BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

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| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

# Exhibit 25A
# Schahfer CCR Part A Demonstration
# Addendum
# Part 1

# Northern Indiana Public Service Company LLC
# R.M. Schahfer Generating Station
# Wheatfield, Indiana

*Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain - Addendum 2*

*Pursuant to 40 CFR Part 257.103(f)(2)*

Submitted to:

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August 2022

NiSource continues to advance efforts under the Your Energy, Your Future initiative a holistic, customer-centric strategic priority aimed at identifying and driving decarbonization pathways that meets the needs of both people and the environment. NiSource's environmental and sustainability performance, include the following goals:

- ✓ 100% coal-free generation mix by 2026-2028
- ✓ 90% reduction of scope 1 greenhouse gas emissions by 2030, with a 58% reduction already accomplished
- ✓ 50% reduction in methane emissions from main and service lines by 2025, with a 42% reduction already accomplished
- ✓ 99% reduction in air emissions (nitrogen oxides, sulfur dioxide, mercury), by 2030
- ✓ 99% reduction in water withdrawals by 2030

**NIPSCO - Leaving things better – YOUR ENERGY, YOUR FUTURE**

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# 1.0 INTRODUCTION

Northern Indiana Public Service Company LLC (NIPSCO) submitted the Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain (hereinafter Demonstration) to the United States Environmental Protection Agency (EPA) on October 30, 2020. The Demonstration was prepared by Golder Associates USA Inc., *a member of WSP* (Golder) in collaboration with and on behalf of NIPSCO for the R. M. Schahfer Generating Station, Wheatfield, Indiana (RMSGS, Figure 1) to meet the requirements of 40 CFR § 257.103(f)(2). Due to a lack of alternative disposal options on- and off-Site for the high-volume waste streams generated by RMSGS, the Demonstration substantiates the basis for continued receipt and management of coal combustion residuals (CCR) and/or non-CCR influent in the Waste Disposal Area (WDA, Figure 2). The WDA is the only currently available management option on- and off-Site for several (e.g., currently up to 4.1 million gallons per day) influent waste streams until coal-fired generation and production of the residual CCR and non-CCR wastes related to typical power plant operation, shutdown, and closure processes end. Furthermore, the Demonstration outlines an alternative closure schedule for RMSGS' single remaining operational CCR surface impoundment beyond the otherwise mandatory April 11, 2021, cease receipt and initiate closure deadline.

Following an informal review of the October 2020 Demonstration and November 23, 2020 discussions with EPA Headquarters representatives about their interpretation of 40 CFR § 257.103(f)(2) regulatory requirements and their expectations regarding Demonstration content, Golder/NIPSCO prepared and on November 30, 2020 NIPSCO submitted the Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain - Addendum 1 (hereinafter Demonstration Addendum 1). In accordance with EPA Headquarters feedback, Demonstration Addendum 1 provides additional CCR Rule groundwater monitoring and corrective action information for other RMSGS CCR Rule regulated management units besides the WDA, updated the existing closure plan, and offered greater detail in an enhanced WDA closure schedule.

Both the Demonstration and Demonstration Addendum 1 anticipated a permanent cessation of coal-fired generation and the initiation of post-operational waste generation and management activities in May 2023. The scheduled cessation of generation was predicated on two key assumptions. First, operating until then would meet existing grid reliability-related electricity supply needs in accordance with the requirements of and commitments to the Midcontinent Independent System Operator (MISO). Second, the schedule of NIPSCO's transition from primarily coal-fired to renewable generation capacity would be sufficient to meet ongoing NIPSCO and MISO electricity demands. However, and as discussed in greater detail in Section 1.2, after preparation of the Demonstration and Demonstration Addendum #1, events outside the control of MISO and NIPSCO occurred. These unforeseen conditions require continued RMSGS coal-fired generation until December 31, 2025. By extension, the cessation of discharge to and initiation of closure of the WDA will follow in approximately six more months. Accordingly, and in accordance with discussions during April-May 2022 between representatives of EPA Headquarters and NIPSCO, on behalf of NIPSCO, Golder has prepared a second Addendum to the Demonstration.

This Demonstration of Site-Specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain - Addendum 2 (Demonstration Addendum 2), provides the new date of permanent cessation of coal-fired boilers at the RMSGS and NIPSCO's continued commitment to cease operation and complete closure the WDA no later than October 17, 2028, as stipulated in 257.103(f)(2)(iv)(B). Furthermore, to meet the requirements of 40 CFR § 257.103(f)(2), Demonstration Addendum 2 supplies information updated since November 2020 (i.e., the date Demonstration Addendum 1 was prepared)

with respect to groundwater monitoring and corrective action activities at RMSGS. Specifically, in accordance with 40 CFR §257.103(f)(2) and the August 28, 2020, preamble to the proposed rulemaking, Demonstration Addendum 2 in concert with the Demonstration and Demonstration Addendum 1:

- address all applicable Part A regulatory requirements
- demonstrate that qualifying criteria had been met
- justifies the new cessation of coal-fired boiler operations date, and
- provides the following updated information:
  - a recent re-evaluation of alternative disposal capacity options and availability
  - progress toward closure since November 30, 2020
  - WDA-specific and other RMSGS CCR management units' geologic/hydrogeologic groundwater monitoring compliance data
  - closure plan schedule as required by 40 CFR §257.102(b) and a narrative with justification for a new cease receipt of waste and amended WDA closure activities timeframe, and
  - NIPSCO recertification of RMSGS facility wide CCR Rule compliance

As explained and justified herein, cessation of coal-fired generation at RMSGS will now be December 31, 2025, providing nearly three years to a) complete boiler shutdown processes, some of which are expected to generate significant volumes of CCR and non-CCR waste streams, b) reduce and/or eliminate other ongoing influent streams, c) optimize the closure plan and gain regulatory agency approval for the WDA closure approach, and d) complete closure construction. Following cease receipt of WDA waste streams (Q2 2026), NIPSCO estimates a timeframe of approximately two and a half years to achieve final closure of the WDA including the professional engineer's certification, thereby achieving final closure by September 17, 2028, and meeting the 40 CFR § 257.103(f)(2) deadline of October 17, 2028.

This Demonstration Addendum 2 in combination with remaining applicable sections of the Demonstration (Golder, October 2020) and Demonstration Addendum 1 (Golder, November 2020) meet the requirements of 40 CFR § 257.103(f)(2).

## 1.1 Background

NIPSCO had been planning for a no later than 2023 retirement of all four coal units (Units 14, 15, 17, 18) at the Schahfer generating station. NIPSCO's preferred resource plan pointed to the retirement of the coal units at the Schahfer Generating Station and the development and completion of a portfolio of renewable wind and solar projects to replace the energy and capacity needs that the station provides NIPSCO and its customers. NIPSCO conducts an Integrate Resource Plan (IRP) every three years to outline the roadmap for future energy needs over the next 20 years. The completion of three wind projects along with a number of transmission system upgrades allowed NIPSCO to retire Units 14 and 15 in 2021, almost 2 years earlier than the planned 2023 retirement. Any delays to the construction progress of the renewable projects significantly impact NIPSCO's ability to sufficiently meet resource adequacy obligations and reliably serve customers. Therefore, NIPSCO must continue to operate RMSGS until the end of 2025 when permanent shutdown of coal-fired electricity generation is scheduled. Until shutdown, RMSGS' ongoing coal-fired generation and associated waste stream management activities are, in turn, dependent upon continued operation of the WDA. Consistent with the objective to reduce its reliance on multiple unlined surface impoundments for waste stream management, NIPSCO is currently in the procurement

(i.e., bid and contractor selection) process, a key initial stage in closure of the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (collectively monitored and referred to as the Multi-Cell Unit (MCU)). As a precursor step in advance of the mandatory April 11, 2021, cease receipt date, NIPSCO ceased discharging influent to these impoundments by October 31, 2020, leaving only the WDA as the remaining operational CCR surface impoundment.

Until Q2 2026 and as shown on the coal-fired cessation, boiler shutdown and impoundment closure timeline, (see Sections 1.4 and 2.4, and Figure 3), the Demonstration, Demonstration Addendum 1, and Demonstration Addendum 2 substantiate the need for receipt and management of CCR and/or non-CCR waste streams by the WDA due to a lack of alternative disposal options on- and off-Site.

In anticipation of and in planning for the reduction of influent waste streams to the WDA and final closure by September 17, 2028, NIPSCO has or is currently engaging in several activities, including:

- The wastewater piping re-direct project was completed in October 2020, resulting in cessation of waste stream discharges to the MCU. CCR waste streams were redirected to the WDA and non-CCR waste streams were redirected to other on-Site waste management units
- A 2019-20 detailed assessment of WDA solids (i.e., ash) content including the presence and type of CCR, relative thickness, and location/extent, the results of which were summarized in a report prepared to support closure design initiatives
- Preparation of and negotiations regarding a beneficial reuse permitting application is ongoing with Indiana Department of Environmental Management (IDEM). Approval of the permit application would allow NIPSCO to excavate and beneficially reuse 250,000 cubic yards or more of WDA bottom ash as a) a protective layer above the landfill geomembrane composite liner and, b) as a landfill final cover drainage layer, instead of virgin natural resources (i.e., native sand) from off-Site. If approved, the amount of remaining material in the WDA would be significantly less, allowing for a faster closure by removal timeframe
- Cessation of coal-fired generation and completion of boiler shutdown/decommissioning activities, and thus, permanent elimination of those directly produced and resulting waste streams by the end of Q2 2026
- Completion of closure activities for the MCU by Q4 2025 and, as part of this action, elimination of CCR-impacted dewatering streams as influent to the WDA by Q2 2026, and
- Conceptual planning for a second wastewater piping re-direct project which would eliminate current (or remaining post-generation) boiler room sump and yard drain stormwater flows to the WDA by the end of Q2 2026

## 1.2 NIPSCO's Role in Midcontinent Independent System Operations and NIPSCO's Generation Transition Plan

NIPSCO, as a member of MISO, has resource adequacy obligations to MISO, of which RMSGS is a critical element of how NIPSCO meets these obligations. MISO is an Independent System Operator (ISO) or Regional Transmission Organization (RTO) ensuring the reliable delivery of electricity in the United States and Canada to 42 million consumers. ISOs and RTOs are organizations formed with the approval of the Federal Energy Regulatory Commission (FERC) to coordinate, control, and monitor the use of the electric transmission system by utilities, generators, and marketers. ISOs and RTOs operating in North America manage the systems that serve two-thirds of the customers in the U.S. and over half the population of Canada. MISO approved NIPSCO's plan to

retire RMSGS in 2023 but that was only one step in a highly complex process to enable the retirement and replacement of generation assets. On the state regulatory front, NIPSCO secured Indiana Utility Regulatory Commission (IURC) approval in December 2019 of an electric base rate case, to support its generation strategy, with new depreciation schedules related to the early retirement of coal-fired generation. In addition, NIPSCO is also executing on a number of required transmission system upgrades that need to be completed prior to the retirement of RMSGS.

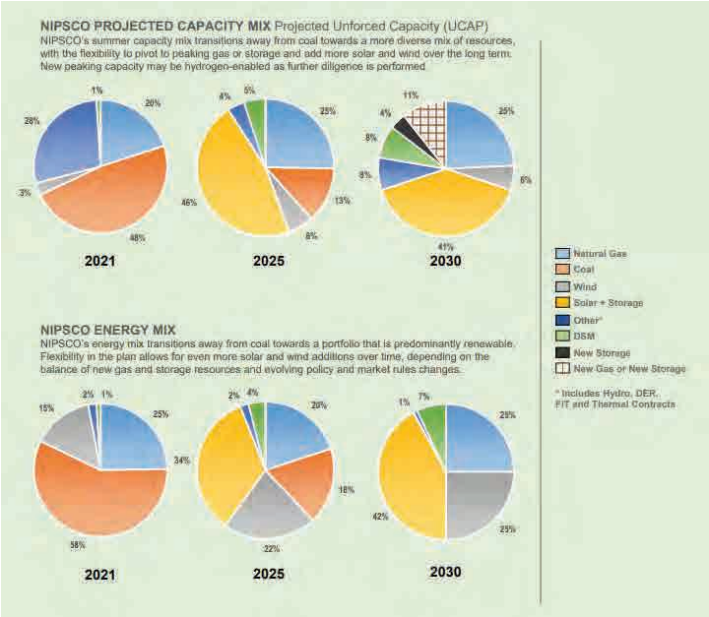
### 1.2.1 Background On NIPSCO's Generation Transition

As a public utility in the state of Indiana, NIPSCO conducts an Integrated Resource Plan, known as an IRP, every three years to outline the roadmap for future energy needs over the next 20 years. Analysis in 2016 and 2018 demonstrated that considering maintenance, environmental compliance, and economic pressures facing the coal generating portfolio, coal unit retirement was the most compelling economic alternative for customers. Furthermore, the analysis pointed to a portfolio of primarily renewable resources (wind, solar and solar plus storage) as being the most economic alternative for customers with estimated savings of $4B as compared to maintaining the existing coal fleet and will drive a 90% reduction in CO2 emissions by 2030 (based on 2005 levels).[1]

Accordingly, NIPSCO's generation transition strategy called for the retirement of the coal fleet over a ten-year period, starting with the retirement of the Schahfer coal units in 2023 and Michigan City Unit 12 in 2028. In order to replace the capacity at Schahfer, NIPSCO has acquired a mix renewable wind and solar projects through a combination of NIPSCO ownership (JVs with Tax Equity Partners) and Power Purchase Agreements (PPAs).

NIPSCO has been planning for a no later than 2023 retirement of all four coal units (Units 14, 15, 17, 18) at the Schahfer generating station. The completion of three wind projects along with a number of transmission system upgrades allowed NIPSCO to retire Units 14 and 15 in 2021, almost 2 years earlier than the planned 2023 retirement. The retirement of the remaining coal units at the Schahfer Generating Station is contingent on the development and completion of the remaining portfolio of renewable projects to replace the energy and capacity of Units 17 and 18. By 2025, the NIPSCO portfolio is expected to transition from coal dominant portfolio to a solar dominant portfolio with over 46% of its capacity coming from solar resources and providing 34% of its customers energy requirements.

[1] NIPSCO has sold in the past, and in the future may sell, the Renewable Energy Credits from its renewable generation to a third party because this helps keep our energy more affordable for our customers.




### 1.2.2 Maintaining System Reliability

As noted above, NIPSCO participates within the MISO market. MISO is responsible for coordinating the reliable operation of the energy system in collaboration with the various market participants. One of the ways it effectuates this responsibility is by ensuring there are enough capacity resources plus contingency reserves to meet customers energy needs at all times. For NIPSCO, part of its Resource Adequacy obligation to MISO is that it has capacity resources and reserves to cover its own customer's annual peak demand plus reserves. Currently, this must be demonstrated to MISO annually. Furthermore, as a vertically integrated utility, NIPSCO is also required by rules and statute in Indiana to have capacity resources to economically and reliably serve its customer's energy needs.

With a 2025 retirement of the RMSGS coal units, solar resources will become one of the primary ways in which NIPSCO will meet its capacity and reliability obligations to MISO and reliably serve its customers.

### 1.2.3 Solar Supply Chain Issues

There are a range of external factors creating uncertainty around the availability of key input material necessary to place solar projects in-service in the US. Currently, these key issues are:

- Department of Commerce (DOC) Investigation into antidumping and countervailing duties anti circumvention petition filed by a domestic solar manufacturer
- Uyghur Forced Labor Prevention Act and Forced Labor Withhold Release Order
- Section 201 Tariffs, and
- General global supply chain and labor availability issues

The issue of most significance is the decision from the U.S. DOC announcing that it will move forward with an investigation into the petition filed by a domestic solar manufacturer. The combination of the DOC investigation and the other issues virtually eliminated solar panel imports and other key components required to build solar

projects in the U.S. starting in March 2022. A significant number of solar projects have been delayed or canceled.[2] As NIPSCO is in the midst of a transition to a solar dominant portfolio, its projects are not immune to the effects of these issues. There is currently uncertainty around the timing of completion for NIPSCO's planned portfolio of projects. NIPSCO has received several notices of potential Force Majeure from developers in connection with solar panel availability, thus project delays are anticipated. The uncertainty surrounding the completion timing of the renewable projects created the potential risk that NIPSCO would not have the resources available to meet its capacity/energy obligations.

### 1.2.4 The Antidumping and Countervailing Duties Anti Circumvention Petition And DOC Investigation

On February 8, 2022, Auxin Solar Inc., a domestic manufacturer of solar modules, filed a petition requesting that the DOC initiate a circumvention investigation into whether imports of certain parts and components imported from Cambodia, Malaysia, Thailand, or Vietnam are circumventing antidumping and countervailing duty orders from China. On March 25, 2022, the DOC announced it would move forward with a circumvention investigation that could have wide ranging effects on the companies that import or rely on solar imports in the United States. For context, the countries subject to the investigation accounted for more than 85% of U.S. solar panel imports in the fourth quarter of 2021.

If the DOC issues an affirmative preliminary circumvention determination, importers will be required to pay antidumping and countervailing duties (tariffs) on certain parts and components that entered the U.S. on or after March 31, 2022. The amounts of tariffs being contemplated under the petition range from 19% to 525%. Regulations require the DOC to issue a preliminary determination by August 29, 2022, and a final determination by January 19, 2023.

It is important to note that the tariffs determinations will be based on individual manufacturers and the countries where the panels are manufactured, therefore should tariffs be imposed as result of this investigation, the impact will have to be assessed on a project-by-project basis. This could create further uncertainty on the timeline based on the individual circumstances of each project.

On June 6th, 2022, President Biden took Executive Action with the focus on spurring domestic solar production, including a 24-month suspension of anti-circumvention tariffs on modules, invoking the Defense Production Act to accelerate the production of clean energy technologies, eliminating back-dated tariffs, and employing federal procurement to increase domestic manufacturing. The Executive Action and 24-month tariff suspension are a positive development as they provide some level of certainty regarding in-flight solar projects. However, they do not fully mitigate the project delays and supply chain and labor issues facing solar project development. Solar panel imports essentially ceased in March 2022 at the onset of the DOC investigation, and it will take some time for imports to recover to previous levels.

### 1.2.5 Implications for NIPSCO Capacity Position and MISO Obligations

The high level of uncertainty surrounding the supply of solar panels and timely completion of the renewables projects creates a significant risk for NIPSCO to reliably meet its capacity/energy obligations for MISO and our customers. Any delays to the completion dates of the anticipated portfolio of solar projects will impact NIPSCO's

[2] Utility Dive, "Supply-chain squeeze: Solar, storage industries grapple with delays, price spikes as demand continues to grow," March 31, 2022, https://www.utilitydive.com/news/solar-storage-delays-price-supplychain/620537/.

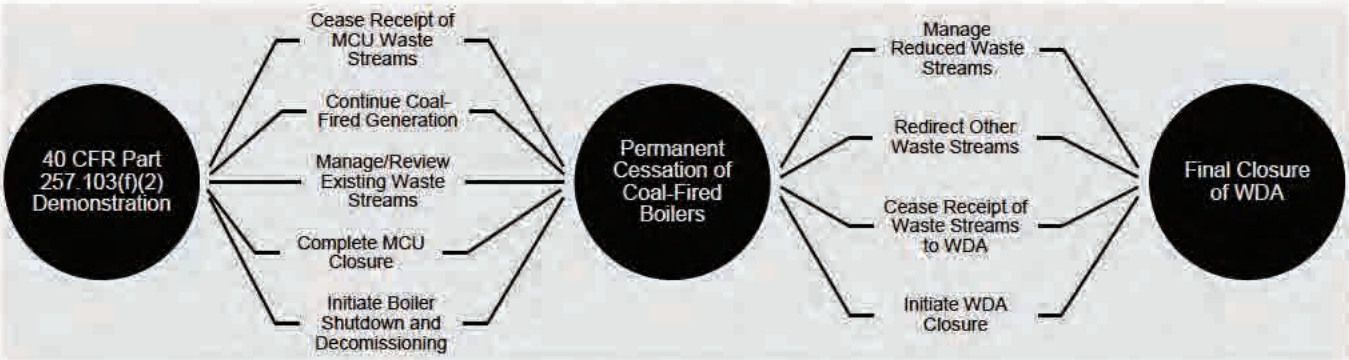
capacity position and its ability to meet its Resource Adequacy obligations to MISO. This challenge becomes acute should the remaining coal units at RMSGS (Units 17 and 18) retire as originally anticipated in May 2023.

NIPSCO is moving forward with two solar projects already under construction – Dunns Bridge I and Indiana Crossroads Solar (INCR) – and extending the operating life of RMSGS Units 17 and 18 to close the capacity gap to a more manageable level, which could then be addressed through a combination of other mitigations.

## 1.3 Planned Cessation of Operations

In 2020 MISO approved NIPSCO's plan to retire RMSGS in 2023; however, increasing regional electric demand, decreasing non-renewable production capacity, and unforeseen regulatory and supply chain issues which are delaying production-critical renewable generation projects have impacted MISO's previous assumptions. This, in turn, requires that RMSGS's coal-fired retirement be delayed until the end of 2025. As summarized in the embedded figure below, waste generation activities, individually and collectively, impact and require continued use of the WDA, the Site's only remaining active CCR Rule-regulated surface impoundment, for the next several years. The embedded figure below summarizes the planned reduction of influent waste stream activities to achieve cessation of the coal-fired boilers and permanent closure of the WDA.

**Planned Cessation of WDA Operations**




In the Demonstration and an annual progress report completed in October 2021 and considered in Demonstration Addendum 2, NIPSCO/Golder identified and evaluated discharge flows into the WDA on a waste stream-specific basis for on- and off-Site treatment and disposal alternatives. Future annual progress reports will be produced following the same waste stream-by-waste stream basis. Most of these discharge flows are high in volume yet based on sampling of ash and the saturated zone within the WDA, confirmed to be low in relative contaminant loading (i.e., concentrations of 40 CFR § 257 Appendix III and IV constituents). As a practical matter, reduction, or permanent elimination of waste streams, particularly those of significant volume, will be NIPSCO's primary focus, corresponding largely with cessation of coal-fired generation and completion of boiler shutdown activities. Initiated in October 2021, NIPSCO achieved significant reductions in influent volume (cessation of Units 14 and 15) and by the end of Q2 2026, will ultimately eliminate waste stream discharges to the WDA.

These and related activities with specific focus on the WDA are discussed in Section 2.4 and depicted on the facility closure timeline provided therein (Figure 3).

## 1.4 Demonstration Approach and Contents

The approach to and preparation of the Demonstration, Demonstration Addendum 1, and Demonstration Addendum 2 are based on the final CCR Rule Part A regulations as found in 40 CFR § 257.103(f)(2). The Demonstration and Addenda have been prepared to address all applicable regulatory requirements, demonstrate that qualifying criteria have been met, and provide an evaluation of alternative disposal capacity options and availability, a risk mitigation plan for continued operation, facility-wide CCR compliance certification, WDA-specific groundwater monitoring compliance data, and a 30% design closure plan with narrative.

Following this Introduction, Section 2.0 summarizes key information about the WDA including:

- overview of CCR and non-CCR wastes managed by the WDA, including source and flow volume tabulated on a waste stream-specific basis and depicted on a facility water flow diagram
- high-level summary of the historical and current CCR groundwater monitoring programs, including current CCR Rule monitoring phase, and
- description of the sequence of cessation of coal-fired generation, boiler shutdown activities, reduction/elimination of all waste streams into the CCR Unit, and planned closure, including a Gantt chart that depicts key actions and milestones (Figure 3)

Section 3.0 provides an identification and evaluation of existing alternative disposal options for influent into the WDA.

Section 4.0 addresses the continued operation risk mitigation plan, which remains largely unchanged since the submittal of the Demonstration in October 2020.

Section 5.0 provides information relative to CCR Rule regulatory compliance, with emphasis on groundwater monitoring and response requirements, including:

- recertification of RMSGS' compliance with all applicable 40 CFR § 257.60-107 requirements, signed by an authorized representative of NIPSCO
- figure showing groundwater monitoring well locations in relation to the CCR Units
- well construction diagrams and drilling logs for monitoring wells installed since 2020
- potentiometric surface maps characterizing the direction of groundwater flow accounting for seasonal variations
- tabulated groundwater monitoring data for each monitoring well for each CCR Rule monitoring event
- corrective measures assessment required in accordance with 40 CFR § 257.96
- progress reports on remedy selection and design and the report of final remedy selection required at 40 CFR § 257.97(a)
- most recent structural stability assessment performed pursuant to 40 CFR § 257.73(d), and
- most recent safety factor assessment performed pursuant to 40 CFR § 257.73(e)

Section 6.0 provides the current closure plan, a narrative that explains and justifies the date by which RMSGS will cease receipt into the WDA in order to meet the Q2 2026 closure construction start schedule date and construction completion date of September 17, 2028, design plans, and a timeline of key milestones and planned activities occurring between the development of WDA Final Closure Construction Plans (Q2 2024) and Closure Certification (Q3 2028).

Section 7.0 discusses the owner/operator compliance responsibilities NIPSCO LLC will fulfill subsequent to the Demonstration's submission to EPA and Section 8.0 provides the attestation of Golder, the preparer of the Demonstration, as to its accuracy and conclusions regarding the availability of no alternative disposal capacity, followed by Section 9.0 which provides references used in the preparation of the document. Supporting tables, figures, and appendices follow the Demonstration text.

# 2.0 DESCRIPTION OF CCR UNIT

This section of the Demonstration provides unit-specific details about the WDA including an explanation and summary of the source, type, and volumes of waste streams managed in the WDA; an overview of the CCR Rule-required groundwater monitoring well network and monitoring phases; and a discussion of key activities related to reduction of influent and other actions to be taken prior to cessation of waste receipt and final closure.

## 2.1 Overview of Waste Streams Managed

As noted, the WDA receives both CCR and non-CCR waste streams. At the time of this Demonstration, NIPSCO provided waste stream data including point source category descriptions (40 CFR § 423.11), a Facility Water Flow Diagram, and estimated average daily flows. This information was reviewed and updated for the purposes of the October 2021 annual progress report and preparation of Demonstration Addendum 2. The point source categories (RMSGS color-coding) and associated RMSGS designations for the waste streams managed at the WDA include:

- Low Volume Waste pursuant to 40 CFR § 423.11(b)
  - Unit 14 Boiler Room Sump (Non-CCR)
  - Unit 15 Boiler Room Sump (Non-CCR)
  - Yard Drain (Non-CCR)
- Flue Gas Desulfurization (FGD) Wastewater pursuant to 40 CFR § 423.11(n)
  - Unit 17/18 FGD Filter Building North Sump (CCR)
  - Unit 17/18 FGD Filter Building South Sump (CCR)
- Ash Transport Water pursuant to 40 CFR § 423.11(p)
  - Unit 17 Bottom Ash Sluice (CCR)
  - Unit 18 Bottom Ash Sluice (CCR)
- Combustion Residual Leachate pursuant to 40 CFR § 423.11(r)
  - MCU Closure Dewatering (CCR)[3]

[3] Development of the closure plan for the Multi-Cell Unit (MCU, [Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area]), estimates that dewatering activities will generate a waste stream of approximately 1.42 MGD for a duration of approximately six months.

The waste stream from Units 14 and 15 Boiler Room Sumps include boiler drains and some other service water systems collected in the 14 or 15 sumps inside the main building. These waste streams are pumped through sump pumps to the WDA. The Yard Drain waste stream is from an outdoor sump that collects outdoor drainage water, as well as some water that comes from the Unit 14 boiler and some other service systems. This waste stream is pumped through sump pumps to the WDA. The waste stream from 17/18 FGD Filter Building North/South Sumps includes wastewater and slurry from the FGD process that cannot be filtered. This waste stream is pumped through either the North or South sump pumps inside FGD to the WDA. These waste streams were redirected to the WDA as part of the MCU wastewater piping re-direct project and in anticipation of closure of the MCU. The waste stream from Units 17 and 18 Bottom Ash Sluice includes bottom ash (or slag) that must be removed from the bottom holding tank of the boiler. Service water is used as a sluicing medium to transport the ash from the holding tank (bottom ash hopper), through pumps inside the main building to the WDA.

In addition to the above streams, NIPSCO's MCU closure application, which is currently undergoing IDEM review, includes the removal of interstitial water (i.e., dewatering) and discharge of this project specific CCR waste stream to the WDA. The selected remedial contractor may use well points or other dewatering equipment to extract the interstitial water, allowing excavation of the ash from within the MCU. The water may be pumped into the abandoned Unit 15 sluice line that runs parallel and to the west of the MCU and discharges in the northwest corner of the WDA. Dewatering and discharge to the WDA in compliance with the facility's NPDES permit is currently scheduled to begin in Q4 2023 and be required for virtually the duration of the closure project.

Following cessation of coal-fired generation, requisite Units 14, 15, 17, and 18 boiler decommissioning activities are expected to also generate Unit-specific washdown streams of approximately 3.5 to 5.0 million gallons per Unit, per decommissioning event. Given the existing RMSGS wastewater piping layout, discharge of these streams will be directed to the WDA prior to its cease receipt date and initiation of closure construction activities.

Based on the data provided by NIPSCO LLC, the embedded table below summarizes the estimated average daily flows managed during normal operation of the WDA until cessation of the coal-fired boilers. At the time of preparation of this Demonstration Addendum 2 the measurable reduction in Site-wide generation of CCR and non-CCR waste streams resulting from boiler shutdowns of Units 14 and 15 could not be definitively quantified due to the absence of flow metering capacity in individual feed and discharge lines. However, in determination of alternative capacity and reliance for the operation of the WDA, the combined estimated average daily waste stream flow of 5.04 MGD reported in the Demonstration (i.e., October 2020) from Units 14 and 15, has been removed from the combined total waste stream flow considered in this Demonstration Addendum. Note that such an approach assumes an instantaneous and maximum waste stream flow reduction (and does not account for the compulsory boiler washdown flow from Units' decommissioning) and is, as a result, considered a conservative compacity demand-based approach to this update. Therefore, due to ongoing Site operations and maintenance activities (e.g., boiler room sump dewatering for both shut down and active Units, stormwater collection and management), volumes of individual CCR and non-CCR effluent being discharged to the WDA are estimated to be between 0.34 MGD and 1.42 MGD, with a combined estimated daily flow of 4.1 MGD. At this time, the washdown generated waste streams are only projections based on NIPSCO LLC's experience performing similar activities and are, therefore, not included in the combined waste stream summary.

**WDA Managed Waste Stream Flows**

| Description | Estimated Average Daily Flow (MGD) | Category |
|---|---|---|
| Unit 14 Boiler Room Sump Cessation 10/2021 | ~~2.88~~ | Non-CCR |
| Unit 15 Boiler Room Sump Cessation 10/2021 | ~~2.16~~ | Non-CCR |
| Yard Drain | 0.86 | Non-CCR |
| Unit 17/18 FGD Filter Building North Sump | 0.55 | CCR |
| Unit 17/18 FGD Filter Building South Sump | 0.55 | CCR |
| Unit 17 Bottom Ash Sluice | 0.34 | CCR |
| Unit 18 Bottom Ash Sluice | 0.34 | CCR |
| **Combined Sub-Total Waste Steam** | **2.64** | |
| MCU Closure Dewatering | 1.42 | CCR |
| **Combined Total Waste Steam** | **4.06** | |

## 2.2 CCR Rule Groundwater Monitoring

Starting in 2016, following the installation of a groundwater monitoring system certified by a qualified professional engineer to be consistent with the design and construction requirements of 40 CFR § 257.91, and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring around the WDA pursuant to the requirements of 40 CFR § 257.94. The monitoring system initially consisted of two background and six downgradient monitoring wells. In 2018, Golder performed the first and second Assessment Monitoring sampling events pursuant to the requirements of 40 CFR § 257.95, following which, ten additional downgradient monitoring wells (including six monitoring wells on the property boundary) were installed. In 2019, consistent with evolution of the Conceptual Site Model (CSM), nine additional downgradient monitoring wells (including five additional monitoring wells on the property boundary) were installed. In 2020, two additional background monitoring wells were installed on the southern property boundary. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, corrective measures program requirements are neither required nor have they been implemented at this CCR Unit. The current monitoring well network is summarized in the embedded table below and shown on Figure 4.

| Well Installation Purpose | Well ID |
|---|---|
| Background Monitoring Wells | GAMW03, GAMW03B, GAMW-68, and GAMW-68B |
| Downgradient Monitoring Wells | GAMW01, GAMW01B, GAMW12, GAMW12B, GAMW13, GAMW13B, GAMW14, and GAMW14B |

| Well Installation Purpose | Well ID |
|---|---|
| Assessment Monitoring Wells | GAMW51, GAMW51B, GAMW59, GAMW59B, GAMW60, and GAMW60B |
| Property Boundary Wells | GAMW42, GAMW42B, GAMW42C, GAMW43, GAMW43B, GAMW44, GAMW44B, GAMW57, GAMW57B, GAMW58, and GAMW58B |

## 2.3 Cessation of Operation and Closure

Because of the design and operation of the generating station and as a result of other compliance-driven projects completed ahead of the CCR Rule Part A revisions, virtually all remaining flows into the WDA are high-volume waste streams, limiting available alternatives for their management prior to cessation of coal-fired generation by the end of Q4 2025. Reduction in current waste stream inflows, cease receipt of all influent, and initiation of closure of the WDA are linked inextricably to several other major activities being undertaken as elements of RMSGS' ongoing closure and decommissioning plans including, but not limited to:

- Permanent cessation of all coal-fired generation and, thus, permanent elimination of those directly produced waste streams
- completion of boiler shutdown/decommissioning activities and, following such, permanent elimination of the resulting waste streams
- redirect of other non-CCR waste streams, and
- dewatering and closure of other CCR surface impoundments in accordance with IDEM approvals

NIPSCO will reduce influent into the WDA and the need for management on- or off-Site due to the Q4 2025 permanent elimination of high-volume waste streams following the cessation of coal-fired generation and the closure of the MCU, also scheduled to be completed no later than Q4 2025. Following the cessation of coal-fired generation, NIPSCO will systematically implement a final boiler shutdown and washdown process, which will potentially produce both CCR and non-CCR waste streams on a boiler-by-boiler basis. As each boiler is shut down and cleaned prior to demolition, these waste streams (washdown streams referenced in Section 2.2) will also be permanently eliminated as influents to the WDA.

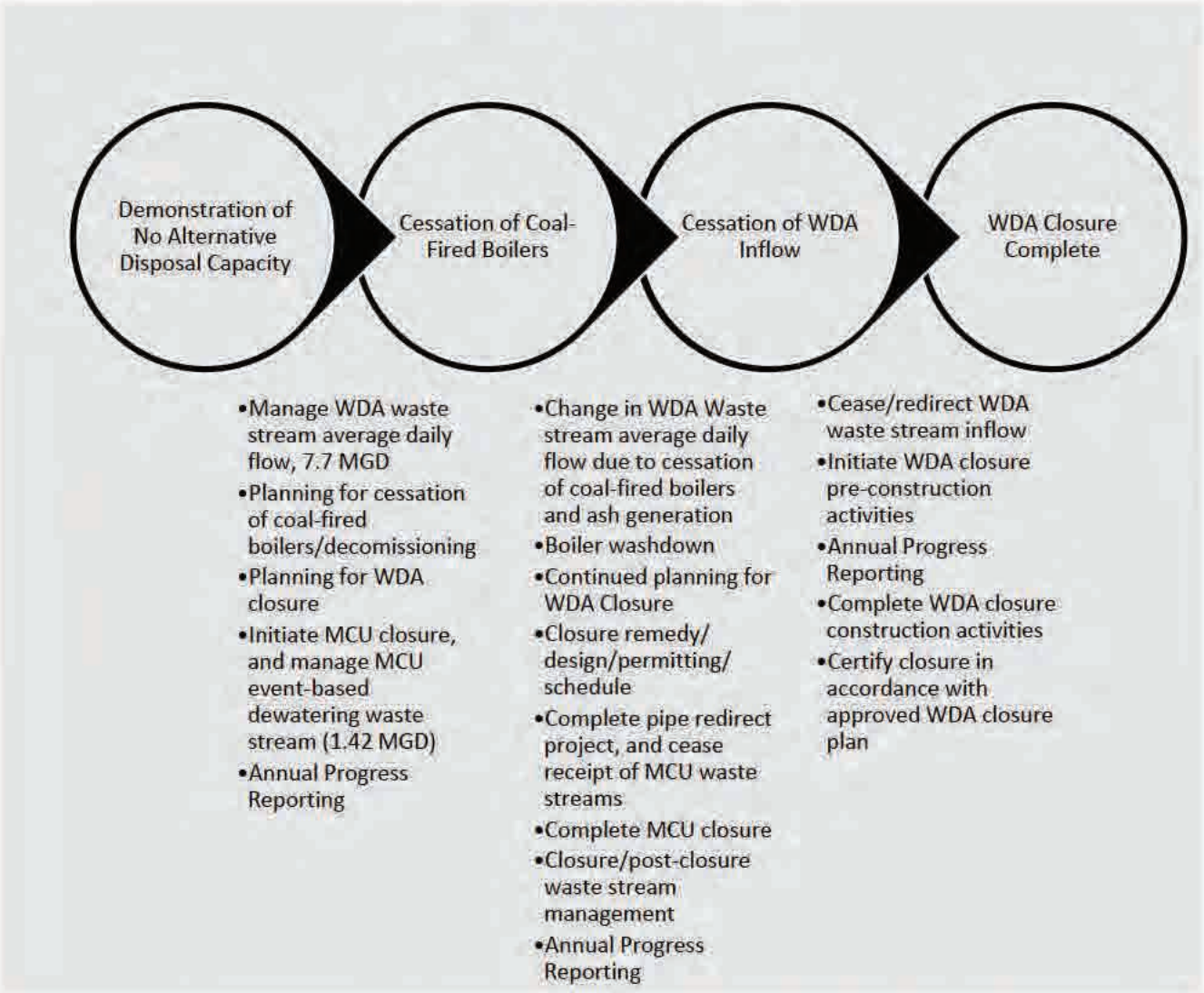
Initiated in October 2021 NIPSCO achieved significant reductions in influent volume (cessation of Units 14 and 15) and current waste materials inventory, and by the end of Q2 2026 ultimately eliminate discharges to the WDA by completing the following actions:

- Late 2021 through 2022 – shutdown, cleaning, and washdown of the former boilers and ancillary equipment in anticipation of plant demolition, permanently eliminating these waste streams
- 2023 (pending acceptance by IDEM) – contingent upon regulatory approval of a CCR beneficial reuse proposal, NIPSCO will begin to permanently remove 250,000 cubic yards or more of bottom ash currently in the WDA, substituting it for virgin materials as a geomembrane liner protectant and drainage underlayment in the final cover system for the on-Site landfill

- Late 2025 – redirect other non-CCR waste steams to other surface impoundments, permanently eliminating these waste streams
- Late 2025 – completion of dewatering activities associated with the MCU closure and permanent elimination of this waste stream
- End 2025 – cessation of coal-fired generation, followed by permanent elimination of bottom ash and sluice water waste streams, and
- Early 2026 – shutdown, cleaning, and washdown of the former boilers and ancillary equipment in anticipation of plant demolition, permanently eliminating these waste streams

The following schematic of operation and closure activities outlines the process NIPSCO will follow to decrease reliance on the WDA, achieve systematic reduction/elimination of influent waste streams, and complete final closure of the CCR Unit by September 17, 2028. A detailed timeline for these concurrent and sequential activities is presented in the embedded figure below.

**Operation and Closure Activities**




# 3.0 EVALUATION OF ALTERNATIVE DISPOSAL CAPACITY, 257.103(f)(2)(v)(A)

40 CFR §257.103(f)(2) outlines specific conditions that must be met to qualify for continued operation and alternative deadlines to initiate closure of the WDA, without consideration of increase in costs or inconvenience to NIPSCO. Pursuant to 40 CFR §257.103(f)(2)(v)(A) the options considered to evaluate the availability of existing alternative disposal capacity for CCR and non-CCR waste streams both on and off-site that are currently managed in the WDA are documented in the Demonstration and the Part A Demonstration Annual Progress Report #01-21 (Golder 2021, Appendix A). The Annual Progress Report, which documents a continued lack of alternative capacity both on-Site and off-Site, was certified by a professional engineer in October 2021. The next Annual Progress Report will be completed and similarly certified in October 2022.

# 4.0 CONTINUED OPERATION RISK MITIGATION PLAN, 257.103(f)(2)(v)(B)

In the event a release from the WDA is detected in groundwater during continued operation of the CCR Unit, 40 CFR § 257.103(f)(2)(v)(B) requires a plan to expedite and maintain the containment of any contaminant plume generated by the release. The Demonstration described the risk mitigation plan in detail. There have been no changes to the risk mitigation plan since the submittal of the Demonstration in October 2020. In short, the risk mitigation plan includes use of the existing downgradient Detection Monitoring and Assessment Monitoring wells to extract groundwater and contain the plume on a temporary basis with the discharge being directed back into the WDA. This initial response is intended only as a temporary method to contain the plume generated by the release until the release can be more fully assessed and a full-scale pump-and-treat system could be designed and constructed as needed. The full-scale pump-and-treat system would be constructed to contain the release and would consist of newly installed extraction wells, following which the extracted groundwater would be pumped to a new treatment facility located to the northwest of the WDA. Treatment technologies selected and other design parameters would be established based on the COC(s) requiring a response action.

# 5.0 CCR RULE REGULATORY COMPLIANCE, 257.103(f)(2)(v)(C)

This section of the Demonstration Addendum 2 provides description and documentation of all 40 CFR §257 requirements completed since the submittal of the Demonstration in October 2020 and Demonstration Addendum 1 in November 2020.

## 5.1 Certification of Facility Status

In accordance with 40 CFR §257.103(f)(2)(iii), this section of the Demonstration Addendum 2 substantiates compliance with all other applicable requirements of 40 CFR §257. RMSGS includes three waste management areas subject to CCR Rule regulation (see Figure 2), two of which NIPSCO will continue to operate for the foreseeable future and one of which is slated for closure in the near term. These include the WDA, which is the primary focus of this Demonstration; Landfill Phases V, VI, and VII; and the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), collectively the Multi-Cell Unit (MCU).

On October 30, 2020 NIPSCO certified that the entire facility complies with the applicable requirements of the CCR Rule (Appendix D of the 2020 Demonstration). NIPSCO has completed a recertification indicating that the entire facility still complies with the applicable requirements of the CCR Rule (Appendix B). Since October 2020, the following additional independent certifications have been completed by a qualified professional engineer in accordance with the content and schedule requirements of the CCR Rule:

- Periodic inspection report §257.83(b)(2) and §257.84(b)(2) (only applicable to the WDA and the Landfill)
- Groundwater system certifications §257.91(f) (applicable to all CCR Units)
- Assessment of corrective measures addendum §257.96(a) (only applicable to the MCU)
- ASDs for the Landfill Phases V and VI, Detection Monitoring §257.94(e)(2), and the WDA, Assessment Monitoring §257.95(c)(3)

### 5.1.1 Monitoring System Design

Since the submittal of the Demonstration and Demonstration Addendum, Golder installed an additional well pair (GAMW68 and GAMW68B) south of the WDA and three additional piezometers designated GAMW65B, GAMW66B, and GAMW67B to the north of the existing groundwater network. These piezometers were installed to further assess groundwater flow direction northwest of the WDA. No changes were made to the monitoring well

networks of the MCU or Landfill Phases V, VI, and VII. In 2022, Golder on behalf of NIPSCO, prepared the Groundwater Monitoring System Design Manual Revision 4.0 (GMSDM Revision 4, Golder 2022) to provide recently discovered historical information regarding the role and construction of the slurry trench cores and their impacts on hydraulic conditions at the Site. The report reaffirms Golder's understanding of the appropriate design and construction of the groundwater monitoring system based on this recently discovered historical information. Based on the GMSDM Revision 4, NIPSCO's professional engineer, recertified the groundwater monitoring systems in May 2022 (Appendix C). A summary of the well networks for all three CCR Units is provided below.

| WDA | |
|---|---|
| Background Monitoring Wells | GAMW03, GAMW03B, GAMW68, and GAMW68B |
| Downgradient Monitoring Wells | GAMW01, GAMW01B, GAMW12, GAMW12B, GAMW13, GAMW13B, GAMW14, and GAMW14B |
| Assessment Monitoring Wells | GAMW42, GAMW42B, GAMW42C, GAMW43, GAMW43B, GAMW44, GAMW44B, GAMW51, GAMW51B, GAMW57, GAMW57B, GAMW58, GAMW58B, GAMW59, GAMW59B, GAMW60, and GAMW60B |
| Piezometers (non-CCR Monitoring Wells) | GAMW02, GAMW05, GAMW65B, GAMW66B, and GAMW67 |

| Drying Area, MSRB, MCWB (i.e., MCU) | |
|---|---|
| Background Monitoring Wells | GAMW04, GAMW07, GAMW07B, GAMW15, and GAMW15B |
| Downgradient Monitoring Wells | GAMW08, GAMW08B, GAMW09, GAMW09B, GAMW16R, GAMW16BR, GAMW17, GAMW17B, GAMW17B, GAMW18, and GAMW18B |
| Assessment Monitoring Wells | GAMW46, GAMW46B, GAMW52, GAMW52B, GAMW53, GAMW53B, GAMW54, GAMW54B, GAMW55R, GAMW55B, GAMW56, and GAMW56B |
| Piezometers (non-CCR Monitoring Wells) | GAMW06, GAMW63B, and GAMW64B |

| Landfill Phases V, VI, and VII | |
|---|---|
| Background Monitoring Well | GAMW20, GAMW24, GAMW24B, GAMW25, and GAMW25B |
| Downgradient Monitoring Well | GAMW26, GAMW26B, GAMW27, GAMW27B, GAMW38, GAMW38B, GAMW39, GAMW39B, GAMW40, GAMW40B, GAMW41, GAMW41B |
| Piezometers (non-CCR Monitoring Wells) | MW-1S/1D, MW-2S/2D, WM-3S/3D, MW-4S/4D, MW-5S/5D, MW-6S/6D, MW-7S/7D, MW-8S/8D, MW-9S/9D, MW-10S/10D, MW-11S/11D, MW-12S/12D, MW-13S/13D, MW-14S/14D, GAMW10, GAMW11, GAPIEZ07, GAMW20B, GAMW29/29B, GAMW30/30B, GAMW31/31B, GAMW32/32B, GAMW33/33B, GAMW34/34B, GAMW35B, GAMW36/36B, GAMW37B, GAMW48/48B, GAMW49/49B, GAMW50/50B |

A summary of the well construction information is provided in Table 1 and a summary of the dates and purpose of installation is provided in Table 2. The additional boring and well construction logs are provided in Appendix D. The monitoring well locations are shown in Figure 4.

## 5.2 Groundwater Monitoring Results

Starting in July 2016 on behalf of NIPSCO, in accordance with the requirements of the CCR Rule Golder has performed monitoring of each well in the CCR groundwater monitoring network on at least a semi-annual basis. The monitoring well network is described above in Section 5.1.1 and shown in Figure 4. A compilation of all groundwater data collected as part of the CCR program since October 2020 is provided in Appendix E. The most recent annual reports (2021 Annual Report, submitted January 2021) for the WDA, MCU, and Landfill Phases V, VI, and VII are provided in Appendix F.

### 5.2.1 WDA Monitoring Program Status

As reported in the Demonstration, background groundwater samples were collected between July 2016 and August 2017, as required by 40 CFR §257.94. Golder collected the first Detection Monitoring groundwater samples in October 2017 and identified statistically significant increases (SSIs). Based on these results, NIPSCO established an Assessment Monitoring program in January 2018.

Golder performed the first Assessment Monitoring event in March 2018. The results from the first five Assessment Monitoring events were reported in the Demonstration. Golder performed the fifth Assessment Monitoring event in April/May 2020 and the statistical analysis in September 2020 and concluded that the only constituents demonstrating an apparent statistically significant level (SSL) are molybdenum and lithium in GAMW51B. A summary of the groundwater protection standards (GWPS) is provided in Table 3. The results of the April/May 2020 sampling event are similar to historical data. Golder recertified the previously submitted alternative source demonstration (ASD) in December 2020 (Appendix G).

Golder performed the sixth Assessment Monitoring event in October 2020 and the statistical evaluation in February 2021 and identified SSLs for molybdenum and lithium in well GAMW51B and molybdenum in GAMW-60B. As described in the Demonstration, GAMW60B was installed downgradient of GAMW51/51B in 2019 to further assess the nature and extent of groundwater quality further downgradient of the WDA. The October 2020 Assessment Monitoring event was the fourth round of sampling at this location, and therefore, was the first event for which SSLs were calculated. As these results are consistent with the primary lines of evidence presented in the June 2020 ASD, this ASD was recertified in May 2021 (Appendix H).

Golder performed the seventh Assessment Monitoring event in April 2021 and the statistical evaluation of the resulting data in August 2021 and identified SSLs for molybdenum and lithium in well GAMW51B and molybdenum in GAMW60B. As these results were consistent with the previous Assessment Monitoring event, the ASD was recertified November 2021 (Appendix I). Golder performed the eighth Assessment Monitoring event in September 2021 and the statistical evaluation in January 2022 and again identified SSLs for molybdenum and lithium in well GAMW51B and molybdenum in GAMW60B. As these results were consistent with the previous Assessment Monitoring event, the ASD was recertified April 2022 (Appendix J). Golder performed the ninth Assessment Monitoring event in April/May 2022 and is currently awaiting receipt of data from the analytical laboratory.

A summary of the dates and purposes of each monitoring event is presented in Table 4 and a complete compilation of all analytical data is provided in Appendix E.

### 5.2.2 MCU Monitoring Program Status

As reported in the Demonstration Addendum 1, background groundwater samples were collected between July 2016 and August 2017, as required by 40 CFR §257.94. Golder collected the first Detection Monitoring groundwater samples in October 2017 and identified SSIs. Based on these results, NIPSCO established an Assessment Monitoring program in January 2018.

Golder performed the first Assessment Monitoring event in March 2018 and completed the Assessment of Corrective Measures (ACM) in 2019 (see Section 5.3). The results from the first five Assessment Monitoring events were reported in the Demonstration. Golder performed the fifth Assessment Monitoring event in April/May 2020 and the statistical analysis in September 2020 and the results confirmed the SSL for cobalt at GAMW08. A summary of the GWPS is provided in Table 3. Golder performed the sixth Assessment Monitoring event in October 2020 and the statistical analysis in February 2021. Golder performed the seventh Assessment Monitoring event in April 2021 and the statistical analysis in August 2021. Golder performed the eighth Assessment Monitoring event in September/October 2021 and the statistical analysis in January 2022. The results of the sixth, seventh, and eighth Assessment Monitoring events confirmed the SSL for cobalt in GAMW08. Golder performed the ninth Assessment Monitoring event in April/May 2022 and are currently awaiting receipt of data from the analytical laboratory.

A summary of the dates and purposes of each monitoring event is presented in Table 4 and a complete compilation of all analytical data is provided in Appendix E.

### 5.2.3 Landfill Monitoring Program Status

As reported in the Demonstration Addendum 1, background groundwater samples were collected between July 2016 and August 2017, as required by 40 CFR §257.94. Golder collected the first Detection Monitoring groundwater samples in October 2017 and identified SSIs. Golder identified a potential alternative source that could explain the SSIs and prepared an ASD. A qualified Indiana-licensed professional engineer certified the ASD in April 2018. The ASD supports the findings that the SSIs determined in January 2018 do not result from a release from the CCR Unit. The key supporting lines of evidence described in the ASD indicate that the closed, non-CCR Rule regulated phases of the landfill (i.e., Phases I and II) are the source of the SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and Phases V and VI will remain in Detection Monitoring. The results from the first seven Detection Monitoring events were reported in the Demonstration Addendum 1. Golder performed the seventh Detection Monitoring event in September 2020 and recertified the ASD in March 2021 (Appendix K).

Golder performed the eighth and nineth Detection Monitoring events in April and September 2021. Consistent with the previous evaluations, Golder identified a potential alternative source that explained the SSIs. The ASD was recertified in October 2021 (Appendix L) and March 2022 (Appendix M). Golder performed the ninth Assessment Monitoring event in April/May 2022 and are currently awaiting receipt of data from the analytical laboratory.

A summary of the dates and purposes of each monitoring event is presented in Table 4 and a complete compilation of all analytical data is provided in Appendix E.

## 5.3 Corrective Measures Assessment

Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, NIPSCO is only currently required to complete an Assessment of Corrective Measures (ACM) for the MCU. The ACM was completed and posted to the NIPSCO's CCR Website in 2019. The first Addendum to the ACM was completed in November

2020. Both the ACM and the ACM Addendum were included in the Demonstration Addendum 1. A second ACM Addendum was completed in July 2021. The ACM Addendum #2 incorporates an enhanced final cap design in all corrective measure alternatives. The certified ACM Addendum #2 is included in Appendix N. A third ACM Addendum was completed in March 2022. The ACM Addendum #3 includes ACM revisions in response to site conditions, evolving state regulatory agency (i.e., IDEM) requests/requirements, and changing Federal (i.e., EPA) regulation and policy interpretations. The ACM Addendum #3 further refines remedial alternatives based on the single cobalt SSL. The certified ACM Addendum #3 is included in Appendix O. Neither the WDA, which is in Assessment Monitoring being performed consistent with 40 CFR §257.95, nor the Landfill, which remains in Detection Monitoring pursuant to 40 CFR §257.94, is subject to the ACM requirement.

## 5.4 Remedy Selection

Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, NIPSCO is currently required to complete remedy selection requirements pursuant to 40 CFR §257.97 or 257.98 for only the MCU. Neither the WDA, which is in Assessment Monitoring being performed consistent with 40 CFR §257.95, nor the Landfill, which remains in Detection Monitoring pursuant to 40 CFR §257.94, is subject to the remedy selection requirement.

NIPSCO is currently performing a more detailed evaluation and comparison of the four potential groundwater corrective measures identified in the ACM Addendum #3. That detailed evaluation includes the development of conceptual designs and preparation of engineering cost estimates for each of the potential groundwater corrective measures. On August 3, 2022 NIPSCO received notification of IDEM's approval of the MCU closure application. NIPSCO is now in the early stages of a public comment period and is awaiting substantive public comments on the draft IDEM approval. Following final approval by IDEM on the proposed closure approach, with which the groundwater corrective measure must be aligned, NIPSCO will select a groundwater remedy. In the interim, Golder will continue the remedy evaluation process, will schedule a public meeting on groundwater corrective measure(s), and will complete semi-annual progress reports. The semi-annual progress reports completed since the submittal of the Demonstration Addendum 1 are included in Appendix P.

## 5.5 Structural Stability Assessment

Golder completed the initial Structural Stability and Safety Factor Assessment for the WDA in October 2016 as required by 40 CFR §257.73(d) and 40 CFR §257.73(e) (Appendix L of the Demonstration). The most recent certified annual inspection report (Annual RCRA CCR Unit Inspection Report Waste Disposal Area - Surface Impoundment, December 2021) is attached in Appendix Q. As required by 40 CFR §257.83(b)(1), the WDA has been visually inspected annually for structural stability. This assessment concludes that based on information provided by NIPSCO and on Golder's on-site visual inspection, the overall condition of the WDA is acceptable. The assessment was certified by a qualified professional engineer licensed in the State of Indiana on December 31, 2021. Neither the MCU nor the Landfill are subject to the structural stability assessment requirements (40 CFR §257.73(d)).

## 5.6 Safety Factor Assessment

Golder completed the initial Structural Stability and Safety Factor Assessment for the WDA in October 2016 as required by 40 CFR §257.83(b)(1). The Safety Factor Assessment is provided in Appendix L of the Demonstration and was certified by a qualified professional engineer licensed in the State of Indiana on October 5, 2016. Neither the MCU nor the Landfill are subject to the safety factor assessment requirement (40 CFR §257.73(e)).

# 6.0 CLOSURE PLAN, 257.103(f)(2)(v)(D)

As discussed in Sections 1.4 and 2.4 above, NIPSCO has outlined a planned cessation of operation and closure plan for the Site. The current reliance on the WDA is tied to the ongoing generating activities and dewatering and closure of other CCR surface impoundments with a period of sequential cessation of waste streams from Q1 2021 until Q2 2026. Cessation of coal-fired generation is scheduled by the end of Q4 2025 and closure of the MCU is also scheduled to be completed no later than Q4 2025, reducing the reliance on the WDA due to the elimination of these waste streams. Following the cessation of coal-fired generation, NIPSCO will systematically shut down the boilers, which will produce an action-specific need for the WDA due to cessation washdown streams forecasted until Q2 2026. Identification and redirection of other waste streams, currently forecasted between Q4 2025 and Q2 of 2026, will be completed prior to final cease receipt of WDA streams (Q2 2026). WDA closure construction is scheduled to begin in Q2 2026 and will be completed prior to October 17, 2028.

On the behalf of NIPSCO, Golder completed a CCR Closure Plan Update (Version #5) which addresses the requirements of 40 CFR §257.102(b) *Criteria for conducting the closure or retrofit of CCR units*. The plan describes the WDA CCR Unit, and provides a closure remedy, steps required to close the CCR Unit, design plans and a schedule for closure. The plan calls for closure of the impoundment by removal of the CCR. A copy of the latest Closure Plan Schedule is included as Figure 3.

The final cease receipt of waste streams to the WDA is scheduled to occur in Q2 2026 providing sufficient time for planned cessation of operations reliant on inflow to the WDA and allowing for the forecasted sequence and schedule of closure activities within the regulatory closure deadline.

# 7.0 OPERATOR RESPONSIBILITY

As addressed in this section, after preparation of the Demonstration and submittal on or before November 30, 2020, additional requirements must be met by NIPSCO relative to the 40 CFR §257.102(f)(2) regulations. In addition to compliance with requirements as outlined in 40 CFR §257.103(f)(2)(vi), following submission of the Demonstration to U. S. EPA NIPSCO will comply with the recordkeeping requirements specified in §257.105(i), the notification requirements specified in §257.106(i), and the internet posting requirements in §257.107(i), as applicable and as detailed below.

In accordance with the requirements of 40 CFR §257.103(f)(2)(viii), NIPSCO will upon submission of the Demonstration Addendum 2 prepare and place in the RMSGS operating record and on its publicly accessible CCR internet site a new notification of intent to comply with the site-specific alternative to initiation of closure due to permanent cessation of a coal-fired boiler(s) by a date certain. This notification will include a reference to the submission date along with a copy of the Demonstration.

Pursuant to the requirements of 40 CFR §257.103(f)(2)(ix), upon receipt from EPA of its decision as described in §257.103(f)(3) NIPSCO will place a copy of the approved or denied decision in the RMSGS operating record and the NIPSCO publicly accessible CCR internet site. In addition, NIPSCO will prepare a notification of the availability of the EPA decision.

Per the requirements of 40 CFR §257.103(f)(2)(x), NIPSCO will prepare an annual progress report documenting continued lack of alternative capacity and progress towards the closure of the WDA. Successful completion of the progress report will be documented by its placement in the RMSGS operating record. NIPSCO will also prepare a notification of the availability of the annual progress report and place a copy of the report on the NIPSCO publicly available CCR internet site. The next annual progress report will be completed in October 2022.

# 8.0 CLOSING

It is Golder's opinion that the information contained the October 2020 Demonstration, November 2020 Demonstration Addendum 1, and August 2022 Demonstration Addendum 2 is true, accurate and has been prepared in accordance with good engineering practices and that the documentation provided for continued operation and alternative deadlines to initiate closure of the WDA, without consideration of increase in costs or inconvenience to NIPSCO, in accordance with §257.103(f)(2), demonstrates that there is presently no existing alternative disposal capacity on- or off-Site that could accept the flow currently being impounded in the WDA at RMSGS.

# 9.0 REFERENCES

Golder Associates (2016a), NIPSCO R. M. Schahfer Generating Station, Hazard Potential Classification Assessment and Visual Inspection Report – RCRA CCR Units, Pursuant to 40 CFR § 257.73, September 2016.

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NiSource Environmental, Indiana Department of Environmental Management NIPSCO Request for a Variance Pursuant to Ind. Code 13-14-8-8 From a Deadline in the Coal Combustion Residuals Rule, R.M. Schahfer Generating Station, correspondence dated December 20, 2018.

NiSource Environmental, Indiana Department of Environmental Management NIPSCO Request for a Variance Pursuant to Ind. Code 13-14-8-8 From a Deadline in the Coal Combustion Residuals Rule, R.M. Schahfer Generating Station, correspondence dated December 3, 2018.

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

| CCR Unit | Monitoring Well ID | Ground Surface Elevation (ft-amsl) | Total Borehole Depth (ft) | Top of Casing Elevation (ft-amsl) | Sounded Well Depth (ft-btoc) | Well Material | Screen Length (ft) | Screen Depth | | Screen Elevation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Top (ft-bgs) | Bottom (ft-bgs) | Top (ft-amsl) | Middle (ft-amsl) | Bottom (ft-amsl) |
| WDA | GAMW01 | 664.90 | 15.00 | 668.19 | 18.86 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.90 | 654.90 | 649.90 |
| | GAMW01B | 665.20 | 36.00 | 667.87 | 37.80 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 639.20 | 634.20 | 629.20 |
| | GAMW02 | 666.08 | 15.00 | 669.57 | 19.00 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 661.08 | 656.08 | 651.08 |
| | GAMW03 | 665.14 | 15.00 | 668.77 | 18.30 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.14 | 655.14 | 650.14 |
| | GAMW03B | 665.29 | 35.00 | 668.16 | 37.79 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.29 | 635.29 | 630.29 |
| | GAMW05 | 666.69 | 17.00 | 669.75 | 20.01 | 2" Sch 40 PVC | 10.00 | 7.00 | 17.00 | 659.69 | 654.69 | 649.69 |
| | GAMW12 | 664.35 | 15.00 | 667.29 | 18.17 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.35 | 654.35 | 649.35 |
| | GAMW12B | 664.23 | 35.00 | 666.81 | 37.82 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 639.23 | 634.23 | 629.23 |
| | GAMW13 | 664.31 | 15.00 | 667.24 | 18.45 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.31 | 654.31 | 649.31 |
| | GAMW13B | 664.23 | 35.00 | 667.12 | 38.86 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 639.23 | 634.23 | 629.23 |
| | GAMW14 | 664.76 | 15.00 | 667.96 | 18.43 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.76 | 654.76 | 649.76 |
| | GAMW14B | 664.62 | 35.00 | 667.94 | 39.19 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 639.62 | 634.62 | 629.62 |
| | GAMW42 | 663.12 | 15.00 | 665.80 | 17.97 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 658.12 | 653.12 | 648.12 |
| | GAMW42B | 663.15 | 36.00 | 665.66 | 36.70 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 637.15 | 632.15 | 627.15 |
| | GAMW42C | 663.20 | 50.00 | 666.28 | 52.91 | 2" Sch 40 PVC | 10.00 | 40.00 | 50.00 | 623.20 | 618.20 | 613.20 |
| | GAMW43 | 663.14 | 15.00 | 665.59 | 18.29 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 658.14 | 653.14 | 648.14 |
| | GAMW43B | 663.12 | 26.00 | 665.53 | 32.28 | 2" Sch 40 PVC | 10.00 | 16.00 | 26.00 | 647.12 | 642.12 | 637.12 |
| | GAMW44 | 664.11 | 15.00 | 666.31 | 16.02 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.11 | 654.11 | 649.11 |
| | GAMW44B | 664.11 | 36.00 | 666.25 | 38.82 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 638.11 | 633.11 | 628.11 |
| | GAMW51 | 666.15 | 15.00 | 668.77 | 18.58 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 661.15 | 656.15 | 651.15 |
| | GAMW51B | 666.03 | 37.00 | 668.79 | 39.99 | 2" Sch 40 PVC | 10.00 | 27.00 | 37.00 | 639.03 | 634.03 | 629.03 |
| | GAMW57 | 670.46 | 15.00 | 672.97 | 25.55 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 665.46 | 660.46 | 655.46 |
| | GAMW57B | 670.45 | 45.00 | 672.88 | 47.45 | 2" Sch 40 PVC | 10.00 | 35.00 | 45.00 | 635.45 | 630.45 | 625.45 |
| | GAMW58 | 664.99 | 15.00 | 667.54 | 17.58 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.99 | 654.99 | 649.99 |
| | GAMW58B | 664.88 | 36.00 | 667.59 | 37.81 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 638.88 | 633.88 | 628.88 |
| | GAMW59 | 665.93 | 15.00 | 668.49 | 17.22 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.93 | 655.93 | 650.93 |
| | GAMW59B | 665.95 | 40.00 | 668.55 | 42.36 | 2" Sch 40 PVC | 10.00 | 30.00 | 40.00 | 635.95 | 630.95 | 625.95 |
| | GAMW60 | 665.08 | 15.00 | 667.50 | 17.39 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.08 | 655.08 | 650.08 |
| | GAMW60B | 665.06 | 40.00 | 667.50 | 42.59 | 2" Sch 40 PVC | 10.00 | 30.00 | 40.00 | 635.06 | 630.06 | 625.06 |
| | GAMW65B | 665.45 | 35.00 | 668.67 | 37.95 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.45 | 635.45 | 630.45 |
| | GAMW66B | 669.20 | 44.00 | 672.99 | 47.80 | 2" Sch 40 PVC | 10.00 | 34.00 | 44.00 | 635.20 | 630.20 | 625.20 |
| | GAMW67B | 664.65 | 40.50 | 667.97 | 43.75 | 2" Sch 40 PVC | 10.00 | 30.50 | 40.50 | 634.15 | 629.15 | 624.15 |
| | GAMW68 | 665.93 | 17.00 | 665.53 | 17.03 | 2" Sch 40 PVC | 10.00 | 7.00 | 17.00 | 658.93 | 653.93 | 648.93 |
| | GAMW68B | 666.00 | 34.50 | 665.72 | 34.78 | 2" Sch 40 PVC | 10.00 | 24.50 | 34.50 | 641.50 | 636.50 | 631.50 |
| MSRB, MCWB, and Drying Area | GAMW04 | 665.81 | 15.00 | 669.21 | 17.86 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.81 | 655.81 | 650.81 |
| | GAMW06 | 667.50 | 15.00 | 670.81 | 18.82 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 662.50 | 657.50 | 652.50 |
| | GAMW07 | 666.55 | 15.00 | 669.89 | 18.89 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 661.55 | 656.55 | 651.55 |
| | GAMW07B | 666.83 | 40.00 | 669.99 | 42.40 | 2" Sch 40 PVC | 10.00 | 30.00 | 40.00 | 636.83 | 631.83 | 626.83 |
| | GAMW08 | 665.95 | 15.00 | 669.66 | 18.78 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.95 | 655.95 | 650.95 |
| | GAMW08B | 665.92 | 36.00 | 668.47 | 38.79 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 639.92 | 634.92 | 629.92 |
| | GAMW09 | 665.10 | 15.00 | 668.99 | 18.48 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.10 | 655.10 | 650.10 |
| | GAMW09B | 665.35 | 35.00 | 668.29 | 37.42 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.35 | 635.35 | 630.35 |
| | GAMW15 | 665.01 | 15.00 | 668.25 | 18.71 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.01 | 655.01 | 650.01 |
| | GAMW15B | 665.14 | 35.00 | 668.05 | 38.86 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.14 | 635.14 | 630.14 |
| | GAMW16* | 665.20 | 15.00 | 668.37 | 18.20 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.20 | 655.20 | 650.20 |
| | GAMW16R | 664.35 | 20.00 | 667.17 | 21.75 | 2" Sch 40 PVC | 10.00 | 10.00 | 20.00 | 654.35 | 649.35 | 644.35 |
| | GAMW16B* | 665.16 | 35.00 | 667.76 | 40.13 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.16 | 635.16 | 630.16 |
| | GAMW16BR | 664.39 | 40.00 | 667.32 | 42.45 | 2" Sch 40 PVC | 10.00 | 30.00 | 40.00 | 634.39 | 629.39 | 624.39 |
| | GAMW17 | 668.81 | 15.00 | 671.93 | 18.00 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 663.81 | 658.81 | 653.81 |
| | GAMW17B | 668.86 | 35.00 | 670.60 | 40.34 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 643.86 | 638.86 | 633.86 |
| | GAMW18 | 666.04 | 15.00 | 669.07 | 18.51 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 661.04 | 656.04 | 651.04 |
| | GAMW18B | 665.94 | 35.00 | 668.47 | 35.89 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.94 | 635.94 | 630.94 |
| | GAMW46 | 661.99 | 15.00 | 664.80 | 17.50 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 656.99 | 651.99 | 646.99 |
| | GAMW46B | 661.98 | 32.00 | 664.79 | 33.00 | 2" Sch 40 PVC | 10.00 | 22.00 | 32.00 | 639.98 | 634.98 | 629.98 |
| | GAMW52 | 664.07 | 15.00 | 666.79 | 18.50 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.07 | 654.07 | 649.07 |
| | GAMW52B | 664.50 | 37.00 | 666.90 | 39.34 | 2" Sch 40 PVC | 10.00 | 27.00 | 37.00 | 637.50 | 632.50 | 627.50 |
| | GAMW53 | 664.68 | 15.00 | 667.24 | 17.49 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.68 | 654.68 | 649.68 |
| | GAMW53B | 664.62 | 36.00 | 667.29 | 40.10 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 638.62 | 633.62 | 628.62 |
| | GAMW54 | 663.87 | 15.00 | 666.37 | 15.46 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 658.87 | 653.87 | 648.87 |
| | GAMW54B | 663.98 | 32.00 | 666.47 | 36.41 | 2" Sch 40 PVC | 10.00 | 22.00 | 32.00 | 641.98 | 636.98 | 631.98 |
| | GAMW55* | 665.06 | 15.00 | 667.64 | 18.68 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.06 | 655.06 | 650.06 |
| | GAMW55R | 665.36 | 15.00 | 667.71 | 16.31 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.36 | 655.36 | 650.36 |
| | GAMW55B | 665.18 | 35.00 | 667.53 | 37.60 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.18 | 635.18 | 630.18 |
| | GAMW56 | 665.43 | 15.00 | 667.91 | 15.56 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.43 | 655.43 | 650.43 |
| | GAMW56B | 665.33 | 35.00 | 667.82 | 36.84 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.33 | 635.33 | 630.33 |
| | GAMW63B | 668.31 | 33.00 | 668.74 | 35.43 | 2" Sch 40 PVC | 10.00 | 23.00 | 33.00 | 643.31 | 638.31 | 633.31 |
| | GAMW64B | 664.42 | 31.00 | 666.83 | 33.26 | 2" Sch 40 PVC | 10.00 | 21.00 | 31.00 | 643.42 | 638.42 | 633.42 |

Table 1 Monitoring Well Construction Details
NIPSCO LLC Rollin M. Schahfer Generating Station
Wheatfield, Indiana

| CCR Unit | Monitoring Well ID | Ground Surface Elevation (ft-amsl) | Total Borehole Depth (ft) | Top of Casing Elevation (ft-amsl) | Sounded Well Depth (ft-btoc) | Well Material | Screen Length (ft) | Screen Depth | | Screen Elevation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Top (ft-bgs) | Bottom (ft-bgs) | Top (ft-amsl) | Middle (ft-amsl) | Bottom (ft-amsl) |
| Landfill Phase V, Phase VI, and Phase VII | GAMW20 | 664.61 | 16.00 | 667.21 | 18.95 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 658.61 | 653.61 | 648.61 |
| | GAMW20B | 664.48 | 36.00 | 667.40 | 18.22 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 639.48 | 634.48 | 629.48 |
| | GAMW21* | 666.60 | 18.00 | 668.38 | 20.36 | 2" Sch 40 PVC | 10.00 | 8.00 | 18.00 | 658.60 | 653.60 | 648.60 |
| | GAMW21B* | 666.66 | 37.00 | 669.37 | 36.34 | 2" Sch 40 PVC | 10.00 | 27.00 | 37.00 | 639.66 | 634.66 | 629.66 |
| | GAMW22* | 666.33 | 18.00 | 668.64 | 20.38 | 2" Sch 40 PVC | 13.00 | 5.00 | 18.00 | 661.33 | 654.83 | 648.33 |
| | GAMW22B* | 666.39 | 37.00 | 669.38 | 37.13 | 2" Sch 40 PVC | 10.00 | 27.00 | 37.00 | 639.39 | 634.39 | 629.39 |
| | GAMW23* | 667.02 | 19.00 | 668.34 | 20.30 | 2" Sch 40 PVC | 14.00 | 5.00 | 19.00 | 662.02 | 655.02 | 648.02 |
| | GAMW23B* | 667.03 | 38.00 | 670.02 | 37.92 | 2" Sch 40 PVC | 10.00 | 28.00 | 38.00 | 639.03 | 634.03 | 629.03 |
| | GAMW24 | 662.09 | 16.00 | 665.46 | 20.31 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 656.09 | 651.09 | 646.09 |
| | GAMW24B | 662.13 | 31.00 | 665.43 | 35.38 | 2" Sch 40 PVC | 10.00 | 21.00 | 31.00 | 641.13 | 636.13 | 631.13 |
| | GAMW25 | 665.26 | 16.00 | 668.07 | 19.43 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 659.26 | 654.26 | 649.26 |
| | GAMW25B | 665.26 | 35.00 | 667.97 | 37.00 | 2" Sch 40 PVC | 10.00 | 25.00 | 35.00 | 640.26 | 635.26 | 630.26 |
| | GAMW26 | 664.89 | 16.00 | 667.83 | 20.00 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 658.89 | 653.89 | 648.89 |
| | GAMW26B | 664.91 | 33.00 | 667.76 | 37.08 | 2" Sch 40 PVC | 10.00 | 23.00 | 33.00 | 641.91 | 636.91 | 631.91 |
| | GAMW27 | 662.68 | 16.00 | 665.57 | 20.00 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 656.68 | 651.68 | 646.68 |
| | GAMW27B | 662.65 | 31.00 | 665.52 | 34.73 | 2" Sch 40 PVC | 10.00 | 21.00 | 31.00 | 641.65 | 636.65 | 631.65 |
| | GAMW28* | 662.24 | 16.00 | 665.56 | 20.15 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 656.24 | 651.24 | 646.24 |
| | GAMW28B* | 662.32 | 29.00 | 665.62 | 32.92 | 2" Sch 40 PVC | 10.00 | 19.00 | 29.00 | 643.32 | 638.32 | 633.32 |
| | GAMW29 | 666.58 | 16.00 | 669.48 | 20.39 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 660.58 | 655.58 | 650.58 |
| | GAMW29B | 666.64 | 36.00 | 669.43 | 40.52 | 2" Sch 40 PVC | 10.00 | 26.00 | 36.00 | 640.64 | 635.64 | 630.64 |
| | GAMW30 | 664.27 | 16.00 | 666.92 | 20.40 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 658.27 | 653.27 | 648.27 |
| | GAMW30B | 664.27 | 32.00 | 666.96 | 35.49 | 2" Sch 40 PVC | 10.00 | 22.00 | 32.00 | 642.27 | 637.27 | 632.27 |
| | GAMW31 | 662.68 | 16.00 | 665.39 | 19.26 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 656.68 | 651.68 | 646.68 |
| | GAMW31B | 662.69 | 30.00 | 665.40 | 32.10 | 2" Sch 40 PVC | 10.00 | 20.00 | 30.00 | 642.69 | 637.69 | 632.69 |
| | GAMW32 | 665.44 | 18.00 | 668.09 | 21.07 | 2" Sch 40 PVC | 10.00 | 8.00 | 18.00 | 657.44 | 652.44 | 647.44 |
| | GAMW32B | 665.53 | 34.00 | 668.25 | 36.93 | 2" Sch 40 PVC | 10.00 | 24.00 | 34.00 | 641.53 | 636.53 | 631.53 |
| | GAMW33 | 662.63 | 16.00 | 665.24 | 20.33 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 656.63 | 651.63 | 646.63 |
| | GAMW33B | 662.43 | 31.00 | 665.25 | 35.35 | 2" Sch 40 PVC | 10.00 | 21.00 | 31.00 | 641.43 | 636.43 | 631.43 |
| | GAMW34 | 661.78 | 16.00 | 664.83 | 20.28 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 655.78 | 650.78 | 645.78 |
| | GAMW34B | 661.65 | 29.00 | 664.84 | 30.48 | 2" Sch 40 PVC | 10.00 | 19.00 | 29.00 | 642.65 | 637.65 | 632.65 |
| | GAMW35B | 661.78 | 24.00 | 664.81 | 28.66 | 2" Sch 40 PVC | 10.00 | 14.00 | 24.00 | 647.78 | 642.78 | 637.78 |
| | GAMW36 | 662.24 | 16.00 | 664.97 | 20.28 | 2" Sch 40 PVC | 10.00 | 6.00 | 16.00 | 656.24 | 651.24 | 646.24 |
| | GAMW36B | 662.35 | 25.50 | 665.04 | 35.33 | 2" Sch 40 PVC | 1.00 | 24.50 | 25.50 | 637.85 | 637.35 | 636.85 |
| | GAMW37B | 662.68 | 25.00 | 665.36 | 27.78 | 2" Sch 40 PVC | 10.00 | 15.00 | 25.00 | 647.68 | 642.68 | 637.68 |
| | GAMW38 | 660.93 | 15.00 | 663.29 | 17.97 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 655.93 | 650.93 | 645.93 |
| | GAMW38B | 660.81 | 29.50 | 663.31 | 32.00 | 2" Sch 40 PVC | 10.00 | 19.50 | 29.50 | 641.31 | 636.31 | 631.31 |
| | GAMW39 | 661.04 | 15.00 | 663.53 | 17.95 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 656.04 | 651.04 | 646.04 |
| | GAMW39B | 660.96 | 29.50 | 663.49 | 31.15 | 2" Sch 40 PVC | 10.00 | 19.50 | 29.50 | 641.46 | 636.46 | 631.46 |
| | GAMW40 | 664.11 | 15.00 | 666.56 | 19.94 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 659.11 | 654.11 | 649.11 |
| | GAMW40B | 664.05 | 31.50 | 666.40 | 35.16 | 2" Sch 40 PVC | 10.00 | 21.50 | 31.50 | 642.55 | 637.55 | 632.55 |
| | GAMW41 | 660.09 | 15.00 | 662.43 | 16.40 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 655.09 | 650.09 | 645.09 |
| | GAMW41B | 660.08 | 27.00 | 662.17 | 30.04 | 2" Sch 40 PVC | 10.00 | 17.00 | 27.00 | 643.08 | 638.08 | 633.08 |
| | GAMW48 | 660.81 | 15.00 | 663.38 | 17.00 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 655.81 | 650.81 | 645.81 |
| | GAMW48B | 660.44 | 30.00 | 663.33 | 32.30 | 2" Sch 40 PVC | 10.00 | 20.00 | 30.00 | 640.44 | 635.44 | 630.44 |
| | GAMW49 | 662.00 | 15.00 | 664.64 | 14.18 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 657.00 | 652.00 | 647.00 |
| | GAMW49B | 662.12 | 33.00 | 664.52 | 34.82 | 2" Sch 40 PVC | 10.00 | 23.00 | 33.00 | 639.12 | 634.12 | 629.12 |
| | GAMW50 | 662.52 | 15.00 | 665.17 | 19.60 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 657.52 | 652.52 | 647.52 |
| | GAMW50B | 662.28 | 31.00 | 664.90 | 31.79 | 2" Sch 40 PVC | 10.00 | 21.00 | 31.00 | 641.28 | 636.28 | 631.28 |
| | GAMW10 | 663.99 | 15.00 | 667.83 | 18.75 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 658.99 | 653.99 | 648.99 |
| | GAMW11 | 663.60 | 15.00 | 667.17 | 19.18 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 658.60 | 653.60 | 648.60 |
| | MW-1D | 666.36 | NA | 668.86 | 33.68 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-1S | 666.43 | NA | 668.81 | 19.52 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |

**Table 1 Monitoring Well Construction Details**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| CCR Unit | Monitoring Well ID | Ground Surface Elevation (ft-amsl) | Total Borehole Depth (ft) | Top of Casing Elevation (ft-amsl) | Sounded Well Depth (ft-btoc) | Well Material | Screen Length (ft) | Screen Depth | | Screen Elevation | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Top (ft-bgs) | Bottom (ft-bgs) | Top (ft-amsl) | Middle (ft-amsl) | Bottom (ft-amsl) |
| LANDFILL Phase V, Phase VI and Phase VII | MW-2S | 662.10 | NA | 664.10 | 11.96 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-3D | 664.84 | NA | 667.58 | 29.75 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-3S | 664.82 | NA | 667.58 | 18.41 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-4D | 664.13 | NA | 666.56 | 33.24 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-4S | 664.26 | NA | 666.90 | 17.51 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-5D | 662.75 | NA | 664.97 | 31.00 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-5S | 662.72 | NA | 664.29 | 16.19 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-6D | 661.79 | NA | 664.64 | 33.29 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-6S | 662.01 | NA | 664.61 | 19.06 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-7D | 662.01 | NA | 664.72 | 32.91 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-7S | 661.99 | NA | 664.80 | 18.33 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-8D | 661.34 | NA | 663.52 | 35.42 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-8S | 661.42 | NA | 663.75 | 18.04 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-9D | 661.84 | NA | 662.68 | 39.20 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-9S | 661.83 | NA | 662.42 | 19.53 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-10D | 662.20 | NA | 663.18 | 31.22 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-10S | 661.95 | NA | 662.53 | 14.68 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-11D | 661.51 | NA | 663.57 | 32.86 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-11S | 661.46 | NA | 663.25 | 17.18 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-12D | 661.58 | NA | 663.60 | 32.75 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-12S | 661.54 | NA | 663.48 | 16.83 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-13D | 662.03 | NA | 664.80 | 32.52 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-13S | 662.22 | NA | 664.67 | 17.90 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-14D | 662.84 | NA | 665.41 | 33.20 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | MW-14S | 662.57 | NA | 665.24 | 17.72 | 2" Sch 40 PVC | NA | NA | NA | NA | NA | NA |
| | GAPIEZ07 | 665.15 | 15.00 | 668.77 | 18.91 | 2" Sch 40 PVC | 10.00 | 5.00 | 15.00 | 660.15 | 655.15 | 650.15 |

**Notes:**

ft-bgs = Feet below ground surface

ft-amsl = Feet above mean sea level

ft-btoc = Feet below top of casing

WDA = Waste Disposal Area

MSRB = Material Storage Runoff Basin

MCWB = Metal Cleaning Waste Basin

No highlight indicates well is not part of the CCR monitoring program, however, water levels are measured in these wells to supplement groundwater contour maps

Yellow highlight indicates a CCR background well

Green highlight indicates a CCR downgradient well

2" Sch 40 PVC = Two-inch diameter well, constructed of schedule 40 polyvinyl chloride material

Survey elevations for new wells obtained from Marbach, Brady, and Weaver survey, June 2016, August 2018, June 2019, June 2020, and October 2020

*Decommissioned monitoring well.

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

**Table 2: Monitoring Well Installation Date and Purpose**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| CCR Unit | Well Purpose | Monitoring Well ID | Installation Date | Decommission Date (If Applicable) | Basis For Action |
|---|---|---|---|---|---|
| Waste Disposal Area | Background Monitoring Well | GAMW-03 | 6/27/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-03B | 5/24/2016 | - | |
| | | GAMW-68 | 8/27/2020 | - | |
| | | GAMW-68B | 8/27/2020 | - | |
| | Downgradient Monitoring Well | GAMW-01 | 6/26/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-12 | 5/23/2016 | - | |
| | | GAMW-13 | 5/24/2016 | - | |
| | | GAMW-13B | 5/23/2016 | - | |
| | | GAMW-14 | 5/23/2016 | - | |
| | | GAMW-14B | 5/23/2016 | - | |
| | | GAMW-01B | 7/31/2018 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-12B | 7/31/2018 | - | |
| | | GAMW-51 | 7/25/2018 | - | |
| | | GAMW-51B | 7/25/2018 | - | |
| | | GAMW-42 | 7/24/2018 | - | Installed to monitor groundwater quality at the property boundary[3] |
| | | GAMW-42B | 7/24/2018 | - | |
| | | GAMW-42C | 8/8/2019 | - | |
| | | GAMW-43 | 5/16/2018 | - | |
| | | GAMW-43B | 5/16/2018 | - | |
| | | GAMW-44 | 5/16/2018 | - | |
| | | GAMW-44B | 5/16/2018 | - | |
| | | GAMW-57 | 6/7/2019 | - | |
| | | GAMW-57B | 6/7/2019 | - | |
| | | GAMW-58 | 6/6/2019 | - | |
| | | GAMW-58B | 6/6/2019 | - | |
| | | GAMW-59 | 6/8/2019 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-59B | 6/6/2019 | - | |
| | | GAMW-60 | 6/8/2019 | - | |
| | | GAMW-60B | 6/4/2019 | - | |
| Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area | Background Monitoring Well | GAMW-04 | 6/27/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-07 | 6/29/2015 | - | |
| | | GAMW-15 | 5/25/2016 | - | |
| | | GAMW-15B | 5/24/2016 | - | |
| | | GAMW-07B | 7/26/2018 | - | Installed to provide additional groundwater quality data |
| | Downgradient Monitoring Well | GAMW-08 | 6/28/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-09 | 6/28/2015 | - | |
| | | GAMW-09B | 5/24/2016 | - | |
| | | GAMW-16 | 5/26/2016 | NA | Removed during construction activities[5] |
| | | GAMW-16R | 9/23/2020 | - | Installed to replace GAMW-16[5] |
| | | GAMW-16B | 5/25/2016 | 9/22/2020 | Decommissioned due to construction activities[6] |
| | | GAMW-16BR | 9/22/2020 | - | Installed to replace GAMW-16B[6] |
| | | GAMW-17 | 5/25/2016 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-17B | 5/25/2016 | - | |
| | | GAMW-18 | 5/24/2016 | - | |
| | | GAMW-08B | 7/25/2018 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-18B | 7/26/2018 | - | |
| | | GAMW-52 | 7/30/2018 | - | |
| | | GAMW-52B | 7/30/2018 | - | |
| | | GAMW-53 | 7/30/2018 | - | |
| | | GAMW-53B | 7/30/2018 | - | |
| | | GAMW-54 | 7/30/2018 | - | |
| | | GAMW-54B | 7/27/2018 | - | |
| | | GAMW-55 | 7/26/2018 | 6/8/2019 | Decommissioned due to well casing damage[4] |
| | | GAMW-55R | 6/8/2019 | - | Installed to replace GAMW-55[4] |
| | | GAMW-55B | 7/26/2018 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-56 | 7/27/2018 | - | |
| | | GAMW-56B | 7/27/2018 | - | |
| | | GAMW-46 | 5/15/2018 | - | Installed to monitor groundwater quality at the property boundary[3] |
| | | GAMW-46B | 5/15/2018 | - | |

**Table 2: Monitoring Well Installation Date and Purpose**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| CCR Unit | Well Purpose | Monitoring Well ID | Installation Date | Decommission Date (If Applicable) | Basis For Action |
|---|---|---|---|---|---|
| LANDFILL Phase V, Phase VI, and Phase VII | Background Monitoring Well | GAMW-20 | 5/27/2016 | - | Installed for Groundwater Quality Monitoring[1] |
| | | GAMW-24 | 9/26/2016 | - | |
| | | GAMW-24B | 9/26/2016 | - | |
| | | GAMW-25 | 10/4/2016 | - | |
| | | GAMW-25B | 10/5/2016 | - | |
| | Downgradient Monitoring Well | GAMW-21 | 5/31/2016 | 4/5/2018 | Abandoned due to Landfill Construction Activities[2] |
| | | GAMW-21B | 5/31/2016 | 4/5/2018 | |
| | | GAMW-22 | 5/31/2016 | 4/5/2018 | |
| | | GAMW-22B | 6/2/2016 | 4/5/2018 | |
| | | GAMW-23 | 6/2/2016 | 4/6/2018 | |
| | | GAMW-23B | 6/2/2016 | 4/6/2018 | |
| | | GAMW-28 | 9/29/2016 | 4/6/2018 | |
| | | GAMW-28B | 9/29/2016 | 4/6/2018 | |
| | | GAMW-26 | 10/4/2016 | - | Installed for Groundwater Quality Monitoring[1] |
| | | GAMW-26B | 10/4/2016 | - | |
| | | GAMW-27 | 10/3/2016 | - | |
| | | GAMW-27B | 10/4/2016 | - | |
| | | GAMW-38 | 4/4/2018 | - | Installed to Replace Abandoned Well[3] |
| | | GAMW-38B | 4/3/2018 | - | |
| | | GAMW-39 | 4/4/2018 | - | |
| | | GAMW-39B | 4/4/2018 | - | |
| | | GAMW-40 | 4/5/2018 | - | |
| | | GAMW-40B | 4/4/2018 | - | |
| | | GAMW-41 | 5/17/2018 | - | |
| | | GAMW-41B | 5/17/2018 | - | |

1) Per 40 CFR §257.93, Golder collected eight rounds of background data prior to October 17, 2017, excluding wells GAMW-68 and GAMW-68B.

2) Per 40 CFR §257.95(g)(1)(i) Rule requirements. Golder collected additional data to further characterize the nature and extent of potential groundwater impacts.

3) Per 40 CFR §257.95(g)(1)(ii). Golder collected data to monitor groundwater quality in the direction of flow at the property boundary.

4) Golder field personnel were unable to collect a groundwater sample from monitoring well GAMW-55 during the April 2019 Assessment Monitoring sampling event due to surface damage (i.e., tubing above the permanent pump was pinched at less than 10 feet below ground surface). The well was replaced with GAMW-55R in June 2019.

5) Monitoring well GAMW-16 was completely removed during construction excavation activities in 2020. No decommissioning was required. The well was replaced with GAMW-16R in September 2020.

6) Monitoring well GAMW-16B was decommissioned during construction activities in 2020. The well was replaced with GAMW-16BR in September 2020.

NA= Not applicable

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH

**Table 3: Unit-Specific Groundwater Protection Standards**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| CCR Unit | Analyte | MCL (mg/L) | GWPS (mg/L)[2] | GWPS (mg/L)[3] |
|---|---|---|---|---|
| Waste Disposal Area | Antimony | 0.006 | 0.006 | 0.006 |
| | Arsenic | 0.01 | 0.015 | 0.018 |
| | Barium | 2 | 2 | 2 |
| | Beryllium | 0.004 | 0.004 | 0.004 |
| | Cadmium | 0.005 | 0.005 | 0.005 |
| | Chromium | 0.1 | 0.1 | 0.1 |
| | Cobalt[1] | 0.006 | 0.015 | 0.015 |
| | Fluoride | 4 | 4 | 4 |
| | Lead[1] | 0.015 | 0.015 | 0.015 |
| | Lithium[1] | 0.04 | 0.04 | 0.04 |
| | Mercury | 0.002 | 0.002 | 0.002 |
| | Molybdenum[1] | 0.1 | 0.1 | 0.1 |
| | Radium 226+228 | 5 | 5 | 5 |
| | Selenium | 0.05 | 0.05 | 0.05 |
| | Thallium | 0.002 | 0.002 | 0.002 |
| MSRB, MCWB, and Drying Area | Antimony | 0.006 | 0.006 | 0.006 |
| | Arsenic | 0.01 | 0.078 | 0.091 |
| | Barium | 2 | 2 | 2 |
| | Beryllium | 0.004 | 0.004 | 0.004 |
| | Cadmium | 0.005 | 0.005 | 0.005 |
| | Chromium | 0.1 | 0.1 | 0.1 |
| | Cobalt[1] | 0.006 | 0.01 | 0.01 |
| | Fluoride | 4 | 4 | 4 |
| | Lead[1] | 0.015 | 0.015 | 0.015 |
| | Lithium[1] | 0.04 | 0.04 | 0.04 |
| | Mercury | 0.002 | 0.002 | 0.002 |
| | Molybdenum[1] | 0.1 | 0.1 | 0.1 |
| | Radium 226+228 | 5 | 5 | 5 |
| | Selenium | 0.05 | 0.05 | 0.05 |
| | Thallium | 0.002 | 0.002 | 0.002 |

**Notes:**
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard
mg/L= milligrams per liter

1) As of August 29, 2018, these four constituents have health-based standards that can be used when calculating the GWPS, these health-based standards are not MCLs but are provided in the MCL column.
2) GWPS calculated in August 2018.
3) GWPS calculated in March 2020.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

**Table 4: Dates and Purposes of Each Monitoring Event**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Well Purpose | Monitoring Well ID | Sample Event #15 | Sample Event #16 | Sample Event #17 |
|---|---|---|---|---|
| Purpose of Sample | | Semi-Annual Assessment Monitoring | Annual Assessment Monitoring | Semi-Annual Assessment Monitoring |
| Sample Parameters | | Appendix III and Appendix IV | Appendix III and Appendix IV | Appendix III and detected Appendix IV |
| WDA Background Monitoring Well | GAMW03 | 10/22/2020 | 4/14/2021 | 9/17/2021 |
| | GAMW03B | 10/22/2020 | 4/15/2021 | 9/17/2021 |
| | GAMW68 | 10/29/2020 | 4/22/2021 | 9/17/2021 |
| | GAMW68B | 10/29/2020 | 4/22/2021 | 9/17/2021 |
| WDA Downgradient Monitoring Well | GAMW01 | 10/21/2020 | 4/14/2021 | 9/16/2021 |
| | GAMW01B | 10/21/2020 | 4/14/2021 | 9/16/2021 |
| | GAMW12 | 10/20/2020 | 4/15/2021 | 9/16/2021 |
| | GAMW12B | 10/20/2020 | 4/15/2021 | 9/16/2021 |
| | GAMW13 | 10/20/2020 | 4/19/2021 | 9/17/2021 |
| | GAMW13B | 10/20/2020 | 4/19/2021 | 9/17/2021 |
| | GAMW14 | 10/20/2020 | 4/19/2021 | 9/17/2021 |
| | GAMW14B | 10/20/2020 | 4/19/2021 | 9/17/2021 |
| | GAMW42 | 10/15/2020 | 4/23/2021 | 9/14/2021 |
| | GAMW42B | 10/15/2020 | 4/23/2021 | 9/14/2021 |
| | GAMW42C | 10/15/2020 | 4/23/2021 | 9/15/2021 |
| | GAMW43 | 10/15/2020 | 4/23/2021 | 9/14/2021 |
| | GAMW43B | 10/16/2020 | 4/27/2021 | 9/14/2021 |
| | GAMW44 | 10/16/2020 | 4/27/2021 | 9/15/2021 |
| | GAMW44B | 10/16/2020 | 4/27/2021 | 9/15/2021 |
| | GAMW51 | 10/27/2020 | 4/21/2021 | 9/29/2021 |
| | GAMW51B | 10/27/2020 | 4/21/2021 | 9/29/2021 |
| | GAMW57 | 10/16/2020 | 4/23/2021 | 9/15/2021 |
| | GAMW57B | 10/16/2020 | 4/23/2021 | 9/15/2021 |
| | GAMW58 | 10/19/2020 | 4/23/2021 | 9/15/2021 |
| | GAMW58B | 10/19/2020 | 4/23/2021 | 9/15/2021 |
| | GAMW59 | 10/28/2020 | 4/21/2021 | 9/29/2021 |
| | GAMW59B | 10/28/2020 | 4/22/2021 | 9/29/2021 |
| | GAMW60 | 10/28/2020 | 4/21/2021 | 9/24/2021 |
| | GAMW60B | 10/28/2020 | 4/21/2021 | 9/24/2021 |
| Total Number of Samples | | 29 | 29 | 29 |

**Table 4: Dates and Purposes of Each Monitoring Event**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Well Purpose | Monitoring Well ID | Sample Event #15 | Sample Event #16 | Sample Event #17 |
|---|---|---|---|---|
| Purpose of Sample | | Semi-Annual Assessment Monitoring | Annual Assessment Monitoring | Semi-Annual Assessment Monitoring |
| Sample Parameters | | Appendix III and Detected Appendix IV | Appendix III and Appendix IV | Appendix III and Detected Appendix IV |
| MSRB, MCWB, and Drying Area Background Monitoring Well | GAMW-04 | 10/22/2020 | 4/15/2021 | 9/23/2021 |
| | GAMW-07 | 10/27/2020 | 4/16/2021 | 9/21/2021 |
| | GAMW-07B | 10/27/2020 | 4/16/2021 | 9/23/2021 |
| | GAMW-15 | 10/27/2020 | 4/16/2021 | 9/22/2021 |
| | GAMW-15B | 10/27/2020 | 4/16/2021 | 9/22/2021 |
| MSRB, MCWB, and Drying Area Downgradient Monitoring Well | GAMW-08 | 10/26/2020 | 4/22/2021 | 9/24/2021 |
| | GAMW-08B | 10/23/2020 | 4/22/2021 | 9/24/2021 |
| | GAMW-09 | 10/23/2020 | 4/20/2021 | 9/23/2021 |
| | GAMW-09B | 10/23/2020 | 4/20/2021 | 9/23/2021 |
| | GAMW-16R | 10/29/2020 | 4/22/2021 | 9/21/2021 |
| | GAMW-16BR | 10/26/2020 | 4/22/2021 | 9/21/2021 |
| | GAMW-17 | 10/26/2020 | 4/14/2021 | 9/22/2021 |
| | GAMW-17B | 10/26/2020 | 4/14/2021 | 9/22/2021 |
| | GAMW-18 | 10/23/2020 | 4/20/2021 | 9/16/2021 |
| | GAMW-18B | 10/23/2020 | 4/21/2021 | 9/17/2021 |
| | GAMW-46 | 10/19/2020 | 4/27/2021 | 9/15/2021 |
| | GAMW-46B | 10/19/2020 | 4/27/2021 | 9/15/2021 |
| | GAMW-52 | 10/22/2020 | 4/16/2021 | 9/30/2021 |
| | GAMW-52B | 10/23/2020 | 4/16/2021 | 9/30/2021 |
| | GAMW-53 | 10/23/2020 | 4/16/2021 | 9/30/2021 |
| | GAMW-53B | 10/23/2020 | 4/16/2021 | 9/30/2021 |
| | GAMW-54 | 10/23/2020 | 4/19/2021 | 10/1/2021 |
| | GAMW-54B | 10/23/2020 | 4/19/2021 | 10/1/2021 |
| | GAMW-55R | 10/28/2020 | 4/20/2021 | 10/1/2021 |
| | GAMW-55B | 10/28/2020 | 4/20/2021 | 10/1/2021 |
| | GAMW-56 | 10/28/2020 | 4/20/2021 | 10/4/2021 |
| | GAMW-56B | 10/28/2020 | 4/21/2021 | 10/4/2021 |
| Total Number of Samples | | 27 | 27 | 27 |

**Table 4: Dates and Purposes of Each Monitoring Event**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

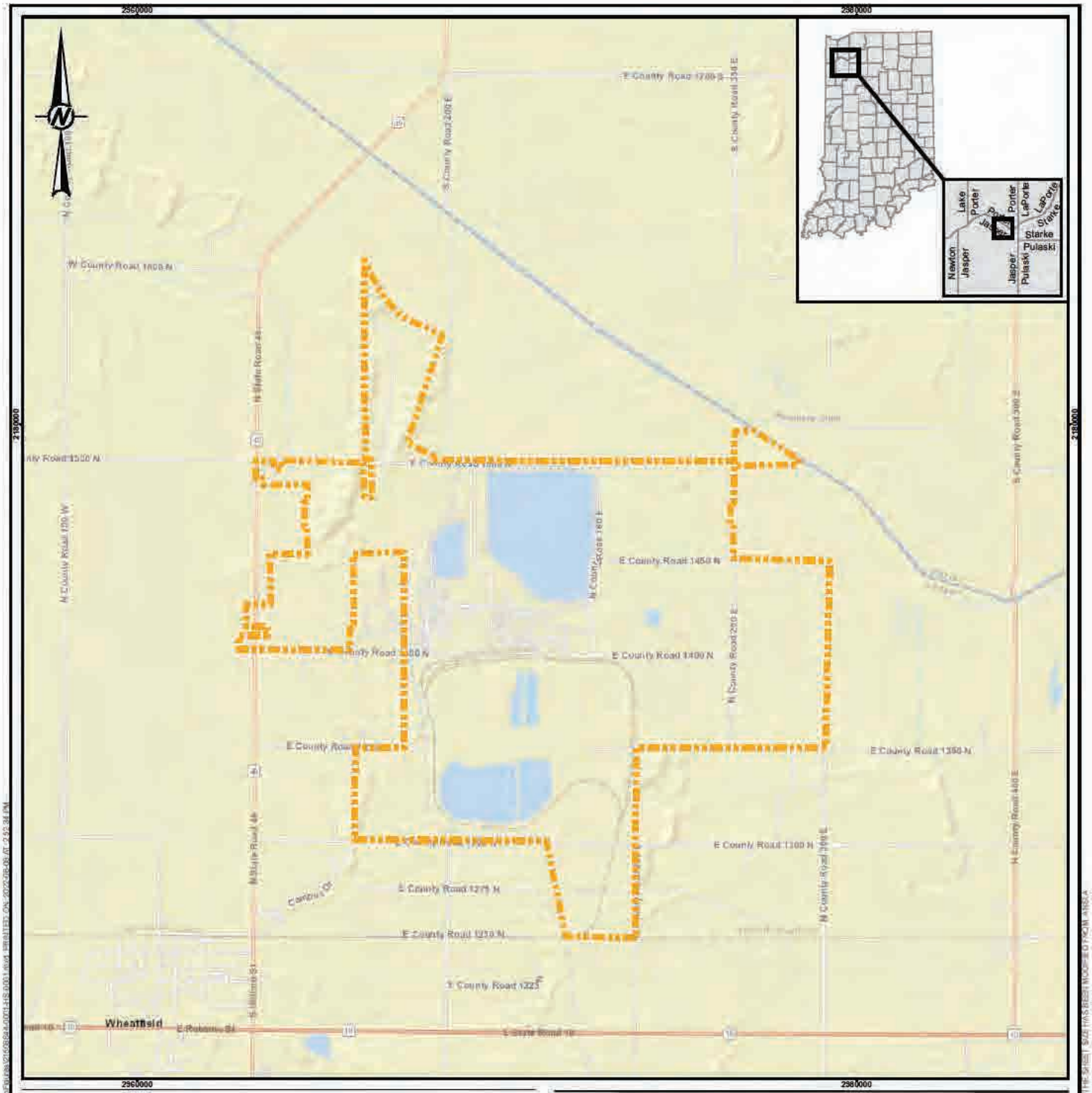
| Well Purpose | Monitoring Well ID | Sample Event #15 | Sample Event #16 | Sample Event #17 |
|---|---|---|---|---|
| Purpose of Sample | | Detection Monitoring | Detection Monitoring | Detection Monitoring |
| Sample Parameters | | Appendix III | Appendix III | Appendix III |
| Landfill Background Monitoring Well | GAMW-20 | 9/16/2020 | 4/12/2021 | 9/13/2021 |
| | GAMW-24 | 9/15/2020 | 4/12/2021 | 9/13/2021 |
| | GAMW-24B | 9/15/2020 | 4/13/2021 | 9/13/2021 |
| | GAMW-25 | 9/15/2020 | 4/12/2021 | 9/10/2021 |
| | GAMW-25B | 9/16/2020 | 4/12/2021 | 9/10/2021 |
| Landfill Downgradient Monitoring Well | GAMW-26 | 9/16/2020 | 4/12/2021 | 9/10/2021 |
| | GAMW-26B | 9/16/2020 | 4/12/2021 | 9/10/2021 |
| | GAMW-27 | 9/17/2020 | 4/13/2021 | 9/10/2021 |
| | GAMW-27B | 9/17/2020 | 4/13/2021 | 9/13/2021 |
| | GAMW-38 | 9/17/2020 | 4/13/2021 | 9/11/2021 |
| | GAMW-38B | 9/17/2020 | 4/13/2021 | 9/11/2021 |
| | GAMW-39 | 9/17/2020 | 4/13/2021 | 9/11/2021 |
| | GAMW-39B | 9/17/2020 | 4/13/2021 | 9/11/2021 |
| | GAMW-40 | 9/17/2020 | 4/14/2021 | 9/13/2021 |
| | GAMW-40B | 9/21/2020 | 4/14/2021 | 9/13/2021 |
| | GAMW-41 | 9/21/2020 | 4/14/2021 | 9/13/2021 |
| | GAMW-41B | 9/21/2020 | 4/13/2021 | 9/13/2021 |
| Total Number of Samples | | 17 | 17 | 17 |

**Notes:**
Sample counts do not include QC/QA samples.

(1) Sample events #1-14 were completed prior to October 2020. The purpose, sample parameters, and sample dates are included in the Demonstration or Demonstration Addendum.

(2) Semi-annual assessment monitoring parameters did not include radium.

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH




**LEGEND**

Approximate Property Line

0 0.75 1.5

1 " = 0.75 mi Miles

**REFERENCE(S)**

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

PART A DEMONSTRATION
R. M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

**SITE LOCATION MAP**

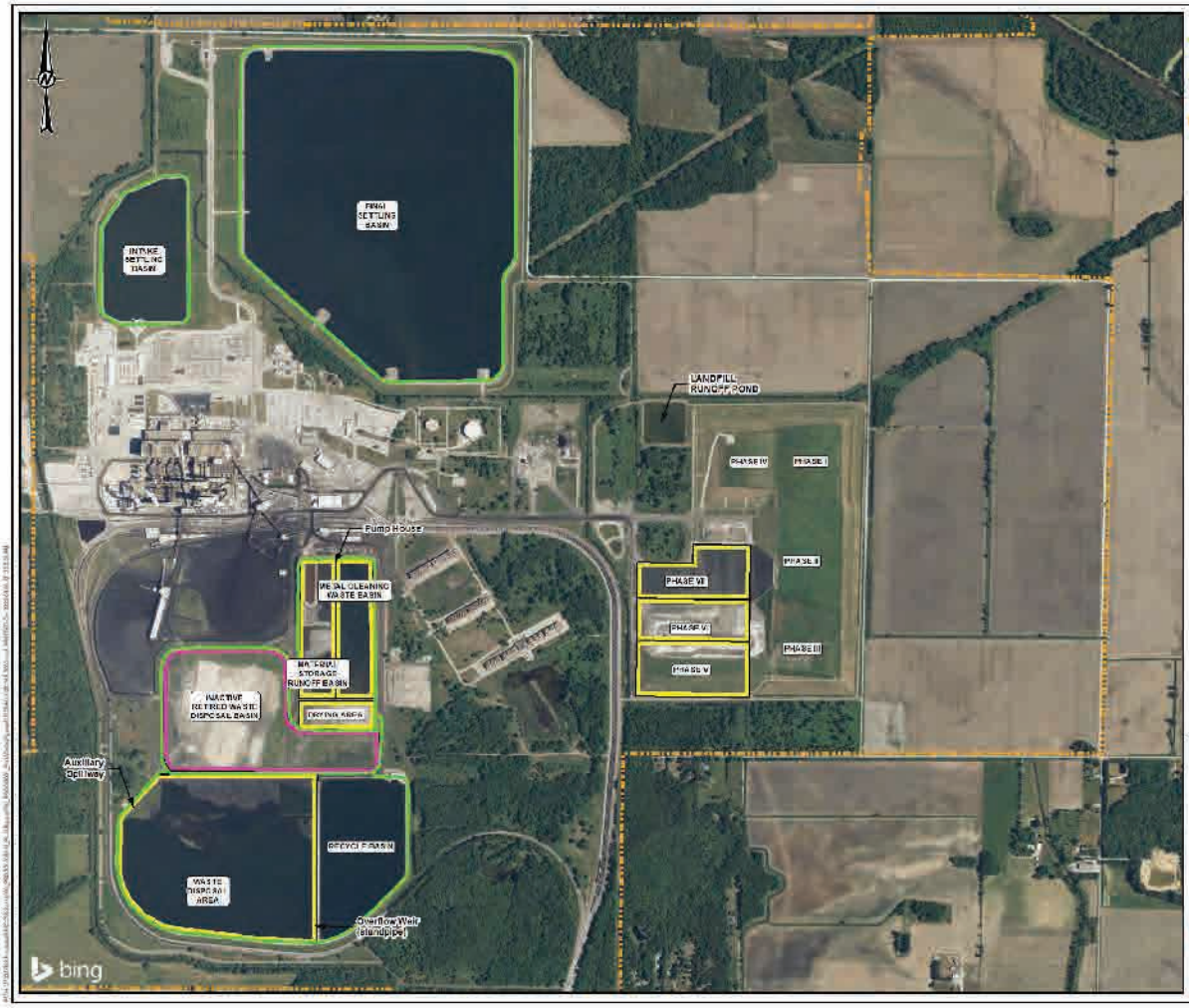
CONSULTANT

WSP GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-06-08 |
| DESIGNED | DFS |
| PREPARED | SHL |
| REVIEWED | JSP |
| APPROVED | MAH |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| GL21508844 | A | 0 | 1 |

IN THE MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A




LEGEND

- Slurry Wall
- CCR Units
- Approximate Extent of Inactive Retired Waste Disposal Basin
- Approximate Property Line

0 1,000 2,000

Feet

NOTE(S)

REFERENCE(S)

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

FACILITY SITE PLAN

CONSULTANT

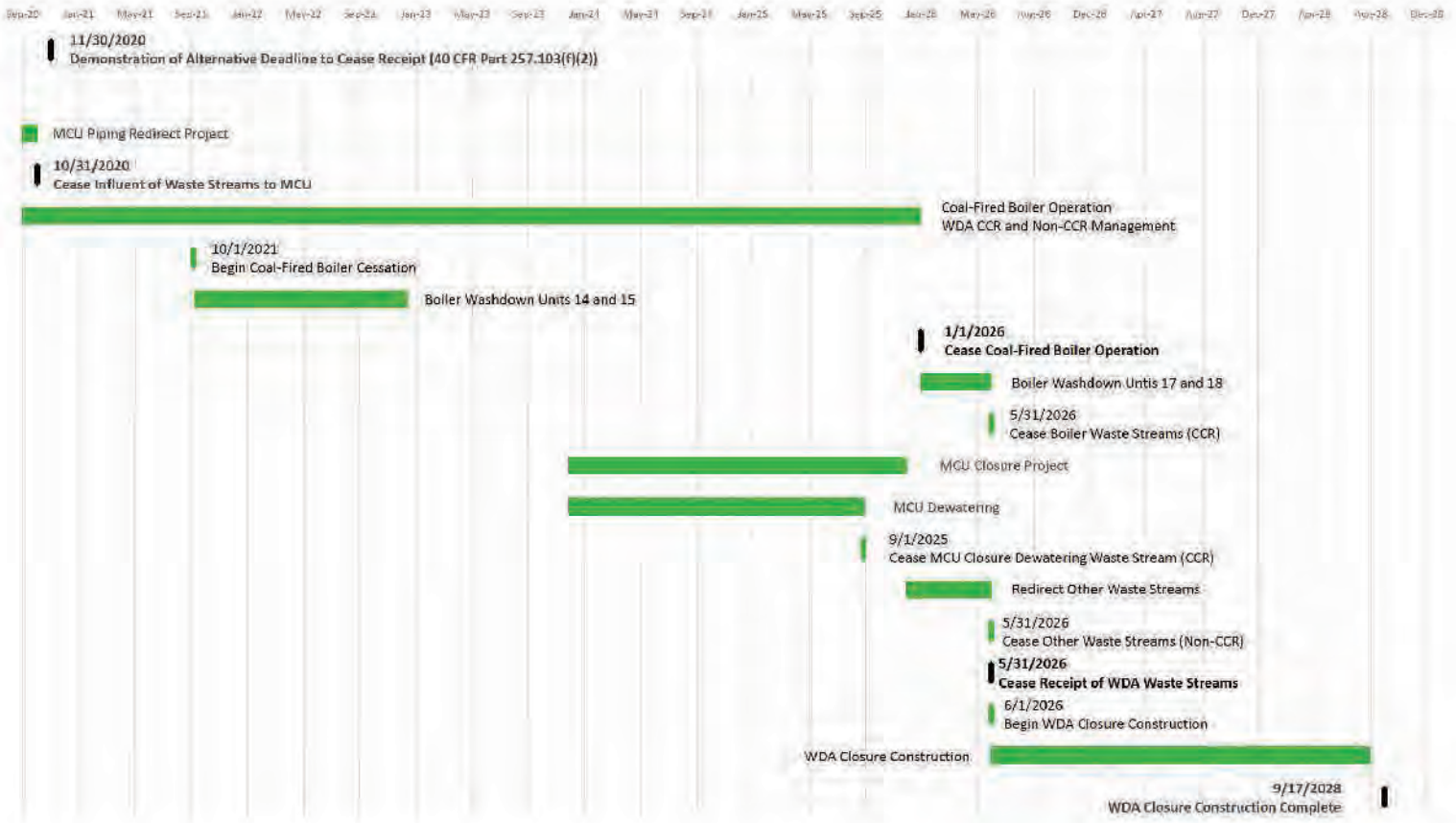
wsp GOLDER

| | |
|---|---|
| DESIGNED | TR |
| PREPARED | SHL |
| REVIEWED | BMR |
| APPROVED | MMH |

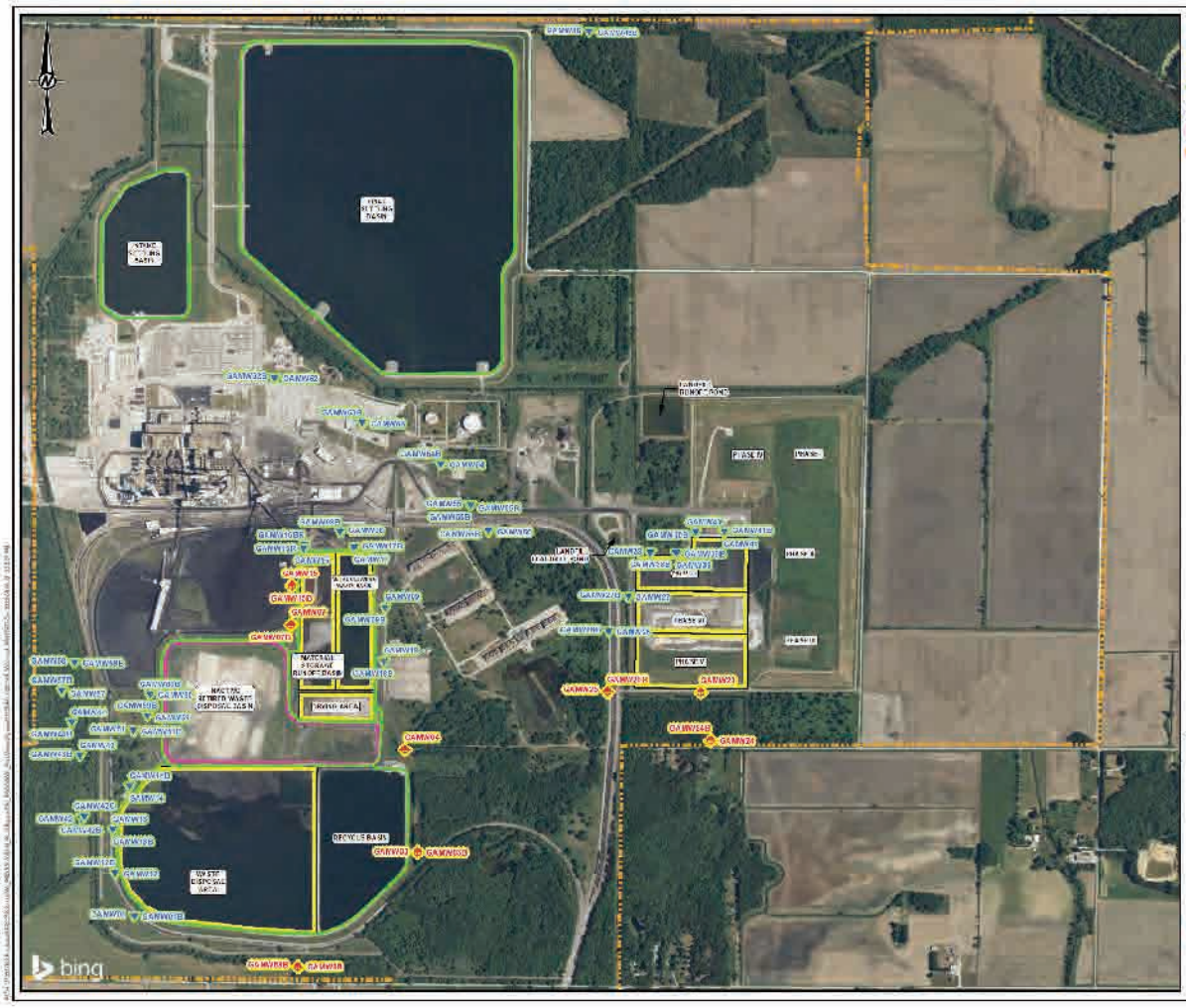
PROJECT NO. 215600044 | CONTROL A | REV. 0 | FIGURE 2

Figure 3
Operation and Closure Schedule






GOLDER




CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
MONITORING WELL LOCATION MAP

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-04-06 |
| DESIGNED | TH |
| PREPARED | SHL |
| REVIEWED | RM |
| APPROVED | MW |

PROJECTION: GI21500044 | CONTROL: A | REV: 0 | FIGURE: 4

**APPENDIX A**

# Part A Demonstration Annual Progress Report #01-21 40 CFR Part §257. 103(f)(2)(X)

# DEMONSTRATION ANNUAL PROGRESS REPORT #01-21

**DATE** October 29, 2021 **Project No.** 20368079

**TO** Jeff Loewe, Maureen Turman, Joe Kutch, Maggie Rice
Northern Indiana Public Service Company LLC

**CC** Richard Wesenberg, Danielle Sylvia Cofelice

**FROM** Mark Haney **EMAIL mhaney@golder.com**

**NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC**
**R. M. SCHAHFER GENERATING STATION, WASTE DISPOSAL AREA**
**40 CFR §257.103(F)(2)(X) PART A DEMONSTRATION ANNUAL PROGRESS REPORT #01-21**

On October 30, 2020 in accordance with the requirements of 40 Code of Federal Regulations (CFR) §257.103(f)(2), Northern Indiana Public Service Company LLC (NIPSCO) submitted the "*NIPSCO LLC RMSGS Demonstration of Site-specific Alternative Deadline to Initiate Closure of CCR Surface Impoundment Due to Permanent Cessation of Coal-Fired Boilers by a Date Certain*" (hereinafter Demonstration) for the NIPSCO R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. The Demonstration, the subject of which is the Coal Combustion Residuals (CCR) Rule regulated surface impoundment referred to as the Waste Disposal Area (WDA), was submitted to and is currently under review by the United States Environmental Protection Agency (USEPA).

Both the text of the 2020 Demonstration and 40 CFR §257.103(f)(2)(x) address completion of an annual report documenting the continued lack of alternative capacity and the progress toward the closure of the surface impoundment. This Demonstration Annual Progress Report #01-21 (hereinafter Report) fulfills the 40 CFR §257.103(f)(2)(x) regulatory requirement and the reporting commitments as outlined in the Demonstration. In addition to providing the aforementioned information, the Report serves as an update on select additional RMSGS CCR Rule compliance and Demonstration actions completed by NIPSCO subsequent to the October 2020 submission.

Progress Toward Closure/Permanent Cessation of Coal-Fired Boiler Operations

As of October 1, 2021, NIPSCO permanently shut down operations of Units 14 and 15, representing two of the four coal-fired boilers at RMSGS. Remaining Units 17 and 18 continue to operate, with management of CCR and non-CCR waste streams produced from these Units being provided by the WDA. Cessation of operations of the two coal-fired boilers is consistent with overall Site retirement plans and on schedule with NIPSCO's planned permanent cessation of all coal-fired generation activities by Q2 2023, as outlined in the Demonstration (Section 2.4 and Figure 3).

**Golder Associates Inc.**
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Ongoing Need for Operation of the WDA

As evidenced by the recent shut down of two of its four coal-fired boilers, NIPSCO is progressing toward permanent cessation of all coal-fired generation activities at RMSGS. Although Units 14 and 15 have been shut down, boiler decommissioning and washdown event(s) associated with these two Units will increase the generation of CCR and non-CCR wastewater and resultant discharge to the WDA for a period of time. Furthermore, Units 17 and 18 continue to operate at or near their capacity, generating substantial volumes of CCR and non-CCR waste streams as detailed in the Demonstration and discussed below. Thus, the need remains for existing capacity and continued operation of the WDA to meet both ongoing coal-fired generation and current and future decommissioning demands.

Aside from ongoing operational and future decommissioning needs, continued availability of the WDA is also a pivotal component in the planned closure of three other inactive CCR Rule regulated surface impoundments referred to collectively as the Multi-Cell Unit (MCU). A Closure Application, which has undergone several revisions in response to Indiana Department of Environmental Management (IDEM) reviews, is awaiting final IDEM approval. A key facet of the MCU closure by removal approach is the planned discharge of dewatering fluids to the WDA. As the only remaining operational CCR Rule regulated impoundment on-Site, discharge to the WDA is the only viable alternative for the management of high-volume dewatering effluent. Anticipating IDEM approval will be received, NIPSCO is in the construction contractor procurement stage. Contractor selection is expected within the next few months and closure construction activities, including dewatering, are currently planned for summer 2023. Completion of the 2023 closure activities, shutdown of the remaining coal-fired boilers, and conclusion of decommissioning activities will reduce reliance on the WDA as a CCR and non-CCR waste management unit.

As designed and constructed, most of NIPSCO's wastewater and stormwater systems feature a network of common sumps which ultimately discharge to the WDA. Until such time as CCR Rule regulated waste streams are no longer being generated, separation of the various sumps and pipelines is impractical, especially for a generating station with less than two years of active generation life remaining. Therefore, until cessation and decommissioning actions are completed, the WDA remains essential to the management of these high-volume waste streams. Once CCR generation activities cease and boiler decommissioning is complete, ongoing post-generation non-CCR waste streams can be managed in one or more existing NPDES-regulated non-CCR impoundments as an alternative to management in the WDA.

Continued Lack of Alternative Capacity

At the time of preparation of this Report the measurable reduction in Site-wide generation of CCR and non-CCR waste streams resulting from these boiler shutdowns could not be definitively quantified due to the absence of flow metering capacity in individual feed and discharge lines. However, in determination of alternative capacity and reliance for the operation of the WDA, the combined estimated average daily waste stream flow of 5.04 MGD reported in the Demonstration (i.e., October 2020) from Units 14 and 15, has been removed from the combined total waste stream flow considered in this Report. Note that such an approach assumes an instantaneous and maximum waste stream flow reduction (and does not account for the compulsory boiler washdown flow from Units' decommissioning) and is, as a result, considered a conservative compacity demand-based approach to this update. Therefore, due to ongoing Site operations and maintenance activities (e.g., boiler room sump dewatering for both shut down and active Units, stormwater collection and management), volumes of individual CCR and non-CCR effluent being discharged to the WDA are estimated to be between 0.34 MGD and 1.42 MGD, with a combined estimated daily flow of 4.1 MGD.

Consistent with the requirements of 40 CFR §257.103(f)(2)(x) and employing processes consistent with those used in the evaluation of alternate disposal capacity for the Demonstration, Golder Associates USA Inc. (Golder), *a member of WSP*, on behalf of NIPSCO, performed a valuation of its previous assessment. The continued lack of alternative capacity is supported by the following conclusions:

- No existing on-Site impoundment system can accept partial or total flows of CCR waste streams that are currently discharging into the WDA
- No alternative disposal available for CCR and non-CCR waste streams in the existing on-Site WWTP
- No existing off-loading or conveyance piping infrastructure to support on or off-Site alternative disposal of CCR or non-CCR waste streams
- Commercial tanker truck, railcar, on-Site infrastructure, and treatment capacity in the region continue to preclude off-Site transport and/or alternative disposal
- An employee and public health and safety risk associated with off-Site disposal due to the additional truck traffic both on-Site and on the public roads as well as an increased carbon footprint with added truck traffic
- An increased risk of release that could harm the environment every time the wastewater is handled (i.e., pumped for off-Site transport, pumped to the on-Site WWTP)

NIPSCO previously evaluated the feasibility of constructing new alternative CCR and non-CCR waste management options on-Site, even though RMSGS will cease all coal-fired generation in about one and one-half years. As in 2020, due to Site-specific factors (e.g., space limitations, shallow depth to groundwater and thus the inability to reasonably achieve the 40 CFR §257.60(a) five-foot separation from the upper limit of the uppermost aquifer), permitting and/or regulatory hurdles, and building timeframes, construction of new alternative management facilities is infeasible.

Based on current operating conditions and an updated evaluation regarding alternative disposal capacity, Golder concludes that no viable alternative to continued use of the WDA currently exists.

Additional NIPSCO Demonstration-Related Work Completed Subsequent to October 2020

In April 2019, NIPSCO completed an Assessment of Corrective Measures (ACM) in accordance with the requirements of 40 CFR §257.96. In November 2020, based upon informal feedback from USEPA officials regarding their interpretation of ACM content, Golder, on behalf of NIPSCO, prepared an Addendum (hereinafter Addendum #1) to the 2019 ACM. Addendum #1 was certified by a qualified Indiana-licensed professional engineer on November 30, 2020. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In July 2021, consistent with changes to the Multi-Cell Unit (MCU) closure design and resultant impacts on remedy alternatives, Golder, on behalf of NIPSCO, prepared a second Addendum (hereinafter Addendum #2) to the 2020 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #2 was certified by a qualified Indiana-licensed professional engineer on July 29, 2021. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. Predicated upon IDEM approval of the MCU Closure Application, NIPSCO expects the groundwater Selection of Remedy process to be completed in the next few months.

NIPSCO continues to perform all CCR Rule required activities at RMSGS' four regulated CCR surface impoundments and its multi-phase CCR landfill. Based upon its interpretation of the regulatory obligations, NIPSCO reasserts its facility-wide compliance with all applicable Part 257 requirements.

## Conclusion

Golder completed the evaluation and prepared this Report on behalf of NIPSCO. The Report documents a) the continued lack of alternative capacity on-Site and off-Site, and b) NIPSCO's progress toward the closure of the RMSGS surface impoundment referred to as the WDA. NIPSCO currently anticipates no delays in the cease receipt date, or the final closure date as outlined in its 2020 Demonstration. As such, Golder submits this Report which fulfills the 40 CFR §257.103(f)(2)(x) annual progress reporting regulatory requirement and the reporting commitments as outlined in the Demonstration.

**APPENDIX B**

# Certification of Facility Compliance
# 40 CFR Part §257.103(f)(2)(v)(C)(1)

**Alternative Closure Requirements Certification of Compliance**
**Pursuant to 40 C.F.R. 257.103(f)**

**Northern Indiana Public Service Company LLC**
**R.M. Schahfer Generating Station**

Northern Indiana Public Service Company LLC (NIPSCO) requires additional time to close the Waste Disposal Area ("WDA") and must continue to use the CCR surface impoundment due to the absence of alternative disposal capacity both on and offsite of the facility. In support of the demonstration, and as required by 40 C.F.R. §257.103(f)(2)(C)(1), NIPSCO submits the following certification:

> I hereby certify that to the best of my knowledge and inquiry of those persons who are immediately responsible for compliance with environmental regulations for the Waste Disposal Area at the NIPSCO R.M. Schahfer Generating System, the facility is in compliance with all of the requirements of 40 C.F.R. Part 257, Subpart D.

Kurt W. Sangster, Vice President Electric Generation
Northern Indiana Public Service Company LLC

8/15/2022
Date

APPENDIX C

# Certifications of Design and Construction of Groundwater Monitoring Systems

May 2022

**Certification of Design and Construction of Groundwater Monitoring System (40 CFR §257.91(f))**

**Northern Indiana Public Service Company**
**R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

**CCR Management Unit referred to as Waste Disposal Area**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of groundwater monitoring systems for surface impoundments and landfills, do hereby state that I am qualified in the subject matter of CCR groundwater monitoring. I have personally examined and am familiar with the information related to design and construction of groundwater monitoring systems for CCR management units located at the Northern Indiana Public Service Company (NIPSCO) R. M. Schahfer Generating Station, as provided in the Groundwater Monitoring System Design Manual Revision 4.0 prepared by Golder Associates Inc. and dated May 2022. Based on an inquiry of those individuals immediately responsible, and on supporting information which I understand to be true, accurate and complete, I believe the design and construction of the groundwater monitoring system for the Waste Disposal Area meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the groundwater monitoring system for the regulated CCR management unit referred to as Waste Disposal Area has been designed and constructed to meet the applicable requirements of 40 CFR §257.91 and corresponding State of Indiana requirements.




Daniel Sullivan
Indiana Professional Engineer
License #19600309

5·24·2022
Date

**May 2022**

**Certification of Design and Construction of Groundwater Monitoring System (40 CFR §257.91(f))**

**Northern Indiana Public Service Company**
**R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

**CCR Management Units referred to as Drying Area, Material Storage Runoff Basin, and Metal Cleaning Waste Basin**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of groundwater monitoring systems for surface impoundments and landfills, do hereby state that I am qualified in the subject matter of CCR groundwater monitoring. I have personally examined and am familiar with the information related to design and construction of groundwater monitoring systems for CCR management units located at the Northern Indiana Public Service Company (NIPSCO) R. M. Schahfer Generating Station, as provided in the Groundwater Monitoring System Design Manual Revision 4.0, prepared by Golder Associates Inc. and dated May 2022. Based on an inquiry of those individuals immediately responsible, and on supporting information which I understand to be true, accurate and complete, I believe the design and construction of the multi-unit groundwater monitoring system that collectively monitors surface impoundments referred to as the Drying Area, Material Storage Runoff Basin, and Metal Cleaning Waste Basin meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the groundwater monitoring system for the regulated CCR management units referred to as the Drying Area, Material Storage Runoff Basin, and Metal Cleaning Waste Basin has been designed and constructed to meet the applicable requirements of 40 CFR §257.91 and corresponding State of Indiana requirements.




Daniel Sullivan
Indiana Professional Engineer
License #19600309

5.24.2022
Date

May 2022

**Certification of Design and Construction of Groundwater Monitoring System (40 CFR §257.91(f))**

**Northern Indiana Public Service Company**
**R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

**CCR Management Units referred to as Schahfer Landfill Phase V, VI, and VII**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of groundwater monitoring systems for surface impoundments and landfills, do hereby state that I am qualified in the subject matter of CCR groundwater monitoring. I have personally examined and am familiar with the information related to design and construction of groundwater monitoring systems for CCR management units located at the Northern Indiana Public Service Company (NIPSCO) R. M. Schahfer Generating Station, as provided in the Groundwater System Design Manual Revision 4.0 prepared by Golder Associates Inc. and dated May 2022. Based on an inquiry of those individuals immediately responsible, and on supporting information which I understand to be true, accurate and complete, I believe the design and construction of the groundwater monitoring system for the Schahfer Landfill Phase V, VI, and VII meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the groundwater monitoring system for the regulated CCR management unit referred to as Schahfer Landfill Phase V, VI, and VII has been designed and constructed to meet the applicable requirements of 40 CFR §257.91 and corresponding State of Indiana requirements.




Daniel Sullivan
Indiana Professional Engineer
License #19600309

5·24·2022
Date

**APPENDIX D**

# Soil Borings and Monitoring Well Logs 40 CFR Part §257.103(f)(2)(v)(C)(2)(ii)

# BOREHOLE LOG: GAMW-65B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.3

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173229.48 E: 2968253.82
GROUND SURFACE ELEV.: 665.45
TOP OF CASING ELEV.: 668.67
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/17/2020 8:45:00 AM
END DATE/TIME: 4/17/2020 11:50:00 AM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| 665.0 | dark brown fine clayey SILTY SAND | | 1 | SS | | 1.4 / 2 | 0.0' to 1.3': (SM) clayey SILTY SAND, fine, low plasticity; dark brown; cohesive, w > PL, soft.<br>1.3' to 1.4': (SP-SM) SAND, fine, some nonplastic fines; trace coarse sand, trace fine to coarse subrounded gravel; brown; non-cohesive, moist, very loose.<br>SPTs (WOH-WOH-WOH-1) | | Cement-bentonite Grout 0-21 ft bgs |
| | brown fine SAND, trace coarse sand, trace fine to coarse gravel | | | | | | | | |
| | gray-brown fine to medium SILTY SAND | | | | | | | | |
| 660.0 | dark brown fine SILTY SAND | | 2 | SS | | 1.3 / 2 | 5' to 5.4': (SM) SILTY SAND, fine to medium, trace coarse sand; gray-brown; non-cohesive, wet, loose.<br>5.4' to 6.3': (SM) SILTY SAND, fine; dark brown, clay pockets; non-cohesive, moist, loose.<br>SPTs (4-4-4-5) | | |
| | light brown fine to medium SAND, trace coarse sand, trace fine gravel | | | | | | | | |
| 655.0 | | | 3 | SS | | 1.4 / 2 | 10' to 11.4': (SP) SAND, fine to medium; light brown; non-cohesive, wet, loose; grain size decreases with depth.<br>SPTs (2-4-4-6) | | |
| | | | 4 | SS | | 1.6 / 2 | 12' to 13.6': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, loose to compact.<br>SPTs (3-5-6-6) | | |
| 650.0 | gray fine to medium SAND, some coarse sand, trace fine to coarse gravel | | 5 | SS | | 1.2 / 2 | 15.0' to 15.7': (SP) SAND, fine, trace fine subrounded gravel; light brown; non-cohesive, wet, loose to compact.<br>15.7' to 16.2: (SP) SAND, fine to medium, some coarse sand, trace fine to coarse subrounded gravel; gray; non-cohesive, wet, compact.<br>SPTs (2-4-6-8) | | |
| | light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel | | | | | | | | |
| 645.0 | | | 6 | SS | | 2.0 / 2 | 20.0' to 22.0': (SP) SAND, fine, some medium, trace coarse sand, trace fine to coarse subrounded gravel; light brown; non-coheisve, wet, loose.<br>SPTs (1-2-3-5) | | Bentonite Chips 21-23 ft bgs<br>#5 Sand Filter Pack 23-35 ft bgs |

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand with Silt (SP-SM)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

# BOREHOLE LOG: GAMW-65B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 37
DEPTH TO BEDROCK: 36.3

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173229.48 E: 2968253.82
GROUND SURFACE ELEV.: 665.45
TOP OF CASING ELEV.: 668.67
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/17/2020 8:45:00 AM
END DATE/TIME: 4/17/2020 11:50:00 AM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| 640.0 | light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel | | 7 | SS | | 1.4 / 2 | 25.0' to 26.4': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (2-8-12-22) | | 2" PVC Screen slot 0.010 25-35 ft bgs |
| 635.0 | | | 8 | SS | | 1.2 / 2 | 30.0' to 31.2': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (3-8-15-20) | | |
| | | | 9 | SS | | 1.2 / 2 | 32.0' to 33.2': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. SPTs (4-9-20-22) | | |
| 630.0 | highly weathered, light gray CLAYEY SHALE | | 10 | SS | | 1.4 / 2 | 35.0' to 36.3': (SP) SAND, fine to medium, trace coarse sand; light borwn; non-cohesive, wet, compact. 36.3' to 36.4: clayey SHALE, light gray, highly weathered; sampled as sandy gravel. SPTs (5-15-27-17) | | |
| 625.0 | | | | | | | | | |
| 620.0 | | | | | | | | | |

LITHOLOGY LEGEND

USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand with Silt (SP-SM)
USCS Poorly-graded Sand (SP)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

# BOREHOLE LOG: GAMW-66B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669 20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| | brown to dark brown fine SAND, some silt, some organics | | 1 | SS | | 1.0 / 2 | 0.0' to 0.8': (SP-SM) SAND, fine, some nonplastic fines, some organics (grass), trace fine gravel; brown to dark brown; non-cohesive, moist, very loose. | | Bentonite Chips 0-2 ft bgs |
| | light brown to yellow brown fine SAND, trace coarse sand | | | | | | 0.8'-1': (SP) SAND, fine; light brown to yellow brown; non-cohesive, moist, very loose. | | Cement-bentonite Grout 2-22.5 ft bgs |
| | brown to dark brown fine SAND, some silt | | 2 | SS | | 0.9 / 2 | SPTs (1-1-1-1) | | |
| 665.0 | | | | | | | 2.0' to 2.9': (SP) SAND, fine, trace coarse sand; light brown, dark brown at 2.9'; non-cohesive, moist, loose. | | |
| | yellow brown to brown fine to medium SAND | | 3 | SS | | 1.0 / 2 | SPTs (4-2-2-4) | | |
| | | | | | | | 4.0' to 4.5': (SP-SM) SAND, fine, some non-plastic fines; brown to dark brown, lenses of black fine sand, non-cohesive, moist, loose. | | |
| | | | 4 | SS | | 1.6 / 2 | 4.5' to 5.0': (SP) SAND, fine to medium; brown to yellow brown; non-cohesive, moist, compact. | | |
| | | | | | | | SPTs (3-4-6-10) | | |
| 660.0 | | | 5 | SS | | 1.0 / 2 | 6.0' to 6.8': (SP) SAND, fine to medium, trace organics; light gray to brown, pockets of gray/light gray; non-cohesive, moist, compact. | | |
| | | | 6 | SS | | 1.0 / 2 | 6.8' to 7.6': (SP) SAND, fine to medium; light yellow brown, non-cohesive, moist, compact. | | |
| | | | | | | | SPTs(3-6-8-13) | | |
| | | | 7 | SS | | 1.1 / 2 | 8.0' to 9.0': (SP) SAND, fine to medium; yellow brown; non-cohesive, moist, compact. | | |
| | | | | | | | SPTs (3-6-10-11) | | |
| 655.0 | | | | | | | 10.0' to 11.0': (SP) SAND, fine to medium; yellow brown; non-cohesive, wet, compact. | | |
| | | | 8 | SS | | 1.5 / 2 | SPTs (2-4-8-6) | | |
| | | | | | | | 12.0' to 13.1': (SP) SAND, fine to medium, trace coarse sand; yellow brown; non-cohesive, wet, very loose. | | |
| | light brown fine to medium SAND, trace coarse sand, trace fine gravel | | | | | | SPTs (1-2-2-2) | | |
| | | | 9 | SS | | 1.6 / 2 | 14.0' to 15.5': (SP) SAND, fine to medium, trace coarse sand; yellow brown; non-cohesive, wet, loose. | | |
| | | | | | | | SPTs (2-2-6-6) | | |
| 650.0 | | | 10 | SS | | 1.6 / 2 | 16.0' to 17.6': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. | | |
| | | | | | | | SPTs (4-7-9-10) | | |
| | | | | | | | 18.0' to 19.6': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, loose. | | |
| | | | 11 | SS | | 1.0 / 2 | SPTs (3-2-4-6) | | |
| | | | | | | | 20.0' to 21.0': (SP) SAND, fine to medium; light brown; non-cohesive, wet, compact. | | |
| | | | | | | | SPTs (2-6-6-8) | | |
| | | | 12 | SS | | 2.0 / 2 | 22.0' to 24.0': (SP) SAND, fine to medium, trace coarse sand, trace fine gravel, trace organics; light brown, pocket of clay at 23.4'; non-cohesive, wet, compact. | | Bentonite Chips 22.5-29 ft bgs |
| 645.0 | | | | | | | SPTs (4-6-7-7) | | |
| | | | 13 | SS | | 1.1 / 2 | | | |

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

# BOREHOLE LOG: GAMW-66B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669.20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| | light brown fine to medium SAND, trace coarse sand, trace fine gravel | | 13 | SS | | 1.1 / 2 | 24.0' to 25.1': (SP) SAND, fine to medium, trace coarse sand, trace fine gravel, trace organics, light brown; non-cohesive, wet, loose. SPTs (2-3-4-4) | | |
| | | | 14 | SS | | 2.0 / 2 | 26.0' to 28.0': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, loose. SPTs (2-3-6-8) | | |
| 640.0 | light brown to gray-brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel | | 15 | SS | | 1.2 / 2 | 28.0' to 28.5': (SP) SAND, fine to medium, trace coarse sand, trace fine to coarse subrounded gravel; light brown; non-cohesive, wet, compact. | | #5 Sand Filter Pack 29-44 ft bgs |
| | | | 16 | SS | | 1.9 / 2 | 28.5' to 29.2': (SP) SAND, fine to medium, some coarse sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact. SPTs (3-6-12-14) | | |
| | | | 17 | SS | | 1.2 / 2 | 30.0' to 31.6': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet compact. | | |
| 635.0 | | | 18 | SS | | 1.9 / 2 | 31.6' to 31.9': (SP) SAND, fine to medium, some coarse sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact. SPTs (3-7-7-7) | | 2" PVC Screen slot 0.010 34-44 ft bgs |
| | | | 19 | SS | | 0.3 / 2 | 32.0' to 33.2': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, loose; coarser 32.1-32.4'. SPTs (3-3-6-9) | | |
| 630.0 | | | 20 | SS | | 1.5 / 2 | 34.0' to 35.9': (SP) SAND, fine to medium, trace coarse sand; light brown, gray brown from 35.6-36.0'; non-cohesive, wet, compact. SPTs (3-4-7-10) | | |
| | | | 21 | SS | | 1.2 / 2 | 36.0' to 36.3': (SP) SAND, fine to medium, trace coarse subrounded gravel; light brown to gray brown; non-cohesive, wet, loose. SPTs (4-4-5-7) | | |
| | light gray fine to coarse SAND | | 22 | SS | | 0.9 / 2 | 38.0' to 39.5': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, compact. SPTs (3-3-8-7) | | |
| 625.0 | highly weathered, light gray CLAYEY SHALE | | 23 | SS | | 1.1 / 1.3 | 40.0' to 41.2': (SP) SAND, fine to medium, trace coarse sand; light brown to gray brown; non-cohesive, wet, compact. SPTs (3-7-8-10) | | |
| | | | | | | | 42.0' to 42.8': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. | | |
| | | | | | | | 42.8' to 42.9': (SW) SAND, fine to coarse, gray shale cobble; light gray; non-cohesive, wet, compact. SPTs (7-7-8-13) | | |
| 620.0 | | | | | | | | | |

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM) | USCS Poorly-graded Sand (SP) | Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

# BOREHOLE LOG: GAMW-66B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 45.3
DEPTH TO BEDROCK: 44.2

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2173363.62 E: 2967853.2
GROUND SURFACE ELEV.: 669 20
TOP OF CASING ELEV.: 672.99
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/21/2020 7:45:00 AM
END DATE/TIME: 4/21/2020 12:00:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 44.0' to 44.2': (SW) SAND, fine to coarse; light gray; non-cohesive, wet, compact.<br><br>44.2' to 45.1': (CL) sandy CLAY; light gray, platey, medium to high dry strength; cohesive, w < PL, stiff to very stiff.<br>SPTs (5-28-50/3") | | |
| 615.0 | | | | | | | | | |
| 610.0 | | | | | | | | | |
| 605.0 | | | | | | | | | |
| 600.0 | | | | | | | | | |
| 595.0 | | | | | | | | | |

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

Shale

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

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# BOREHOLE LOG: GAMW-67B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 43
DEPTH TO BEDROCK: 40.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174213.3 E: 2967604.35
GROUND SURFACE ELEV.: 664.65
TOP OF CASING ELEV.: 667.97
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/20/2020 12:05:00 PM
END DATE/TIME: 4/20/2020 4:05:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. Or Run No. | Type | PID (ppm) | Soil Rec./Att. Or Core Rec. % | Soil Sample Description Or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| | brown to dark brown fine SILTY SAND | | 1 | SS | | 0.8 / 2 | 0.0' to 0.2': (SM) SILTY SAND, fine, trace organics (grass); brown to dark brown; non-cohesive, moist, very loose. | | Bentonite Chips 0-2 ft bgs |
| | light gray fine to coarse SAND, some fine to coarse gravel | | | | | | 0.2' to 0.7': (SP) SAND, fine to coarse, some fine to coarse subrounded gravel; light gray; non-cohesive, moist, loose. | | Cement-bentonite Grout 2-19 ft bgs |
| | yellow brown fine SAND | | | | | | 0.7' to 0.8': (SP) SAND, fine, trace medium to coarse sand; yellow brown; non-cohesive, moist, loose. SPTs(2-10-7-7) | | |
| 660.0 | dark brown fine SAND | | 2 | SS | | 0.9 / 2 | 5.0' to 5.9': (SP) SAND, fine; dark brown; non-cohesive, moist, loose. SPTs (4-3-5-5) | | |
| | light brown fine to medium SAND, trace coarse sand | | 3 | SS | | 0.7 / 2 | 10.0' to 10.7': (SP) SAND, fine, some medium sand; light brown; non-cohesive, wet, very loose. SPTs (1-1-2-3) | | |
| 655.0 | | | 4 | SS | | 1.4 / 2 | 12.0' to 13.4': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, loose. | | |
| 650.0 | | | 5 | SS | | 0.9 / 2 | 15.0' to 15.9': (SP) SAND, fine to medium, trace coarse sand, light brown; non-cohesive, wet, compact. SPTs (2-5-7-6) | | |
| 645.0 | | | 6 | SS | | 2.0 / 2 | 20.0' to 22.0': (SP) SAND, fine to medium, trace coarse sand, light brown; non-cohesive, wet, loose. SPTs (1-1-4-5) | | Bentonite Chips 19-28 ft bgs |
| 640.0 | | | | | | | | | |

LITHOLOGY LEGEND



USCS Silty Sand (SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Well-graded Sand (SW)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

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# BOREHOLE LOG: GAMW-67B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19127906
HOLE DEPTH: 43
DEPTH TO BEDROCK: 40.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2174213.3 E: 2967604.35
GROUND SURFACE ELEV.: 664.65
TOP OF CASING ELEV.: 667.97
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD:
DRILL RIG: CME 850 track
START DATE/TIME: 4/20/2020 12:05:00 PM
END DATE/TIME: 4/20/2020 4:05:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| | light brown fine to medium SAND, trace coarse sand | | 7 | SS | | 1.4 / 2 | 25.0' to 26.0': (SP) SAND, fine medium, trace coarse sand; light brown; non-cohesive, wet, compact. | | |
| | light gray to brown fine to coarse SAND | | | | | | 26.0' to 26.4': (SW) SAND, fine to coarse, trace round fine to coarse gravel; light gray brown; non-cohesive, wet, compact; coarser 26.3-26.4'. SPTs (6-10-16-18) | | |
| | light brown fine to medium SAND, trace fine gravel | | | | | | | | #5 Sand Filter Pack 28-40.5 ft bgs |
| 635.0 | | | 8 | SS | | 2.0 / 2 | 30.0' to 32.0': (SP) SAND, fine to medium, trace coarse sand, trace round to subrounded fine gravel; light brown; non-cohesive, wet, compact. SPTs (6-8-8-10) | | 2" PVC Screen slot 0.010 30.5-40.5 ft bgs |
| | light gray to brown, medium to coarse SAND, some fine sand, trace fine gravel | | 9 | SS | | 0.6 / 2 | 32.0' to 32.6': (SW) SAND, medium to coarse, some fine sand, trace fine subrounded gravel; light gray to brown; non-cohesive, wet, compact; coarser 32.3-32.6', light brown fine sand at 32.6'. SPTs (4-8-8-14) | | |
| 630.0 | light brown fine to medium SAND, trace coarse sand, trace fine to coarse gravel, lenses of medium to coarse sand | | 10 | SS | | 1.5 / 2 | 35.0' to 36.5': (SP) SAND, fine to medium, trace coarse sand, trace fine subrounded gravel; light brown; non-cohesive, wet, very dense. SPTs (15-20-33-42) | | |
| | | | 11 | SS | | 2.0 / 2 | 37.0' to 39.0': (SP) SAND, fine to medium, trace coarse sand, trace fine to coarse round to subrounded gravel; light brown, lenses of medium to coarse sand; non-cohesive, wet, compact. SPTs (7-12-17-17) | | |
| 625.0 | | | 12 | SS | | 1.4 / 2 | 39.0' to 40.0': (SP) SAND, fine to medium, trace coarse sand; light brown; non-cohesive, wet, compact. | | |
| | highly weathered, light gray CLAYEY SHALE and light brown fine to coarse sand | | | | | | | | |
| | highly weathered, light gray CLAYEY SHALE | | 13 | SS | | 1.2 / 2 | 40.0' to 40.4': clayey SHALE, light gray, highly weathered, platey, fine to coarse sand and fine to coarse subrounded gravel; non-cohesive, wet, compact. SPTs (10-14-20-12) | | |
| | | | | | | | 41.0' to 42.2': (CL), SILTY CLAY, light gray; cohesive, w~PL, firm to stiff. SPTs (3-4-6-14) | | |
| 620.0 | | | | | | | | | |
| 615.0 | | | | | | | | | |

LITHOLOGY LEGEND



USCS Silty Sand (SM)
Shale



USCS Poorly-graded Sand (SP)



USCS Well-graded Sand (SW)

DRILLING COMPANY: DLZ
DRILLER: Z. Baehr
DRILL RIG: CME 850 track

LOGGED BY: KMC
CHECKED BY: CRH
DATE: 5/7/20

Golder Associates

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# BOREHOLE LOG: GAMW-68



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19121567
HOLE DEPTH: 18
DEPTH TO BEDROCK: N/A

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168555.544 E: 2970328.36
GROUND SURFACE ELEV.: 665.95
TOP OF CASING ELEV.: 665.53
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD: N/A
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/27/2020 3:25:00 PM
END DATE/TIME: 8/27/2020 6:00:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| 665.0 | brown fine SAND, some silt, trace organics | | 1 | SS | | 1.8 / 2 | 0-0.5': (SP-SM) SAND, fine, some organics (roots), brown, non cohesive, dry, loose<br>0.5-1.5': (SP) SAND, fine, light dark, brown, non cohesive, moist, loose<br>1.5-1.8': (SP) SAND, fine, trace organics (roots), light and dark, brown, non cohesive, moist, loose<br>SPTs (6-6-6-7) | | Completed as flush mount<br>Bentonite Chips 1-4 ft bgs |
| | light and dark brown fine SAND, trace organics | | | | | | | | |
| | orange and brown fine SAND | | 2 | SS | | 1.4 / 2 | 2-2.5': (SP) SAND, fine, trace organics (roots), light and dark brown, non cohesive, moist, loose<br>2.5-2.8': (SP) SAND, fine, orange and brown, non cohesive, moist, loose<br>2.8-3.4': (SP) SAND, fine, light brown, non cohesive, moist, loose<br>SPTs (3-3-4-3) | | 1/4" Coated Bentonite Pellets 4-6 ft bgs |
| | light brown to brown fine to medium SAND | | 3 | SS | | 1.2 / 2 | | | |
| 660.0 | | | 4 | SS | | 1.2 / 2 | 4-5.2': (SP) SAND, fine to medium, light brown, non cohesive, moist, loose, wet at 4.4 ft-bgs<br>SPTs (3-4-4-3) | | #5 Sand Filter Pack 6-17 ft bgs<br>2" PVC Screen slot 0.010 7-17 ft bgs |
| | | | 5 | SS | | 1 / 2 | 6-7.2': (SP) SAND, fine to medium, light brown to brown, non cohesive, wet, compact<br>SPTs (4-6-12-16) | | |
| | | | 6 | SS | | 1.6 / 2 | 8-9': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact<br>SPTs (2-5-8-11)<br>10-11': (SP) SAND, fine to medium, some coarse sand and fine round gravel from 11 to 11.3 ft bgs; brown, non cohesive, wet, compact | | |
| 655.0 | | | 7 | SS | | 2 / 2 | 11.3-11.6': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact<br>SPTs (4-7-8-11) | | |
| | | | 8 | SS | | 0.7 / 2 | 12-14': (SP) SAND, medium, some fine and coarse sand, brown, non cohesive, wet, compact<br>SPTs (3-7-10-12) | | |
| 650.0 | | | 9 | SS | | 2 / 2 | 14-14.6': (SP) SAND, medium, some fine and coarse sand, trace fine-coarse subrounded gravel, brown, non cohesive, wet, compact<br>14.6-14.7': (SP) SAND, fine, brown, non cohesive, wet, compact<br>SPTs (2-3-7-12)<br>16-17.5': (SP) SAND, fine, some medium, brown, non cohesive, wet, loose<br>17.5-18': (SP) SAND, fine, brown, non cohesive, wet, compact<br>SPTs (2-5-8-14) | | Native sand collapsed to 17 ft bgs |
| 645.0 | | | | | | | | | |

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)

USCS Poorly-graded Sand (SP)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

# BOREHOLE LOG: GAMW-68B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19121567
HOLE DEPTH: 34.7
DEPTH TO BEDROCK: 34.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168557.418 E: 2970325.081
GROUND SURFACE ELEV.: 665.97
TOP OF CASING ELEV.: 665.72
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD: N/A
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/26/2020 11:20:00 AM
END DATE/TIME: 8/27/2020 3:15:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| 665.0 | brown fine SAND, some silt, trace organics<br>light and dark brown fine SAND, trace organics | | 1 | SS | | 1.8 / 2 | 0-0.5': (SP-SM) SAND, fine, some organics (roots), brown, non cohesive, dry, loose<br>0.5-1.5': (SP) SAND, fine, light dark, brown, non cohesive, moist, loose<br>1.5-1.8': (SP) SAND, fine, trace organics (roots), light and dark, brown, non cohesive, moist, loose<br>SPTs (6-6-6-7) | | Completed as flush mount<br>Bentonite chips 1-6 ft bgs |
| | orange and brown fine SAND<br>light brown to brown fine to medium SAND | | 2 | SS | | 1.4 / 2 | 2-2.5': (SP) SAND, fine, trace organics (roots), light and dark brown, non cohesive, moist, loose<br>2.5-2.8': (SP) SAND, fine, orange and brown, non cohesive, moist, loose<br>2.8-3.4': (SP) SAND, fine, light brown, non cohesive, moist, loose<br>SPTs (3-3-4-3) | | |
| 660.0 | | | 3 | SS | | 1.2 / 2 | 4-5.2': (SP) SAND, fine to medium, light brown, non cohesive, moist, loose, wet at 4.4 ft-bgs<br>SPTs (3-4-4-3) | | Cement Grout 6-20 ft bgs |
| | | | 4 | SS | | 1.2 / 2 | 6-7.2': (SP) SAND, fine to medium, light brown to brown, non cohesive, wet, compact<br>SPTs (4-6-12-16) | | |
| | | | 5 | SS | | 1 / 2 | 8-9': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact<br>SPTs (2-5-8-11) | | |
| 655.0 | | | 6 | SS | | 1.6 / 2 | 10-11': (SP) SAND, fine to medium, some coarse sand and fine round gravel from 11 to 11.3 ft bgs; brown, non cohesive, wet, compact<br>11.3-11.6': (SP) SAND, fine to medium, trace coarse, brown, non cohesive, wet, compact<br>SPTs (4-7-8-11) | | |
| | | | 7 | SS | | 2 / 2 | 12-14': (SP) SAND, medium, some fine and coarse sand, brown, non cohesive, wet, compact<br>SPTs (3-7-10-12) | | |
| | | | 8 | SS | | 0.7 / 2 | 14-14.6': (SP) SAND, medium, some fine and coarse sand, trace fine-coarse subrounded gravel, brown, non cohesive, wet, compact<br>14.6-14.7': (SP) SAND, fine, brown, non cohesive, wet, compact<br>SPTs (2-3-7-12) | | |
| 650.0 | | | 9 | SS | | 2 / 2 | 16-17.5': (SP) SAND, fine, some medium, brown, non cohesive, wet, loose<br>17.5-18': (SP) SAND, fine, brown, non cohesive, wet, compact<br>SPTs (2-5-8-14) | | |
| | brown SILT and fine SAND<br>brown to gray-brown fine to medium SAND, some coarse sand, trace fine gravel | | 10 | SS | | 2 / 2 | 18-19.4': (SP) SAND, fine to medium, brown, non cohesive, wet, loose<br>19.4-19.7': (ML/SP) SILT and SAND, fine, brown, non cohesive, wet, loose<br>19.7-20': (SP) SAND, fine to medium, brown-gray, non cohesive, wet, loose<br>SPTs (2-4-4-7) | | 1/4" Coated Bentonite Pellets 20-22 ft bgs |
| 645.0 | | | 11 | SS | | 1.8 / 2 | 20-21': (SP) SAND, fine to medium, brown-gray, non cohesive, wet, loose<br>21-21.8': (SW) SAND, fine to coarse, trace fine sub rounded gravel, gray-brown, non cohesive, wet, loose<br>SPTs (2-1-2-7) | | #5 Sand Filter Pack 22-34.5 ft bgs |
| | | | 12 | SS | | 2 / 2 | | | |
| | | | 13 | SS | | 2 / 2 | | | 2" PVC Screen slot |

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM) / Shale

USCS Poorly-graded Sand (SP)

USCS Silt (ML)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

# BOREHOLE LOG: GAMW-68B



PROJECT: NIPSCO LLC Schahfer
PROJECT NO.: 19121567
HOLE DEPTH: 34.7
DEPTH TO BEDROCK: 34.7

BOREHOLE LOCATION: Wheatfield, IN
COORDINATES: N: 2168557.418 E: 2970325.081
GROUND SURFACE ELEV.: 665 97
TOP OF CASING ELEV.: 665.72
DATUM: Indiana West Zone NAD 83

DRILLING METHOD: Hollow-stem auger
CORING METHOD: N/A
DRILL RIG: Geoprobe 7822 DT
START DATE/TIME: 8/26/2020 11:20:00 AM
END DATE/TIME: 8/27/2020 3:15:00 PM

| Depth Elev. | LITHOLOGY DESCRIPTION | Graphical Log | SAMPLE INFORMATION: Sample No. or Run No. | Type | PID (ppm) | Soil Rec./Att. or Core Rec. % | Soil Sample Description or Discontinuity Data (Depth, Dip, Angle From Core Axis, Type, and Surface Description) | Well Graphic | Well Construction Information |
|---|---|---|---|---|---|---|---|---|---|
| 640.0 | brown to gray-brown fine to medium SAND, some coarse sand, trace fine gravel | | 13 | SS | | 2 / 2 | 22-22.8': (SW) SAND, fine to coarse, trace fine sub rounded gravel, gray-brown, non cohesive, wet, loose | | 0.010 24.5-34.5 ft bgs |
| | | | 14 | SS | | 2 / 2 | 22.8-23.4': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, brown, non cohesive, wet, compact<br>23.4-24': (SP) SAND, fine to medium, trace coarse sand, trace fine rounded gravel, gray-brown, non cohesive, wet, compact<br>SPTs (5-12-15-16) | | |
| | | | 15 | SS | | 2 / 2 | 24-26': (SP) SAND, fine to medium, trace coarse sand, trace fine sub rounded gravel, gray-brown, non cohesive, wet, compact<br>SPTs (4-9-16-16) | | |
| 635.0 | | | 16 | SS | | 1.5 / 2 | 26-26.3': (SW) SAND, fine to coarse, gray-brown, non cohesive, wet, loose<br>26.3-28': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, non cohesive, wet, compact to dense<br>SPTs (7-14-19-21) | | |
| | | | 17 | SS | | 1.5 / 2 | 28-30': (SP) SAND, fine to medium, some coarse sand, trace fine rounded gravel, non cohesive, wet, compact to dense<br>SPTs (9-14-22-19) | | |
| | slightly weathered, weak, friable light gray SHALE | | 18 | SS | | 0.7 / 0.7 | 30-31.5': (SW) SAND, fine to coarse, trace fine rounded gravel, gray-brown, non cohesive, wet, loose. Increasing grain size with depth<br>SPTs (2-3-4-10) | | |
| 630.0 | | | | | | | 32-33.5': (SP) SAND, medium, some fine, some coarse sand, non cohesive, wet, compact<br>SPTs (6-8-13-23) | | |
| | | | | | | | 34-34.5': (SP) SAND, medium, some fine, some coarse sand, non cohesive, wet, compact<br>34.5-34.7': Slightly weathered, weak, friable light gray shale | | |
| 625.0 | | | | | | | | | |
| 620.0 | | | | | | | | | |

LITHOLOGY LEGEND

USCS Poorly-graded Sand with Silt (SP-SM)
Shale
USCS Poorly-graded Sand (SP)
USCS Silt (ML)

DRILLING COMPANY: Strata Earth Services, LLC
DRILLER: Scott Komen
DRILL RIG: Geoprobe 7822 DT

LOGGED BY: KMC
CHECKED BY: KJ
DATE: 10/19/20

Golder Associates

NIPSCO RMSGS 1648171 - NIPSCO CCR RMSGS - WITH NON-CCR WELLS - COPY.GPJ GOLDER NH 2011.GDT 10/26/20

**APPENDIX E**

# Analytical Data 40 CFR Part §257.103(f)(2)(v)(C)(3)

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW01 | | | GAMW01B | | | GAMW03 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-21 | 2021-04-14 | 2021-09-16 | 2020-10-21 | 2021-04-14 | 2021-09-16 | 2020-10-22 | 2021-04-14 | 2021-09-17 |
| Sample Type | | N | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | |
| Boron | mg/L | 0.71 | 0.78 | 0.24 | 0.34 | 0.35 | 0.29 | 0.18 | 0.22 | 0.13 |
| Calcium | mg/L | 89.6 | 95.2 | 76.7 | 104 | 103 | 112 | 78.3 | 90.3 | 70.2 |
| Chloride | mg/L | 11.3 | 10.1 | 5.9 | 19.9 | 20.8 | 18.6 | 6.6 | 4.3 | 4.2 |
| Fluoride | mg/L | 0.36 | 0.29 | 0.36 J- | 0.12 | 0.076 | 0.094 J- | 0.14 | 0.13 | 0.2 |
| pH | SU | 7.53 | 7.11 | 6.61 | 7.25 | 6.96 | 6.5 | 6.9 | 6.77 | 6.9 |
| Sulfate | mg/L | 100 | 157 | 42.3 | 74.2 | 85.2 | 69.3 | 70.3 | 97.5 | 40.2 |
| Total Dissolved Solids | mg/L | 387 | 574 | 294 | 423 | 450 | 443 | 317 | 390 | 298 |
| CCR Appendix IV | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.019 | 0.012 | 0.02 | 0.001 U | 0.001 U | 0.001 U | 0.014 | 0.0094 | 0.019 |
| Barium | mg/L | 0.059 | 0.051 | 0.049 | 0.16 | 0.17 | 0.17 | 0.086 | 0.074 | 0.08 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.0013 | 0.0019 | 0.001 | 0.001 U | 0.001 | 0.001 U | 0.0012 | 0.0055 | 0.001 U |
| Fluoride | mg/L | 0.36 | 0.29 | 0.36 J- | 0.12 | 0.076 | 0.094 J- | 0.14 | 0.13 | 0.2 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.0087 | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.019 | 0.011 | 0.0076 | 0.001 U | 0.001 U | 0.001 U | 0.01 | 0.011 | 0.0084 |
| Radium Total | pci/l | | 0.642 U | | | 2.02 | | | 0.158 U | |
| Selenium | mg/L | 0.001 U | 0.01 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Sample Parameters | | | | | | | | | | |
| DO | mg/L | 0.39 | 0.6 | 0.49 | 0.43 | 0.51 | 0.51 | 0.54 | 1.47 | 0.27 |
| ORP | millivolts | -35.4 | -37 2 | -240.2 | -73.8 | -88 | -217.6 | 2.6 | -33.4 | -225.9 |
| pH | SU | 7.53 | 7.11 | 6.61 | 7.25 | 6.96 | 6.5 | 6.9 | 6.77 | 6.9 |
| SC | uS/cm | 656 | 721 | 524 | 747 | 752 | 705 | 576 | 605 | 479 |
| TEMP | deg c | 16.2 | 9.7 | 18.23 | 13.3 | 12.1 | 14.36 | 15.9 | 9.5 | 16.85 |
| TURB | ntu | 2.81 | 4.06 | 3.51 | 1.01 | 3.19 | 2.19 | 4.09 | 5.99 | 2.8 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is es imated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW03B | | | GAMW12 | | | GAMW12B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-22 | 2021-04-15 | 2021-09-17 | 2020-10-20 | 2021-04-15 | 2021-09-16 | 2020-10-20 | 2021-04-15 | | 2021-09-16 |
| Sample Type | | N | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | | |
| Boron | mg/L | 0.25 | 0.25 | 0.27 | 0.1 U | 0.1 U | 0.1 U | 0.36 | 0.29 | 0.31 | 0.32 |
| Calcium | mg/L | 92.7 | 96.4 | 102 | 84.8 | 87 | 80.7 | 108 | 103 | 104 | 107 |
| Chloride | mg/L | 17 | 20.1 | 23.1 | 6.3 | 2.3 | 3.2 | 23.1 | 20.5 | 20.8 | 20.6 |
| Fluoride | mg/L | 0.23 | 0.2 | 0.23 | 0.23 | 0.16 | 0.19 J- | 0.098 | 0.079 | 0.082 | 0.079 J- |
| pH | SU | 7.32 | 7.03 | 6.97 | 6.69 | 7.31 | 6.49 | 7.11 | | 7.55 | 6.99 |
| Sulfate | mg/L | 66.8 | 58 | 78.6 | 49.7 | 9.2 | 24.2 | 79.9 | 63.8 | 66.5 | 57.5 |
| Total Dissolved Solids | mg/L | 372 | 400 | 439 | 313 | 336 | 325 | 432 | 435 | 430 | 451 |
| CCR Appendix IV | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.02 | 0.012 | 0.043 | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Barium | mg/L | 0.1 | 0.11 | 0.12 | 0.11 | 0.095 | 0.094 | 0.13 | 0.13 | 0.13 | 0.14 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.002 | 0.0025 | 0.0028 | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.23 | 0.2 | 0.23 | 0.23 | 0.16 | 0.19 J- | 0.098 | 0.079 | 0.082 | 0.079 J- |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0072 | 0.0051 | 0.0066 | 0.003 | 0.0028 | 0.0041 | 0.0017 | 0.0012 | 0.0012 | 0.0013 |
| Radium Total | pci/l | | 1.08 U | | | 1.1 U | | | 1.65 | 2.42 | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Sample Parameters | | | | | | | | | | | |
| DO | mg/L | 0.39 | 0.95 | 0.28 | 0.54 | 0.2 | 0.28 | 0.36 | | 0.13 | 0.46 |
| ORP | millivolts | -11.2 | -81 8 | -255.4 | -4.4 | -90.7 | -191.9 | 1 | | -107.1 | -265.3 |
| pH | SU | 7.32 | 7.03 | 6.97 | 6.69 | 7.31 | 6.49 | 7.11 | | 7.55 | 6.99 |
| SC | uS/cm | 670 | 695 | 634 | 586 | 583 | 625 | 734 | | 709 | 704 |
| TEMP | deg c | 13.2 | 11.8 | 13.22 | 16.2 | 9.04 | 19.11 | 14 | | 11.67 | 14.81 |
| TURB | ntu | 3.56 | 4.08 | 3.19 | 3.89 | 4.78 | 4.53 | 2.35 | | 3.58 | 3.64 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW13 | | | GAMW13B | | | GAMW14 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-20 | 2021-04-19 | 2021-09-17 | 2020-10-20 | 2021-04-19 | 2021-09-17 | 2020-10-20 | | 2021-04-19 | 2021-09-17 |
| Sample Type | | N | N | N | N | N | N | FD | N | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | | |
| Boron | mg/L | 0.16 | 0.16 | 0.19 | 0.67 | 0.71 | 0.6 | 0.14 | 0.14 | 0.29 | 0 2 |
| Calcium | mg/L | 77.9 | 95.6 | 71.2 | 78.6 | 82.7 | 77.8 | 73.8 | 71.7 | 67.7 | 82.6 |
| Chloride | mg/L | 9.3 | 4.3 | 10.5 | 28.8 | 28.3 | 26 | 3.6 | 3.6 | 11.3 | 10.6 |
| Fluoride | mg/L | 0.31 | 0.27 | 0.31 | 0.26 | 0.31 | 0.25 | 0.21 | 0.21 | 0.26 | 0 26 |
| pH | SU | 6.57 | 6.95 | 6.67 | 7.47 | 7.73 | 7.32 | | 6.36 | 7.03 | 6.61 |
| Sulfate | mg/L | 22 | 48.6 | 49.3 | 143 | 146 | 137 | 8.4 | 8.5 | 40.6 | 31.8 |
| Total Dissolved Solids | mg/L | 291 | 355 | 317 | 383 | 376 | 395 | 259 | 240 | 270 | 330 |
| CCR Appendix IV | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Arsenic | mg/L | 0.01 | 0.027 | 0.0076 | 0.0011 | 0.0012 | 0.001 | 0.029 | 0.029 | 0.018 | 0 039 |
| Barium | mg/L | 0.1 | 0.11 | 0.08 | 0.083 | 0.081 | 0.077 | 0.053 | 0.053 | 0.061 | 0 081 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.0012 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.023 | 0.023 | 0.017 | 0 024 |
| Fluoride | mg/L | 0.31 | 0.27 | 0.31 | 0.26 | 0.31 | 0.25 | 0.21 | 0.21 | 0.26 | 0 26 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0.0039 | 0.0096 | 0.004 | 0.017 | 0.016 | 0.016 | 0.0087 | 0.0088 | 0.0073 | 0 0077 |
| Radium Total | pci/l | | 1.06 U | | | 0.82 U | | | | 0.883 U | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Sample Parameters | | | | | | | | | | | |
| DO | mg/L | 0.69 | 0.46 | 0.29 | 0.37 | 0.23 | 0.32 | | 0.49 | 0.2 | 0 29 |
| ORP | millivolts | -18.5 | -16 8 | -155.2 | -31.1 | -120.6 | -259.6 | | 61.1 | -31.7 | -234.5 |
| pH | SU | 6.57 | 6.95 | 6.67 | 7.47 | 7.73 | 7.32 | | 6.36 | 7.03 | 6.61 |
| SC | uS/cm | 582 | 461 | 580 | 636 | 527 | 568 | | 478.2 | 377 | 568 |
| TEMP | deg c | 16.6 | 9.5 | 18.84 | 14.1 | 11.97 | 14.15 | | 15.5 | 10.2 | 16.83 |
| TURB | ntu | 3.73 | 3.79 | 2.17 | 4.1 | 3.92 | 0.5 | | 3.3 | 4.19 | 0 85 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW14B | | | | GAMW42 | | | GAMW42B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-20 | 2021-04-19 | | 2021-09-17 | 2020-10-15 | 2021-04-23 | 2021-09-14 | 2020-10-15 | 2021-04-23 | 2021-09-14 |
| Sample Type | | N | FD | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | | |
| Boron | mg/L | 4.6 | 2.8 | 2.8 | 2.7 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Calcium | mg/L | 171 | 146 | 143 | 112 | 42.6 | 47.1 | 59.9 | 53.2 | 57.9 | 62.6 |
| Chloride | mg/L | 138 | 112 | 108 | 85.2 | 2.8 | 4.2 | 11.4 | 5.6 | 8.6 | 10.3 |
| Fluoride | mg/L | 0.3 | 0.29 | 0.29 | 0.28 | 0.21 | 0.17 J- | 0.19 | 0.15 | 0.15 J- | 0.12 |
| pH | SU | 7.53 | | 7.71 | 7.39 | 7.22 | 7.62 | 7 | 7.73 | 7.72 | 8 |
| Sulfate | mg/L | 1570 | 1330 | 1350 | 841 | 23.6 | 29.9 | 66.5 | 29.3 | 37.7 | 31.8 |
| Total Dissolved Solids | mg/L | 2630 | 1730 | 1740 | 1660 | 178 | 148 | 253 | 207 | 193 | 241 |
| CCR Appendix IV | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0015 | 0.0012 | 0.0011 | 0.001 U | 0.001 U | 0.001 U |
| Barium | mg/L | 0.11 | 0.08 | 0.08 | 0.059 | 0.019 | 0.018 | 0.023 | 0.016 | 0.016 | 0.021 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.3 | 0.29 | 0.29 | 0.28 | 0.21 | 0.17 J- | 0.19 | 0.15 | 0.15 J- | 0.12 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.0093 | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.048 | 0.028 | 0.028 | 0.04 | 0.0021 | 0.0022 | 0.0033 | 0.0026 | 0.0029 | 0.0027 |
| Radium Total | pci/l | | 1.92 | 1.85 | | | 0 U | | | 0.853 U | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Sample Parameters | | | | | | | | | | | |
| DO | mg/L | 0.36 | | 0.29 | 0.42 | 0.37 | 0.59 | 0.17 | 0.34 | 0.49 | 0.15 |
| ORP | millivolts | -13.2 | | -103.5 | -193.7 | -13.5 | -80 9 | -191 | -58.7 | -125.5 | -261 |
| pH | SU | 7.53 | | 7.71 | 7.39 | 7.22 | 7.62 | 7 | 7.73 | 7.72 | 8 |
| SC | uS/cm | 3573 | | 2128 | 2053 | 280.5 | 326.1 | 413 | 352.2 | 407 | 414 |
| TEMP | deg c | 13.7 | | 12.37 | 13.98 | 13.7 | 9.9 | 14.9 | 12.4 | 11.8 | 13.1 |
| TURB | ntu | 3.56 | | 1.86 | 1.1 | 2.28 | 2.56 | 1.76 | 2.25 | 4.87 | 3.98 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW42C | | | GAMW43 | | | GAMW43B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-15 | 2021-04-23 | 2021-09-15 | 2020-10-15 | 2021-04-23 | 2021-09-14 | 2020-10-16 | 2021-04-27 | | 2021-09-14 |
| Sample Type | | N | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | | |
| Boron | mg/L | 0.74 | 0.69 | 0.62 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Calcium | mg/L | 48 | 48.6 | 53.9 | 29.5 | 28 | 32.6 | 39.3 | 41.2 | 40.4 | 38.2 |
| Chloride | mg/L | 5.5 | 6.3 | 8.3 | 0.9 | 0.53 | 0.85 | 1.7 | 1.7 | 1.7 | 1.8 |
| Fluoride | mg/L | 0.2 | 0.2 J- | 0.22 | 0.12 | 0.13 J- | 0.11 | 0.15 | 0.19 | 0.19 | 0.15 |
| pH | SU | 7.29 | 7.59 | 7.36 | 7.08 | 7.22 | 7.22 | 8.03 | | 8.04 | 7.64 |
| Sulfate | mg/L | 3.9 | 4.4 | 4.3 | 24.8 | 30 | 28.4 | 23.8 | 28.9 J+ | 27.9 J+ | 22.2 |
| Total Dissolved Solids | mg/L | 223 | 203 | 254 | 126 | 86 | 137 | 149 | 145 | 151 | 137 |
| CCR Appendix IV | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.003 | 0.0016 | 0.0028 | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Barium | mg/L | 0.01 | 0.0092 | 0.0089 | 0.019 | 0.019 | 0.026 | 0.011 | 0.012 | 0.011 | 0.011 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.0043 | 0.0024 | 0.0022 | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.2 | 0.2 J- | 0.22 | 0.12 | 0.13 J- | 0.11 | 0.15 | 0.19 | 0.19 | 0.15 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.028 | 0.032 | 0.024 | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0031 | 0.0026 | 0.0021 | 0.0019 | 0.0018 | 0.002 | 0.0022 | 0.0023 | 0.0021 | 0.0024 |
| Radium Total | pci/l | | 0.802 U | | | 0.568 U | | | 0.985 U | 0.731 U | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Sample Parameters | | | | | | | | | | | |
| DO | mg/L | 0.29 | 0.43 | 0.12 | 0.36 | 0.7 | 0.64 | 0.38 | | 0.51 | 0.27 |
| ORP | millivolts | -25.6 | -123.3 | -231 | 65.1 | 35.1 | -329 | -60.8 | | -108.7 | -323.9 |
| pH | SU | 7.29 | 7.59 | 7.36 | 7.08 | 7.22 | 7.22 | 8.03 | | 8.04 | 7.64 |
| SC | uS/cm | 409 | 455.1 | 475 | 245.5 | 209 | 226 | 244.6 | | 282 | 191 |
| TEMP | deg c | 11.9 | 11.8 | 12.7 | 14.8 | 9.7 | 17.01 | 12.4 | | 11.4 | 12.88 |
| TURB | ntu | 8.56 | 7.69 | 5.86 | 3.69 | 4.3 | 2.99 | 2.13 | | 2.38 | 1.37 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW44 | | | GAMW44B | | | | GAMW51 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-16 | 2021-04-27 | 2021-09-15 | 2020-10-16 | | 2021-04-27 | 2021-09-15 | 2020-10-27 | 2021-04-21 | 2021-09-29 | |
| Sample Type | | N | N | N | FD | N | N | N | N | N | FD | N |
| Chemical Name | Unit | | | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.92 | 0.43 | 0 51 | 0.5 |
| Calcium | mg/L | 28.1 | 21.5 | 20.2 | 33.8 | 34.4 | 31.2 | 31.7 | 180 | 144 | 148 | 147 |
| Chloride | mg/L | 1.9 | 2.3 | 1.7 | 3.5 | 3.6 | 1.6 | 1.5 | 7.1 | 1.5 | 2 3 | 2.3 |
| Fluoride | mg/L | 0.054 | 0.19 | 0.13 | 0.12 | 0.11 | 0.14 | 0.18 | 0.42 | 0.26 | 0 34 | 0.34 |
| pH | SU | 5.87 | 6.21 | 6.21 | | 8.24 | 8.22 | 7.81 | 7.1 | 7.19 | | 7.04 |
| Sulfate | mg/L | 44.6 | 63.9 J+ | 44.8 | 9.8 | 10.4 | 12.3 J+ | 7.5 | 323 | 196 | 191 | 193 |
| Total Dissolved Solids | mg/L | 153 | 165 | 136 | 118 | 126 | 85 | 113 | 755 | 604 | 597 | 600 |
| CCR Appendix IV | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Arsenic | mg/L | 0.026 | 0.095 | 0.052 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0021 | 0.0016 | 0 0016 | 0.0016 |
| Barium | mg/L | 0.025 | 0.018 | 0.02 | 0.0092 | 0.0092 | 0.0084 | 0.0082 | 0.1 | 0.1 | 0.11 | 0.11 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.0034 | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U |
| Cobalt | mg/L | 0.0033 | 0.0026 | 0.0029 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0022 | 0.0033 | 0 0031 | 0.0031 |
| Fluoride | mg/L | 0.054 | 0.19 | 0.13 | 0.12 | 0.11 | 0.14 | 0.18 | 0.42 | 0.26 | 0 34 | 0.34 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.010 | 0.008 U | 0 012 | 0.012 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0029 | 0.0044 | 0.004 | 0.0017 | 0.0017 | 0.0022 | 0.002 | 0.031 | 0.011 | 0 0092 | 0.0098 |
| Radium Total | pci/l | | 0.365 U | | | | 1.03 U | | | 1.23 U | | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Sample Parameters | | | | | | | | | | | | |
| DO | mg/L | 0.9 | 1.07 | 0.83 | | 0.37 | 0.5 | 0.36 | 0.83 | 0.48 | | 0.27 |
| ORP | millivolts | 109.9 | -8.1 | -294.6 | | -67.9 | -125.8 | -318 | -86 | -100.6 | | 0.197 |
| pH | SU | 5.87 | 6.21 | 6.21 | | 8.24 | 8.22 | 7.81 | 7.1 | 7.19 | | 7.04 |
| SC | uS/cm | 267.1 | 257.8 | 192 | | 212.3 | 210.9 | 158 | 910 | 873 | | 937 |
| TEMP | deg c | 14.2 | 11.2 | 16.11 | | 11.7 | 11.5 | 12.16 | 14.2 | 11.1 | | 15.9 |
| TURB | ntu | 3.22 | 4.66 | 2.04 | | 1.3 | 2.15 | 1.19 | 3.48 | 4.2 | | 4.12 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW51B | | | GAMW57 | | | GAMW57B | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-27 | 2021-04-21 | 2021-09-29 | 2020-10-16 | 2021-04-23 | 2021-09-15 | 2020-10-16 | 2021-04-23 | 2021-09-15 |
| Sample Type | | N | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | |
| Boron | mg/L | 7.5 | 7.2 | 7 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.13 |
| Calcium | mg/L | 256 | 261 | 282 | 23.4 | 13.9 | 21.8 | 44.9 | 43.1 | 47.5 |
| Chloride | mg/L | 62.2 | 54.8 | 53.2 | 1.2 | 1.6 | 1 | 10.7 | 11.2 | 12.4 |
| Fluoride | mg/L | 0.92 | 0.45 | 0.82 | 0.05 U | 0.05 UJ | 0.073 | 0.11 | 0.13 J- | 0.17 |
| pH | SU | 8.07 | 8.11 | 7.83 | 8.88 | 6.22 | 8.03 | 7.9 | 7.95 | 7.33 |
| Sulfate | mg/L | 1610 | 1490 | 1480 | 28.4 | 38 | 25.8 | 24 | 19.1 | 24.4 |
| Total Dissolved Solids | mg/L | 2360 | 2180 J | 2270 | 104 | 58 | 101 | 179 | 150 | 205 |
| CCR Appendix IV | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.0034 | 0.004 | 0.0044 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Barium | mg/L | 0.068 | 0.072 | 0.077 | 0.0059 | 0.014 | 0.0055 | 0.021 | 0.02 | 0.022 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0014 | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.92 | 0.45 | 0.82 | 0.05 U | 0.05 UJ | 0.073 | 0.11 | 0.13 J- | 0.17 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.063 | 0.071 | 0.078 | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 UJ | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.17 | 0.16 | 0.15 | 0.0051 | 0.0011 | 0.003 | 0.0049 | 0.0028 | 0.0067 |
| Radium Total | pci/l | | 3.57 | | | 0.194 U | | | 0.368 U | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Sample Parameters | | | | | | | | | | |
| DO | mg/L | 2.12 | 0.55 | 0.29 | 5.35 | 4.93 | 6.33 | 0.35 | 0.22 | 0.37 |
| ORP | millivolts | -152.7 | -108.7 | 0.246 | 147 | 111.6 | -297.7 | -51.1 | -132.7 | -316.7 |
| pH | SU | 8.07 | 8.11 | 7.83 | 8.88 | 6.22 | 8.03 | 7.9 | 7.95 | 7.33 |
| SC | uS/cm | 2352 | 3094 | 303.9 | 177 | 124 | 136 | 317.8 | 291 | 284 |
| TEMP | deg c | 12.9 | 12.4 | 14.2 | 12.2 | 10.25 | 12.45 | 11.4 | 11.2 | 11.54 |
| TURB | ntu | 1.65 | 1.82 | 1.43 | 3.9 | 2.7 | 2.63 | 2.58 | 3.04 | 1.65 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW58 | | | GAMW58B | | | | GAMW59 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-19 | 2021-04-23 | 2021-09-15 | 2020-10-19 | 2021-04-23 | 2021-09-15 | | 2020-10-28 | 2021-04-21 | 2021-09-29 |
| Sample Type | | N | N | N | N | N | FD | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 1.7 | 0.89 | 1 |
| Calcium | mg/L | 10.8 | 7.3 | 10.9 | 39.5 | 37.8 | 29.2 | 38.6 | 239 | 209 | 217 |
| Chloride | mg/L | 1.1 | 0.95 | 1.1 | 4.3 | 3.6 | 2.1 | 4 | 5 J- | 11.3 | 21.1 |
| Fluoride | mg/L | 0.38 | 0.22 J- | 0.35 | 0.14 | 0.15 J- | 0.12 | 0.19 | 0.59 | 0.42 | 0.7 |
| pH | SU | 5.37 | 4.4 | 5.87 | 8.12 | 7.92 | | 7.32 | 7.49 | 7.53 | 7.26 |
| Sulfate | mg/L | 39.6 | 45 | 38.9 | 26.7 | 24.9 | 32.1 | 23.6 | 692 | 473 | 434 |
| Total Dissolved Solids | mg/L | 67 | 44 J | 82 | 148 | 124 | 135 | 161 | 2310 | 756 | 866 |
| CCR Appendix IV | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0017 | 0.0012 | 0.002 |
| Barium | mg/L | 0.039 | 0.059 | 0.041 | 0.016 | 0.015 | 0.0044 | 0.015 | 0.076 | 0.048 | 0.055 |
| Beryllium | mg/L | 0.00076 | 0.0012 | 0.00075 | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.00025 | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.0083 | 0.01 | 0.0093 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.38 | 0.22 J- | 0.35 | 0.14 | 0.15 J- | 0.12 | 0.19 | 0.59 | 0.42 | 0.7 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.015 | 0.012 | 0.018 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.0034 | 0.0034 | 0.001 U | 0.0041 | 0.048 | 0.03 | 0.045 |
| Radium Total | pci/l | | 1.95 | | | 0.703 U | | | | 1.17 U | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.0025 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Sample Parameters | | | | | | | | | | | |
| DO | mg/L | 1.52 | 4.1 | 0.98 | 0.39 | 0.3 | | 0.73 | 0.43 | 0.21 | 0.28 |
| ORP | millivolts | 207.7 | 291.1 | -314 | -69.1 | -140.4 | | -298.9 | -36.1 | -105.5 | 0.202 |
| pH | SU | 5.37 | 4.4 | 5.87 | 8.12 | 7.92 | | 7.32 | 7.49 | 7.53 | 7.26 |
| SC | uS/cm | 121.9 | 110 | 102 | 280.7 | 252 | | 218 | 1595 | 1038 | 125.5 |
| TEMP | deg c | 12.7 | 9.27 | 13.67 | 11 | 10.84 | | 11.37 | 16.9 | 11.28 | 22.2 |
| TURB | ntu | 1.45 | 0.84 | 1.27 | 3.67 | 2.96 | | 2.66 | 3.57 | 4.8 | 4.52 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW59B | | | GAMW60 | | | | GAMW60B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-10-28 | 2021-04-22 | 2021-09-29 | 2020-10-28 | | 2021-04-21 | 2021-09-24 | 2020-10-28 | 2021-04-21 | 2021-09-24 |
| Sample Type | | N | N | N | FD | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| CCR Appendix III | | | | | | | | | | | |
| Boron | mg/L | 6.4 | 5.4 | 6.3 | 1.1 | 1.1 | 1 | 0.97 | 7.3 | 6.5 | 7 3 |
| Calcium | mg/L | 208 | 292 | 253 | 285 | 293 | 343 | 379 | 304 | 351 | 309 |
| Chloride | mg/L | 46.7 J- | 52 | 51.3 | 18 J- | 18.1 J- | 17.2 | 16.5 | 17.4 J- | 14.3 | 69.6 |
| Fluoride | mg/L | 0.56 | 0.45 | 0.53 | 0.57 | 0.57 | 0.3 | 0.51 | 0.53 | 0.34 | 1.1 |
| pH | SU | 8.15 | 7.6 | 7.57 | | 7.02 | 7.05 | 7.01 | 8.66 | 7.74 | 7.76 |
| Sulfate | mg/L | 1130 | 1180 | 1180 | 654 | 656 | 748 | 1050 | 1160 | 1140 | 443 |
| Total Dissolved Solids | mg/L | 1790 | 1860 | 1950 | 1120 | 1130 | 1300 | 1540 | 1700 | 2710 | 1440 |
| CCR Appendix IV | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Barium | mg/L | 0.039 | 0.037 | 0.04 | 0.028 | 0.028 | 0.027 | 0.031 | 0.071 | 0.077 | 0 063 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.0012 | 0.0011 | 0.0013 | 0.002 | 0.001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 0.56 | 0.45 | 0.53 | 0.57 | 0.57 | 0.3 | 0.51 | 0.53 | 0.34 | 1.1 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Lithium | mg/L | 0.014 | 0.017 | 0.019 | 0.008 U | 0.008 U | 0.012 | 0.015 | 0.0086 | 0.034 | 0 045 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0.052 | 0.044 | 0.05 | 0.024 | 0.024 | 0.013 | 0.015 | 0.49 | 0.35 | 0 37 |
| Radium Total | pci/l | | 1.76 | | | | 1.29 U | | | 3.02 | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0017 | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Sample Parameters | | | | | | | | | | | |
| DO | mg/L | 0.32 | 0.49 | 0.29 | | 0.51 | 1.34 | 0.29 | 0.34 | 0.56 | 0 25 |
| ORP | millivolts | -64.1 | -119.4 | 0.231 | | 217.1 | 84.3 | 0.56 | -63.5 | -101.3 | 0 238 |
| pH | SU | 8.15 | 7.6 | 7.57 | | 7.02 | 7.05 | 7.01 | 8.66 | 7.74 | 7.76 |
| SC | uS/cm | 2638 | 2650 | 264.7 | | 1580 | 1747 | 187.2 | 2216 | 2181 | 209.8 |
| TEMP | deg c | 14.2 | 13.1 | 17.4 | | 16.7 | 11.5 | 20.7 | 13.7 | 12.2 | 14.9 |
| TURB | ntu | 2.7 | 1.46 | 1.58 | | 0.94 | 0.9 | 1.56 | 3.43 | 1.04 | 2 05 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-1: Analytical Data- Waste Diposal Area**
**NIPSCO R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | | Location | GAMW68 | | | GAMW68B | | |
|---|---|---|---|---|---|---|---|---|
| | | Sample Date | 2020-10-29 | 2021-04-22 | 2021-09-17 | 2020-10-29 | 2021-04-22 | 2021-09-17 |
| | | Sample Type | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | |
| CCR Appendix III | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | |
| Calcium | mg/L | 62.7 | 60.7 | 66.4 | 44.4 | 43 5 | 44.7 | |
| Chloride | mg/L | 24.7 | 22.8 | 20.4 | 20.3 | 19 5 | 18.4 | |
| Fluoride | mg/L | 0.2 | 0.16 | 0.28 | 0.15 | 0.1 | 0.2 | |
| pH | SU | 8.32 | 7.82 | 7.75 | 8.09 | 8 35 | 7.99 | |
| Sulfate | mg/L | 77.1 | 68.6 | 81.3 | 80.7 | 62 5 | 63.5 | |
| Total Dissolved Solids | mg/L | 301 | 320 | 315 | 256 | 2040 | 242 | |
| CCR Appendix IV | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | |
| Barium | mg/L | 0.078 | 0.085 | 0.1 | 0.11 | 0.11 | 0.1 | |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | |
| Fluoride | mg/L | 0.2 | 0.16 | 0.28 | 0.15 | 0.1 | 0.2 | |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.0081 | 0.008 U | 0 008 U | 0.008 U | |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | |
| Molybdenum | mg/L | 0.0034 | 0.0035 | 0.0045 | 0.0022 | 0 0022 | 0.0027 | |
| Radium Total | pci/l | | 0.285 U | | | 1 35 U | | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | |
| Sample Parameters | | | | | | | | |
| DO | mg/L | 0.5 | 0.51 | 0.28 | 1.41 | 0 5 | 0.21 | |
| ORP | millivolts | 157.2 | -39.2 | 0.187 | -163 | -154.3 | 0.216 | |
| pH | SU | 8.32 | 7.82 | 7.75 | 8.09 | 8 35 | 7.99 | |
| SC | uS/cm | 532 | 490 | 515 | 336 | 410.1 | 413 | |
| TEMP | deg c | 14.5 | 9.7 | 16 | 12.5 | 11.6 | 13.5 | |
| TURB | ntu | 1.05 | 2.02 | 3.99 | 1.65 | 3 57 | 3.56 | |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter
detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.

**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | GAMW04 | | | | GAMW07 | | | | GAMW07B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020-10-22 | 2021-04-15 | 2021-09-23 | 2021-09-23 | 2020-10-27 | 2021-04-16 | 2021-09-21 | 2021-09-21 | 2020-10-27 | 2021-04-16 | 2021-09-23 |
| | | N | N | FD | N | N | N | FD | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | |
| Boron | mg/L | 0.4 | 1.1 | 0 36 | 0.35 | 1.1 | 0.81 | 0.91 | 0 85 | 5.3 | 5.9 | 6.9 |
| Calcium | mg/L | 90.3 | 178 | 108 | 107 | 213 | 198 | 215 | 212 | 282 | 327 | 373 |
| Chloride | mg/L | 4 9 | 6.2 | 3.7 | 3.6 | 12.3 | 11.7 | 11 9 | 12 | 21 | 38 | 60.3 |
| Fluoride | mg/L | 0 59 | 0.2 | 0 35 | 0.35 | 0.88 | 0 66 | 0.85 | 0 85 | 1.2 | 0.79 | 0 95 |
| pH | SU | 7.79 | 7.26 | | 7.4 | 6.98 | 7.14 | | 7.14 | 8.26 | 7.94 | 7 58 |
| Sulfate | mg/L | 82.1 | 375 | 116 | 121 | 439 | 352 | 362 | 359 | 1040 | 1010 | 1060 |
| Total Dissolved Solids | mg/L | 299 | 726 | 381 | 380 | 911 | 846 | 887 | 894 | 1590 | 1700 | 1790 |
| **Appendix IV Parameters** | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U |
| Arsenic | mg/L | 0.0055 | 0.0019 | 0 0041 | 0.0036 | 0.001 U | 0 001 U | 0.0012 | 0 0013 | 0.0021 | 0.0022 | 0 0022 |
| Barium | mg/L | 0.054 | 0.079 | 0 057 | 0.056 | 0.057 | 0 046 | 0.053 | 0 052 | 0.036 | 0.041 | 0 037 |
| Beryllium | mg/L | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Cadmium | mg/L | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Chromium | mg/L | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0 001 U | 0.0016 | 0 001 U | 0.001 U | 0.0074 | 0 0056 | 0.0061 | 0.006 | 0.001 U | 0.0011 | 0 001 U |
| Fluoride | mg/L | 0 59 | 0.2 | 0 35 | 0.35 | 0.88 | 0 66 | 0.85 | 0 85 | 1.2 | 0.79 | 0 95 |
| Lead | mg/L | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Lithium | mg/L | 0 008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U | 0.0091 | 0.0088 | 0.008 U | 0.008 U | 0 013 |
| Mercury | mg/L | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0 01 | 0.066 | 0.015 | 0.016 | 0.0094 | 0 0078 | 0.01 | 0.01 | 0.036 | 0.029 | 0 023 |
| Radium 226 + 228 | pCi/L | | 0.659 U | | | | 1 29 U | | | | 2.16 | |
| Selenium | mg/L | 0 001 U | 0.0033 | 0.001 U | 0.001 U | 0.0013 | 0 0069 | 0.0044 | 0.0039 | 0.001 U | 0.001 U | 0 001 U |
| Thallium | mg/L | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0 37 | 1.71 | | 0.31 | 0.47 | 0 39 | | 0.25 | 0.32 | 0.23 | 0 26 |
| Oxidation Reduction Potential | millivolts | -7 | -29 | | 0.149 | 259.4 | 55.5 | | 0.1 | -73 9 | -124.1 | 0 224 |
| pH | SU | 7.79 | 7.26 | | 7.4 | 6.98 | 7.14 | | 7.14 | 8.26 | 7.94 | 7 58 |
| Specific Conductivity | uS/cm | 521 | 950 | | 595 | 1250 | 1064 | | 123 | 2055 | 1970 | 222.4 |
| Temperature | deg C | 16.2 | 9.24 | | 15.9 | 15.5 | 11.06 | | 17 | 13.3 | 12.2 | 14.7 |
| Turbidity | NTU | 1 9 | 4.67 | | 7.06 | 1.51 | 3.4 | | 2.65 | 8.02 | 2.6 | 4 84 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | GAMW08 | | | GAMW08B | | | GAMW09 | | | GAMW09B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020-10-26 | 2021-04-22 | 2021-09-24 | 2020-10-23 | 2021-04-22 | 2021-09-24 | 2020-10-23 | 2021-04-20 | 2021-09-23 | 2020-10-23 | 2021-04-20 | | 2021-09-23 |
| | | N | N | N | N | N | N | N | N | N | N | FD | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | |
| Boron | mg/L | 0.52 | 0.89 | 1.1 | 7 | 7.7 | 8.4 | 3.7 | 3 5 | 3.8 | 6.3 | 6.1 | 6.2 | 6.7 |
| Calcium | mg/L | 168 | 266 | 260 | 203 | 198 | 235 | 192 | 168 | 227 | 162 | 169 | 171 | 163 |
| Chloride | mg/L | 26.4 | 50 | 14.9 | 134 | 178 | 179 | 59 8 | 41.6 | 54.7 | 107 | 102 | 94 | 113 |
| Fluoride | mg/L | 0.71 | 0.97 | 0.44 | 0.93 | 0.9 | 0.73 | 0.31 | 0 26 | 0.34 | 1.4 | 1.4 | 1.4 | 1 3 |
| pH | SU | 6.87 | 7.04 | 7 04 | 7.95 | 7.49 | 7.44 | 7.92 | 8.48 O | 7.51 | 8 | | 10.49 O | 7 56 |
| Sulfate | mg/L | 229 | 477 | 841 | 769 | 751 | 1060 | 397 | 418 | 509 | 540 | 582 J | 1040 J | 773 |
| Total Dissolved Solids | mg/L | 636 | 1120 | 2380 | 1250 | 1620 | 2040 | 796 | 659 | 1040 | 1010 | 1030 | 982 | 1430 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | |
| Antimony | mg/L | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Arsenic | mg/L | 0 001 U | 0.001 U | 0 0013 | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.0034 | 0 0033 | 0.0034 | 0 0031 |
| Barium | mg/L | 0 056 | 0.07 | 0 076 | 0.031 | 0.039 | 0 046 | 0.046 | 0 037 | 0.053 | 0.039 | 0 036 | 0.035 | 0 059 |
| Beryllium | mg/L | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Cadmium | mg/L | 0 0002 U | 0.0002 U | 0 00022 | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Chromium | mg/L | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0 037 | 0.017 | 0 015 | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 0.71 | 0.97 | 0.44 | 0.93 | 0.9 | 0.73 | 0.31 | 0 26 | 0.34 | 1.4 | 1.4 | 1.4 | 1 3 |
| Lead | mg/L | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Lithium | mg/L | 0 008 U | 0.012 | 0 015 | 0.008 U | 0.012 | 0 014 | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0 0095 |
| Mercury | mg/L | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0 013 | 0.034 | 0 043 | 0.0096 | 0.011 | 0 011 | 0.051 | 0 04 | 0.058 | 0.011 | 0 012 | 0.012 | 0 015 |
| Radium 226 + 228 | pCi/L | | 1.57 | | | 2.53 | | | 0 649 U | | | 0 924 U | 1.67 U | |
| Selenium | mg/L | 0 0011 | 0.01 | 0 005 | 0.001 U | 0.001 U | 0 001 U | 0.0082 | 0 0053 | 0.0079 | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Thallium | mg/L | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.44 | 1 | 0 35 | 0.33 | 0.29 | 0 27 | 3.43 | 3.42 | 6.2 | 0.34 | | 0.2 | 0 31 |
| Oxidation Reduction Potential | millivolts | 300 | 22 | 19.3 | -51 2 | -120.1 | 0 218 | 337.2 | -20.6 | 0.2 | -29.9 | | -113.1 | 0 204 |
| pH | SU | 6 87 | 7.04 | 7 04 | 7.95 | 7.49 | 7.44 | 7.92 | 8.48 | 7.51 | 8 | | 10.49 | 7 56 |
| Specific Conductivity | uS/cm | 1040 | 1432 | 167 2 | 1917 | 2151 | 286.3 | 1218 | 970 | 138.4 | 1513 | | 1459 | 201 2 |
| Temperature | deg C | 16.3 | 11 2 | 18.8 | 14 | 13 | 15.2 | 17 8 | 10.6 | 18.7 | 15.4 | | 13.4 | 16.4 |
| Turbidity | NTU | 2 39 | 1.99 | 1.48 | 3.85 | 2.78 | 3 9 | 4 | 1 02 | 2.95 | 2.76 | | 4.26 | 3 02 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | GAMW15 | | | GAMW15B | | | | GAMW16R | | | | GAMW16BR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020-10-27 | 2021-04-16 | 2021-09-22 | 2020-10-27 | 2021-04-16 | | 2021-09-22 | 2020-10-29 | | 2021-04-22 | 2021-09-21 | 2020-10-26 | 2021-04-22 |
| | | N | N | N | N | FD | N | N | FD | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | |
| Boron | mg/L | 0.47 O | 8 O | 3 5 | 42.5 O | 32.7 O | 32 5 O | 28.1 | 9.6 O | 9.7 O | 3.6 O | 4.1 | 41 O | 24.8 O |
| Calcium | mg/L | 122 O | 160 O | 136 | 446 O | 335 O | 321 O | 352 | 312 O | 313 O | 410 O | 275 | 439 O | 380 O |
| Chloride | mg/L | 95.7 O | 99 3 O | 49.8 | 613 O | 372 O | 396 O | 269 | 155 O | 155 O | 81.1 O | 112 | 566 O | 331 O |
| Fluoride | mg/L | 0.85 O | 0.76 O | 0.77 J- | 0.41 O | 0.37 O | 0.35 O | 0.44 J- | 0.5 O | 0.5 O | 0.39 O | 0.57 | 0.68 O | 0.41 O |
| pH | SU | 7.02 O | 7.1 O | 7.12 | 6.6 O | | 7.15 O | 7.08 | | 7.21 O | 7.16 O | 7.1 | 7.2 O | 7 21 O |
| Sulfate | mg/L | 153 O | 371 O | 265 | 468 O | 596 O | 643 O | 900 | 720 O | 698 O | 1060 O | 633 | 570 O | 723 O |
| Total Dissolved Solids | mg/L | 556 O | 770 O | 675 | 2170 O | 1740 O | 1870 O | 2030 | 1600 O | 1540 O | 1850 O | 1370 | 2170 O | 2080 O |
| **Appendix IV Parameters** | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 UO | 0.001 UO | 0 001 U | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0 001 UO |
| Arsenic | mg/L | 0.078 O | 0.046 O | 0 09 | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.0059 O | 0.0058 O | 0.0042 O | 0.0088 | 0.001 UO | 0 001 UO |
| Barium | mg/L | 0.053 O | 0.058 O | 0 05 | 0.21 O | 0.18 O | 0.18 O | 0.17 | 0.097 O | 0.097 O | 0.074 O | 0.06 | 0.091 O | 0 073 O |
| Beryllium | mg/L | 0.0002 UO | 0.0002 UO | 0 0002 U | 0.0002 UO | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 U | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 UO | 0 0002 UO |
| Cadmium | mg/L | 0.0002 UO | 0.0002 UO | 0 0002 U | 0.0002 UO | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 U | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 UO | 0 0002 UO |
| Chromium | mg/L | 0.002 UO | 0.002 UO | 0 002 U | 0.002 UO | 0.002 UO | 0.002 UO | 0.002 U | 0.002 UO | 0.002 UO | 0.002 UO | 0.002 U | 0.002 UO | 0 002 UO |
| Cobalt | mg/L | 0.0019 O | 0.003 O | 0 0021 | 0.001 UO | 0.0011 O | 0.001 O | 0.001 U | 0.0039 O | 0.004 O | 0.0064 O | 0.0038 | 0.001 UO | 0 001 UO |
| Fluoride | mg/L | 0.85 O | 0.76 O | 0.77 J- | 0.41 O | 0.37 O | 0.35 O | 0.44 J- | 0.5 O | 0.5 O | 0.39 O | 0.57 | 0.68 O | 0.41 O |
| Lead | mg/L | 0.001 UO | 0.001 UO | 0 001 U | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0 001 UO |
| Lithium | mg/L | 0.008 UO | 0.008 UO | 0 01 | 0.015 O | 0.011 O | 0.012 O | 0.026 | 0.008 UO | 0.008 UO | 0.008 UO | 0.011 | 0.013 O | 0 033 O |
| Mercury | mg/L | 0.0002 UO | 0.0002 UO | 0 0002 U | 0.0002 UO | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 U | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 UO | 0 0002 UO |
| Molybdenum | mg/L | 0.031 O | 0.028 O | 0 027 | 0.001 UO | 0.0012 O | 0.0012 O | 0.0029 | 0.019 O | 0.019 O | 0.027 O | 0.019 | 0.001 UO | 0 001 UO |
| Radium 226 + 228 | pCi/L | | 0.191 UO | | | 2.96 O | 2.15 O | | | | 0.968 UO | | | 2 06 O |
| Selenium | mg/L | 0.001 UO | 0.0036 O | 0 001 U | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.042 O | 0.043 O | 0.001 UO | 0.001 U | 0.001 UO | 0 001 UO |
| Thallium | mg/L | 0.001 UO | 0.001 UO | 0 001 U | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0 001 UO |
| **Field Parameters** | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.3 | 0.2 | 0 28 | 0.36 | | 0.26 | 0.32 | | 0.48 | 0.27 | 0.29 | 0.47 | 0 28 |
| Oxidation Reduction Potential | millivolts | -45.8 | -64.1 | 0.193 | -7.2 | | -65.7 | 0.164 | | 39.1 | -78.9 | 0.208 | -21.2 | -95.1 |
| pH | SU | 7.02 | 7.1 | 7.12 | 6.6 | | 7.15 | 7.08 | | 7.21 | 7.16 | 7.1 | 7.2 | 7 21 |
| Specific Conductivity | uS/cm | 941 | 1153 | 104 8 | 3077 | | 2491 | 286.6 | | 2098 | 2025 | 185 | 3281 | 2510 |
| Temperature | deg C | 22.3 | 14 38 | 19.2 | 19.8 | | 17 6 | 17 | | 20.4 | 15.08 | 25 | 17.5 | 16.38 |
| Turbidity | NTU | 4.15 | 9.82 | 6 36 | 2.06 | | 1.1 | 1.7 | | 2.69 | 4.65 | 1.79 | 8.93 | 7 82 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | |
|---|---|---|
| | | 2021-09-21 |
| | | N |
| | | |
| **Appendix III Parameters** | | |
| Boron | mg/L | 25.3 |
| Calcium | mg/L | 265 |
| Chloride | mg/L | 516 |
| Fluoride | mg/L | 2.6 |
| pH | SU | 7.5 |
| Sulfate | mg/L | 2970 |
| Total Dissolved Solids | mg/L | 5970 |
| **Appendix IV Parameters** | | |
| Antimony | mg/L | 0.001 U |
| Arsenic | mg/L | 0.0042 |
| Barium | mg/L | 0.041 |
| Beryllium | mg/L | 0.0002 U |
| Cadmium | mg/L | 0.0002 U |
| Chromium | mg/L | 0.0023 |
| Cobalt | mg/L | 0.001 U |
| Fluoride | mg/L | 2.6 |
| Lead | mg/L | 0.001 U |
| Lithium | mg/L | 0.031 |
| Mercury | mg/L | 0.0002 U |
| Molybdenum | mg/L | 0.043 |
| Radium 226 + 228 | pCi/L | |
| Selenium | mg/L | 0.0013 |
| Thallium | mg/L | 0.001 U |
| **Field Parameters** | | |
| Dissolved Oxygen | mg/L | 0.31 |
| Oxidation Reduction Potential | millivolts | 0.212 |
| pH | SU | 7.5 |
| Specific Conductivity | uS/cm | 795.5 |
| Temperature | deg C | 19.5 |
| Turbidity | NTU | 20.19 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | GAMW17 | | | GAMW17B | | | GAMW18 | | | GAMW18B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020-10-26 | 2021-04-14 | 2021-09-22 | 2020-10-26 | 2021-04-14 | 2021-09-22 | 2020-10-23 | 2021-04-20 | 2021-09-16 | 2020-10-23 | 2021-04-21 | 2021-09-17 | |
| | | N | N | N | N | N | N | N | N | N | N | N | FD | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | |
| Boron | mg/L | 4.6 | 4.3 | 12.5 | 7.8 | 10.2 | 7.3 | 3.6 | 3.1 | 5.9 | 9 | 8.4 | 8.2 | 8 2 |
| Calcium | mg/L | 144 | 139 | 346 | 152 | 164 | 155 | 341 | 436 | 456 | 301 | 317 | 325 | 323 |
| Chloride | mg/L | 79.4 | 79 | 175 | 118 | 135 | 105 | 54 8 | 40.3 | 97 | 114 | 112 | 85 8 | 86.3 |
| Fluoride | mg/L | 1.5 | 1.2 | 1 3 J- | 0.53 | 0.3 | 0.49 J- | 0.19 | 0.16 | 0.16 J- | 0.8 | 0.35 | 0.6 | 0 6 |
| pH | SU | 7.38 | 7.3 | 7.16 | 8.21 | 7.84 | 7.6 | 7.1 | 10.36 O | 7.1 | 7.43 | 7 51 | | 7 34 |
| Sulfate | mg/L | 396 | 358 | 964 | 404 | 549 | 365 | 765 | 1310 | 1160 | 1240 | 1260 | 1100 | 1120 |
| Total Dissolved Solids | mg/L | 726 | 806 | 1890 | 866 | 1250 | 928 | 1450 | 1440 | 2020 | 1830 | 3340 | 1930 | 2010 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Arsenic | mg/L | 0.0027 | 0.0024 | 0 0027 | 0.0022 | 0.0012 | 0 0021 | 0.001 U | 0 001 U | 0.001 U | 0.0025 | 0 0025 | 0.0028 | 0 0027 |
| Barium | mg/L | 0.071 | 0.059 | 0.17 | 0.061 | 0.094 | 0 053 | 0.053 | 0 044 | 0.057 | 0.032 | 0 041 | 0.028 | 0 029 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.0012 | 0 001 U | 0.001 U | 0.0015 | 0 001 U | 0.001 U | 0 001 U | 0.0011 | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 1.5 | 1.2 | 1 3 J- | 0.53 | 0.3 | 0.49 J- | 0.19 | 0.16 | 0.16 J- | 0.8 | 0.35 | 0.6 | 0 6 |
| Lead | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0 021 | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0 008 U | 0.011 | 0.03 | 0 037 | 0.031 | 0 028 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0.013 | 0.012 | 0 01 | 0.0082 | 0.0058 | 0 012 | 0.079 | 0 082 | 0.14 | 0.05 | 0 074 | 0.03 | 0 031 |
| Radium 226 + 228 | pCi/L | | 1.05 U | | | 1.47 U | | | 0 538 U | | | 2.14 | | |
| Selenium | mg/L | 0.0047 | 0.01 | 0 0036 | 0.001 U | 0.001 U | 0.001 U | 0.034 | 0 042 | 0.028 | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 1.21 | 2.52 | 3.75 | 0.4 | 0.21 | 0.29 | 6.58 | 6 82 | 5.39 | 0.35 | 0.25 | | 0.19 |
| Oxidation Reduction Potential | millivolts | 234.5 | 29 8 | 10.2 | -55 5 | -117 5 | 0.215 | 320.6 | -64.3 | 56.8 | 15.9 | -104.5 | | 0.192 |
| pH | SU | 7.38 | 7.3 | 7.16 | 8.21 | 7.84 | 7.6 | 7.1 | 10.36 | 7.1 | 7.43 | 7.51 | | 7 34 |
| Specific Conductivity | uS/cm | 1188 | 1152 | 236 5 | 1396 | 1778 | 138.8 | 1921 | 1699 | 245.9 | 2646 | 2494 | | 247 3 |
| Temperature | deg C | 20.4 | 11 95 | 21.8 | 16.9 | 15.19 | 16.7 | 17.4 | 10.29 | 21.4 | 15.2 | 12.15 | | 15.8 |
| Turbidity | NTU | 3.85 | 1.25 | 1.47 | 4 | 1.44 | 4.22 | 2.84 | 2 84 | 3.74 | 3.28 | 4.19 | | 4 59 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | GAMW46 | | | GAMW46B | | | GAMW52 | | | GAMW52B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020-10-19 | 2021-04-27 | 2021-09-15 | 2020-10-19 | 2021-04-27 | 2021-09-15 | 2020-10-22 | 2021-04-16 | 2021-09-30 | 2020-10-23 | 2021-04-16 | 2021-09-30 |
| | | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 | 0.1 | 0.1 | 1.7 | 1.2 | 0.64 |
| Calcium | mg/L | 22.7 | 29.1 | 29.3 | 51 | 54.3 | 51 | 71.4 | 59.9 | 62.5 | 142 | 94.9 | 120 |
| Chloride | mg/L | 1.3 | 2.1 | 2.1 | 4.6 | 5.5 | 5.4 | 49.1 | 18.7 | 15.9 | 248 | 131 | 135 |
| Fluoride | mg/L | 0.05 U | 0.078 | 0.11 | 0.058 | 0.077 | 0.12 | 0.26 | 0 22 | 0.31 | 0.26 | 0 24 | 0.38 |
| pH | SU | 8.67 | 8.36 | 8.16 | 7.97 | 7.69 | 7.73 | 7.82 | 7 5 | 7.6 | 7.29 | 7.46 | 7.57 |
| Sulfate | mg/L | 23.9 | 33 J+ | 31.8 | 60.5 | 61.6 J+ | 55.3 | 58 6 | 55.8 | 50.1 | 259 | 181 | 156 |
| Total Dissolved Solids | mg/L | 85 | 112 | 137 | 197 | 190 | 243 | 336 | 269 | 276 | 982 | 673 | 667 |
| **Appendix IV Parameters** | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 0011 | 0.0011 |
| Barium | mg/L | 0.0046 | 0.005 | 0 0044 | 0.023 | 0.025 | 0 023 | 0.014 | 0 011 | 0.014 | 0.23 | 0.15 | 0.14 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Fluoride | mg/L | 0.05 U | 0.078 | 0.11 | 0.058 | 0.077 | 0.12 | 0.26 | 0 22 | 0.31 | 0.26 | 0 24 | 0.38 |
| Lead | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0 008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.0022 | 0.0018 | 0 0018 | 0.0022 | 0 0021 | 0.0025 | 0.015 | 0 013 | 0.011 |
| Radium 226 + 228 | pCi/L | | 1.28 U | | | 1.65 U | | | 0 23 U | | | 1.05 U | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.0011 | 0 0011 | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 4.78 | 1.59 | 1 26 | 1.1 | 0.64 | 0.2 | 0.35 | 0 91 | 0.56 | 1.02 | 0.42 | 0.28 |
| Oxidation Reduction Potential | millivolts | 127 | 109.8 | -130 | -40 5 | -101 3 | -241 | 227.8 | -23.1 | 0.38 | -141 6 | -123.5 | 0.241 |
| pH | SU | 8.67 | 8.36 | 8.16 | 7.97 | 7.69 | 7.73 | 7.82 | 7 5 | 7.6 | 7.29 | 7.46 | 7.57 |
| Specific Conductivity | uS/cm | 175.1 | 238.2 | 238 | 358.9 | 351 | 388 | 641 | 545 | 501 | 1400 | 1159 | 110.4 |
| Temperature | deg C | 13.5 | 10.7 | 15.1 | 11.7 | 11.37 | 12.2 | 19 | 12 | 20 | 17.1 | 15.8 | 18 |
| Turbidity | NTU | 3.02 | 1.73 | 3 21 | 4.69 | 4.58 | 4.3 | 1.09 | 1.79 | 1.39 | 2.36 | 3 9 | 1.27 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | GAMW53 | | | | GAMW53B | | | GAMW54 | | | GAMW54B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020-10-23 | | 2021-04-16 | 2021-09-30 | 2020-10-23 | 2021-04-16 | 2021-09-30 | 2020-10-23 | 2021-04-19 | 2021-10-01 | 2020-10-23 | 2021-04-19 | 2021-10-01 |
| | | FD | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 2.5 | 1.9 | 2.7 | 0.72 | 0.5 | 0.63 | 2.2 | 3.1 | 3.1 |
| Calcium | mg/L | 16.9 | 17 | 17.5 | 28 3 | 136 | 142 | 128 | 154 | 164 | 114 | 195 | 236 | 190 |
| Chloride | mg/L | 1.8 | 2 | 2.4 | 2.7 | 84.6 | 84.8 | 66.4 | 50.3 | 53 9 | 24.6 | 49.2 | 83.9 | 70.4 |
| Fluoride | mg/L | 0.05 U | 0.05 U | 0 05 U | 0.05 U | 0.58 | 0.4 | 0.46 | 0 28 | 0.2 | 0.3 | 0.59 | 0.53 | 0 52 |
| pH | SU | | 5.88 | 5.76 | 6.17 | 7.39 | 7.28 | 7.48 | 6 21 | 6.52 | 6.82 | 6.97 | 7.3 | 7 36 |
| Sulfate | mg/L | 26.6 | 28 2 | 35.2 | 49.4 | 327 | 304 | 295 | 341 | 492 | 191 | 438 | 891 | 501 |
| Total Dissolved Solids | mg/L | 89 | 99 | 97 | 147 | 730 | 748 | 802 | 689 | 735 | 506 | 878 | 1120 | 1030 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Arsenic | mg/L | 0.0014 | 0.0014 | 0 0012 | 0.0012 | 0.001 U | 0.001 U | 0.0014 | 0 0038 | 0.0075 | 0.024 | 0.0042 | 0.0044 | 0 004 |
| Barium | mg/L | 0.022 | 0.023 | 0 027 | 0.033 | 0.061 | 0.067 | 0.051 | 0 068 | 0.071 | 0.048 | 0.054 | 0.063 | 0 056 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.0011 | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 0.05 U | 0.05 U | 0 05 U | 0.05 U | 0.58 | 0.4 | 0.46 | 0 28 | 0.2 | 0.3 | 0.59 | 0.53 | 0 52 |
| Lead | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0.0066 | 0.0066 | 0 0052 | 0.0097 | 0.011 | 0.015 | 0.011 | 0 023 | 0.011 | 0.025 | 0.029 | 0.017 | 0 025 |
| Radium 226 + 228 | pCi/L | | | 0 U | | | 1.21 U | | | 0.694 U | | | 1.43 | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.0019 | 0.001 U | 0.001 U | 0.001 U | 0 0029 | 0.0044 | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | | 1.16 | 1 99 | 0.92 | 0.65 | 0.39 | 0.24 | 1 04 | 0.68 | 0.29 | 0.72 | 0.45 | 0 26 |
| Oxidation Reduction Potential | millivolts | | 122.8 | 111.7 | 94 9 | -111 8 | -104 | -232.6 | 67.5 | 81 2 | -153 9 | -143.2 | -105.3 | -211.7 |
| pH | SU | | 5.88 | 5.76 | 6.17 | 7.39 | 7.28 | 7.48 | 6 21 | 6.52 | 6.82 | 6.97 | 7.3 | 7 36 |
| Specific Conductivity | uS/cm | | 144 | 173 | 204 | 1091 | 1227 | 125.6 | 875 | 1097 | 782 | 1105 | 1626 | 149.4 |
| Temperature | deg C | | 19 | 13 | 20.4 | 19.5 | 17.6 | 20 | 17 | 11 8 | 20.1 | 16.2 | 14.3 | 17.3 |
| Turbidity | NTU | | 2.19 | 4 56 | 4.51 | 4.03 | 3.27 | 3.62 | 2.45 | 6.79 | 3.79 | 4.6 | 6.74 | 3 54 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

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**Appendix E-2: Analytical Results - MSRB, MCWB, and Drying Area**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | Unit | GAMW55R | | | GAMW55B | | | GAMW56 | | | GAMW56B | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2020-10-28 | 2021-04-20 | 2021-10-01 | 2020-10-28 | 2021-04-20 | 2021-10-01 | 2020-10-28 | 2021-04-20 | 2021-10-04 | 2020-10-28 | 2021-04-21 | 2021-10-04 |
| | | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | |
| Boron | mg/L | 0.95 | 0.87 | 1.7 | 10.8 | 9.9 | 8.3 | 0.3 | 0.23 | 0.19 | 2 | 1.6 | 1.4 |
| Calcium | mg/L | 170 | 237 | 197 | 226 | 254 | 205 | 111 | 130 | 108 | 138 | 157 | 160 |
| Chloride | mg/L | 48.2 J- | 51.4 | 44.1 | 120 J- | 120 | 79.4 | 3.2 J- | 2.9 | 1.7 | 45.7 J- | 70 8 | 73.7 |
| Fluoride | mg/L | 0.63 | 0.46 | 0 51 | 0.28 | 0.3 | 0.3 | 0.83 | 0.05 U | 1 | 0 51 | 0.41 | 0.46 |
| pH | SU | 7.45 | 7.6 | 7 27 | 7.56 | 7.7 | 7.44 | 7.07 | 7.05 | 7.09 | 7.47 | 7.55 | 7.34 |
| Sulfate | mg/L | 351 | 867 | 389 | 720 | 985 | 496 | 49.6 | 57.6 | 64.8 | 275 | 277 | 268 |
| Total Dissolved Solids | mg/L | 789 | 842 | 948 | 1380 | 1370 | 1120 | 390 | 480 | 379 | 696 | 738 | 802 |
| **Appendix IV Parameters** | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.0059 | 0.007 | 0.0018 | 0 001 U | 0.001 U | 0.001 U |
| Barium | mg/L | 0.038 | 0.032 | 0 038 | 0.06 | 0.061 | 0.05 | 0.044 | 0.042 | 0.04 | 0 066 | 0.071 | 0.081 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.01 | 0.016 | 0.0045 | 0 001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.63 | 0.46 | 0 51 | 0.28 | 0.3 | 0.3 | 0.83 | 0.05 U | 1 | 0 51 | 0.41 | 0.46 |
| Lead | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0 01 | 0.008 U | 0.008 U | 0.012 | 0.008 U | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0.0091 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.025 | 0.013 | 0 017 | 0.0062 | 0.0068 | 0.0058 | 0.0093 | 0.0083 | 0.011 | 0 0075 | 0.0074 | 0.0062 |
| Radium 226 + 228 | pCi/L | | 1.47 R | | | 1.49 U | | | 0.222 U | | | 2.97 | |
| Selenium | mg/L | 0.0028 | 0.0029 | 0 0046 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0011 | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 2.5 | 1.19 | 0.47 | 1.37 | 0.65 | 0.26 | 1.88 | 1 | 0.37 | 1.48 | 0.23 | 0.29 |
| Oxidation Reduction Potential | millivolts | 12.8 | 32 3 | -16.8 | -130.1 | -97.3 | -213.9 | -64.4 | 65.9 | -133.7 | -123.9 | -110.5 | -214.1 |
| pH | SU | 7.45 | 7.6 | 7 27 | 7.56 | 7.7 | 7.44 | 7.07 | 7.05 | 7.09 | 7.47 | 7.55 | 7.34 |
| Specific Conductivity | uS/cm | 994 | 1319 | 139.1 | 1588 | 1896 | 162.3 | 560 | 740 | 655 | 772 | 1100 | 124.4 |
| Temperature | deg C | 17.6 | 11 3 | 20.6 | 17.2 | 15.3 | 18.7 | 14.7 | 9 | 17.2 | 12.9 | 12 | 14.3 |
| Turbidity | NTU | 1.2 | 2.35 | 1 59 | 3.22 | 4.78 | 4.48 | 0.83 | 2.67 | 3.48 | 2 39 | 6.72 | 4.65 |

Notes:
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nepholometic Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"O" = Indicates te result was identified as an outlier and removed from the data set.

**Appendix E-3 Analytical Data - Landfill Phases V, VI, and VII**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW20 | | | | GAMW24 | | | |
|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-09-16 | 2021-04-12 | 2021-09-13 | | 2020-09-15 | 2021-04-12 | 2021-09-13 | |
| Sample Type | | FD | N | N | N | N | N | FD | N |
| Chemical Name | Unit | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | |
| Boron | mg/L | 3.4 | 3.4 | 2.8 | 3.7 | 0.1 U | 0.1 U | 0.12 | 0.1 U |
| Calcium | mg/L | 188 | 188 | 164 | 249 | 91 | 80.2 | 83.3 | 86.8 |
| Chloride | mg/L | 7.9 | 7.8 | 11.4 | 11.2 | 28 J+ | 18.5 | 21.6 | 22 |
| Fluoride | mg/L | 0.24 | 0.22 | 0.19 | 0.22 | 0 099 | 0 083 | 0.067 | 0.15 |
| pH | SU | | 7.07 | 7.17 | 7.2 | 7 3 | 7 68 | | 7.34 |
| Sulfate | mg/L | 552 | 549 | 500 | 529 | 88 | 70 | 70 | 69.6 |
| Total Dissolved Solids | mg/L | 1110 | 1140 | 1050 | 1170 | 389 | 318 | 351 | 349 |
| **Field Parameters** | | | | | | | | | |
| Dissolved Oxygen | mg/L | | 0.1 | 0.87 | 0.12 | 0 21 | 0.14 | | 0.14 |
| Oxidation-Reduction Potential | millivolts | | -103.9 | -94 | 0.188 | -76.9 | -14.8 | | 0.129 |
| pH | SU | | 7.07 | 7.17 | 7.2 | 7 3 | 7 68 | | 7.34 |
| Specific Conductance | uS/cm | | 1314 | 1530 | 163.7 | 530 | 561 | | 609 |
| Temperature | deg c | | 17.3 | 10 6 | 17.1 | 17 | 9 95 | | 16.8 |
| Turbidity | ntu | | 5.1 | 2.71 | 5.22 | 3 87 | 4 6 | | 4.84 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated.
"J+" = Indicates the result was estimated and maybe biased high.
"J-" = Indicates the result was estimated and maybe biased low.

**Appendix E-3 Analytical Data - Landfill Phases V, VI, and VII**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW24B | | | GAMW25 | | | GAMW25B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2020-09-15 | 2021-04-13 | 2021-09-13 | 2020-09-15 | 2021-04-12 | 2021-09-10 | 2020-09-16 | 2021-04-12 | | 2021-09-10 |
| Sample Type | | N | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.1 U | 0.18 | 0.17 | 0.15 | 0.13 | 0.13 | 0.13 | 0.13 |
| Calcium | mg/L | 50.8 | 46.9 | 51.3 | 82.8 | 76.4 | 72.5 | 83 | 94 | 94.2 | 97.4 |
| Chloride | mg/L | 6.6 J+ | 3 3 | 4.1 | 5.6 J+ | 4.3 | 2.7 | 6.8 | 8.7 | 8 6 | 7.2 |
| Fluoride | mg/L | 0.14 | 0.12 | 0.19 | 1.1 | 1.1 | 1.2 J- | 0.21 | 0.18 | 0.18 | 0.13 J- |
| pH | SU | 7.96 | 7 58 | 7 91 | 7.23 | 7.27 | 7.4 | 7.35 | | 7.16 | 7.36 |
| Sulfate | mg/L | 37 | 26.7 | 24 | 57.7 | 44 9 | 48.5 | 77 | 67.2 | 67.2 | 88 9 |
| Total Dissolved Solids | mg/L | 210 | 184 | 190 | 334 | 288 | 329 | 348 | 378 | 377 | 417 |
| **Field Parameters** | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.19 | 0 65 | 0 24 | 1.57 | 3.81 | 1.65 | 0.18 | | 0.49 | 0.27 |
| Oxidation-Reduction Potential | millivolts | -152.7 | -114 6 | 0 23 | -10.1 | 154.4 | 96.6 | -130.4 | | -127 | 0.185 |
| pH | SU | 7.96 | 7 58 | 7 91 | 7.23 | 7.27 | 7.4 | 7.35 | | 7.16 | 7.36 |
| Specific Conductance | uS/cm | 284 | 312 5 | 340 | 465 | 472.3 | 514 | 449 | | 599 | 653 |
| Temperature | deg c | 14 | 10.9 | 13.5 | 16.3 | 8.8 | 16 | 12.8 | | 11 | 12.1 |
| Turbidity | ntu | 4.91 | 7.77 | 5.64 | 0.74 | 1.99 | 1.9 | 4.02 | | 3 | 1.88 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result was estimated.
"J+" = Indicates the result was estimated and maybe biased high.
"J-" = Indicates the result was estimated and maybe biased low.

**Appendix E-3 Analytical Data - Landfill Phases V, VI, and VII**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | GAMW26 | | | GAMW26B | | | GAMW27 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 2020-09-16 | 2021-04-12 | 2021-09-10 | 2020-09-16 | 2021-04-12 | 2021-09-10 | 2020-09-17 | | 2021-04-13 | | 2021-09-10 |
| | Sample Type | N | N | N | N | N | N | FD | N | FD | N | N |
| Chemical Name | Unit | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | |
| Boron | mg/L | 0.18 | 0.18 | 0.22 | 0 64 | 0.21 | 0.21 | 4 | 3.9 | 4.2 | 4.1 | 4.1 |
| Calcium | mg/L | 86.6 | 84.7 | 92.6 | 158 | 93.3 | 103 | 286 | 283 | 276 | 279 | 277 |
| Chloride | mg/L | 13.8 | 11 5 | 4.2 | 56.3 | 14.6 | 23.1 | 12.3 | 12 9 | 20.9 | 20.4 | 14.2 |
| Fluoride | mg/L | 3.2 | 2.9 | 2.8 J- | 0.17 | 0.18 | 0.11 J- | 0 67 | 0.63 | 0.66 | 0.63 | 0.56 J- |
| pH | SU | 7.23 | 7.51 | 7.54 | 7 62 | 7.79 | 7.8 | | 7.33 | | 7.55 | 7.65 |
| Sulfate | mg/L | 53.7 | 55 2 | 80.2 | 803 | 86.6 | 189 | 884 | 824 | 693 | 701 | 756 |
| Total Dissolved Solids | mg/L | 389 | 350 | 449 | 1510 | 437 | 624 | 1370 | 1340 | 1250 | 1270 | 1400 |
| **Field Parameters** | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.2 | 1.31 | 3.45 | 1.42 | 1.31 | 3.45 | | 0.27 | | 0.45 | 0.21 |
| Oxidation-Reduction Potential | millivolts | -28.4 | -0.1 | -96.1 | -75.4 | -0.1 | -96.1 | | -114.7 | | -118 | 0.18 |
| pH | SU | 7.23 | 7.79 | 7.8 | 7 62 | 7.79 | 7.8 | | 7.33 | | 7.55 | 7.65 |
| Specific Conductance | uS/cm | 561 | 711 | 737 | 1516 | 711 | 737 | | 1401 | | 1558 | 170 |
| Temperature | deg c | 18 | 11 53 | 13.63 | 12.7 | 11.53 | 13.63 | | 16 3 | | 11.5 | 16.8 |
| Turbidity | ntu | 0.49 | 3.85 | 2.98 | 4 65 | 3.85 | 2.98 | | 0.53 | | 4.24 | 1.26 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

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"J+" = Indicates the result was estimated and maybe biased high.
"J-" = Indicates the result was estimated and maybe biased low.

**Appendix E-3 Analytical Data - Landfill Phases V, VI, and VII**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | GAMW27B | | | GAMW38 | | | GAMW39B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 2020-09-17 | 2021-04-13 | 2021-09-13 | 2020-09-17 | 2021-04-13 | 2021-09-11 | 2020-09-17 | 2021-04-13 | 2021-09-11 | |
| | Sample Type | N | N | N | N | N | N | N | N | FD | N |
| Chemical Name | Unit | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | |
| Boron | mg/L | 12.3 | 12.1 | 13.1 | 0.99 | 0.87 | 1 | 5.8 | 6.2 | 6 9 | 6.9 |
| Calcium | mg/L | 356 | 364 | 367 | 79 | 90.4 | 77.3 | 232 | 249 | 274 | 268 |
| Chloride | mg/L | 451 | 408 | 438 | 4.9 | 4.7 | 4.2 | 36 5 | 35.1 | 37.4 | 39.9 |
| Fluoride | mg/L | 0.05 U | 0 05 U | 0.05 U | 0.19 | 0.15 | 0.15 | 0.055 | 0.05 U | 0 05 U | 0.05 U |
| pH | SU | 7.43 | 7.41 | 7.36 | 7.08 | 7.44 | 7.03 | 6.86 | 7.11 | | 6.68 |
| Sulfate | mg/L | 6790 | 6190 | 6530 | 224 | 211 | 164 | 742 | 687 | 726 | 785 |
| Total Dissolved Solids | mg/L | 10800 | 9980 | 10800 | 551 | 522 | 471 | 1440 | 1400 | 1590 | 1550 |
| **Field Parameters** | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.6 | 1 27 | 1.19 | 0.17 | 0.15 | 0.53 | 0.12 | 0.21 | | 0.33 |
| Oxidation-Reduction Potential | millivolts | -110 8 | -95.5 | -272.6 | -104.6 | -82.5 | -229.7 | -95.7 | -65.2 | | -329.8 |
| pH | SU | 7.43 | 7.41 | 7.36 | 7.08 | 7.44 | 7.03 | 6.86 | 7.11 | | 6.68 |
| Specific Conductance | uS/cm | 10122 | 12351 | 10440 | 738 | 816 | 716 | 1575 | 1913 | | 1747 |
| Temperature | deg c | 14.1 | 12.6 | 14.15 | 19 | 9.83 | 18.94 | 14 8 | 11.41 | | 14.37 |
| Turbidity | ntu | 0.88 | 2 35 | 3.59 | 1.5 | 7.49 | 2.73 | 4.56 | 4.62 | | 2.92 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

"U" = Indicates the result is not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
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**Appendix E-3 Analytical Data - Landfill Phases V, VI, and VII**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | GAMW39 | | | GAMW39B | | | GAMW40 | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 2020-09-17 | 2021-04-13 | 2021-09-11 | 2020-09-17 | 2021-04-13 | 2021-09-11 | 2020-09-17 | 2021-04-14 | 2021-09-13 |
| | Sample Type | N | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | |
| Boron | mg/L | 0.93 | 1.1 | 1.4 | 9.7 | 10.1 | 9.8 | 3.2 | 2.8 | 4.1 |
| Calcium | mg/L | 229 | 173 | 162 | 386 | 409 | 443 | 280 | 273 | 276 |
| Chloride | mg/L | 12.2 | 10.2 | 9.7 | 70 | 61.9 | 85.7 | 16.2 | 12 8 | 11.8 |
| Fluoride | mg/L | 0.12 | 0.14 | 0.12 | 0 05 U | 0.05 U | 0.5 U | 0.18 | 0.067 | 0.072 |
| pH | SU | 6.51 | 7.12 | 6.83 | 6 67 | 7.16 | 6.68 | 6.52 | 7.19 | 6.62 |
| Sulfate | mg/L | 430 | 359 | 396 | 1280 | 1140 | 1330 | 438 | 388 | 501 |
| Total Dissolved Solids | mg/L | 1090 | 816 | 865 | 2400 | 2230 | 2690 | 1450 | 1360 | 1550 |
| **Field Parameters** | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.12 | 0.14 | 0.43 | 0.12 | 0.16 | 0.48 | 0.11 | 0.3 | 0.46 |
| Oxidation-Reduction Potential | millivolts | -59.6 | -42.6 | -284 | -75.2 | -47.6 | 310.6 | -51.1 | -39 8 | -304 |
| pH | SU | 6.51 | 7.12 | 6.83 | 6 67 | 7.16 | 6.68 | 6.52 | 7.19 | 6.62 |
| Specific Conductance | uS/cm | 1322 | 1248 | 1109 | 2460 | 2863 | 2813 | 1824 | 1968 | 1933 |
| Temperature | deg c | 18.3 | 11.05 | 17.47 | 15.7 | 12.32 | | 18.1 | 10 | 17.03 |
| Turbidity | ntu | 4.29 | 4 27 | 1.25 | 3 64 | 4.4 | 2.47 | 1.02 | 2.46 | 0.63 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

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**Appendix E-3 Analytical Data - Landfill Phases V, VI, and VII**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | GAMW40B | | | GAMW41 | | | GAMW41B | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 2020-09-21 | 2021-04-14 | 2021-09-13 | 2020-09-21 | 2021-04-14 | 2021-09-13 | 2020-09-21 | 2021-04-13 | 2021-09-13 |
| | Sample Type | N | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | |
| Boron | mg/L | 31.3 | 30 | 29.9 | 8 9 | 10 | 9.4 | 28.7 | 26.2 | 28.8 |
| Calcium | mg/L | 228 | 225 | 195 | 186 | 123 | 134 | 260 | 223 | 231 |
| Chloride | mg/L | 744 | 859 | 700 | 254 | 119 | 44.4 | 722 | 571 | 687 |
| Fluoride | mg/L | 0.05 U | 0.79 | 0.05 U | 0 21 | 0.2 | 0.33 | 0 05 U | 0.79 | 0 05 U |
| pH | SU | 8.03 | 8.5 | 7.87 | | 8.08 | 7.48 | | 8.05 | 7 94 |
| Sulfate | mg/L | 5640 | 6420 | 6580 | 2450 | 2220 | 1750 | 6750 | 6320 | 6250 |
| Total Dissolved Solids | mg/L | 11400 | 9860 | 11500 | 4160 | 3250 | 2750 | 11200 | 10500 | 10800 |
| **Field Parameters** | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.34 | 0.23 | 0.3 | 0 28 | 0.14 | 0.21 | 0 29 | 0.42 | 0.19 |
| Oxidation-Reduction Potential | millivolts | -112 3 | -162.9 | -288 3 | -54.8 | -137.2 | -247 | -134 | -187 2 | -291.7 |
| pH | SU | 8.03 | 8.5 | 7.87 | 7 07 | 8.08 | 7.48 | 8.1 | 8.05 | 7 94 |
| Specific Conductance | uS/cm | 13584 | 13406 | 11500 | 5522 | 4602 | 3312 | 13465 | 13006 | 11430 |
| Temperature | deg c | 14.4 | 11 97 | 14.28 | 19.2 | 10.15 | 19.2 | 16.7 | 13 | 15.88 |
| Turbidity | ntu | 3.7 | 1.37 | 1.18 | 4 21 | 4.43 | 1.91 | 4 28 | 3.81 | 1 8 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/L = picocuries per liter

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**APPENDIX F**

# 2021 Annual Groundwater Monitoring and Corrective Action Reports - January 2022

# 2021 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area

*NIPSCO LLC R. M. Schahfer Generating Station*

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana Administrative Code 10-9-1

Submitted to:

**Northern Indiana Public Service Company LLC**
R.M. Schahfer Generating Station
Wheatfield, Indiana

Submitted by:

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191-21567

January 31, 2022

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**APPENDICES**

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Waste Disposal Area Alternative Source Demonstration May 2021

**APPENDIX B**
Waste Disposal Area Alternative Source Demonstration November 2021

# 1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc., *a member of WSP* (Golder), prepared this 2021 Annual Groundwater Monitoring and Corrective Action Report (2021 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) Waste Disposal Area (WDA, the CCR Unit) located at 2723 E 1500 N, Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" and Longitude 87° 01' 48", see Figure 1). As shown in Figure 2, the WDA is an approximately 80-acre impoundment located in the southwest portion of the RMSGS facility. Golder prepared the 2021 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The CCR Unit is currently in Assessment Monitoring pursuant to 40 CFR §257.95. Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of groundwater samples for laboratory analysis.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2021 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit and monitoring well locations
- Summarizes key CCR Rule groundwater activities completed during calendar year 2021
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2021
- Describes any problems encountered during the monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year

# 2.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM OVERVIEW OF CURRENT STATUS

Starting in 2016 following the installation of a groundwater monitoring system (Table 1) and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring at the CCR Unit pursuant to the requirements of 40 CFR §257.94. Due to the identification of significantly statistical increases (SSIs) in January 2018, NIPSCO established an Assessment Monitoring program in April 2018 pursuant to the requirements of 40 CFR §257.95. In 2018, Golder performed the first and second Assessment Monitoring sampling events. Following the first Assessment Monitoring sampling event, including verification sampling, Golder prepared an alternative source demonstration (ASD) indicating that the detections of Appendix IV parameters downgradient of the WDA are not due to a release from the WDA. In 2019, Golder completed the third and fourth Assessment Monitoring sampling events and completed ASDs following each sampling event. In 2020, Golder performed the fifth and sixth Assessment Monitoring sampling events and completed ASDs following each sampling event. In 2021, Golder performed the seventh and eighth Assessment Monitoring sampling events. The WDA began and ended the current annual reporting period in Assessment Monitoring pursuant to 40 CFR §257.95. Appendix IV constituents statistically significant levels (SSLs) identified in 2021 include molybdenum and

lithium in groundwater samples collected from well GAMW-51B and molybdenum in well GAMW-60B. In May 2021, Golder prepared an ASD indicating that the SSLs for molybdenum and lithium were not due to a release from the WDA; therefore, the CCR Unit remained in Assessment Monitoring. Pursuant to 40 CFR §257.94, a qualified Indiana-licensed professional engineer recertified the ASD in November 2021. The sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling associated with the seventh and eighth Assessment Monitoring events are provided in Table 2. The 2021 analytical results are presented in Table 3. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, no corrective action program requirements as outlined in 40 CFR §257.96-98 have either been triggered or implemented at this CCR Unit.

## 2.1 Key Actions Completed - 2021

NIPSCO completed the following key actions relative to CCR Rule groundwater monitoring at the WDA during calendar year 2021:

- Preparation of the of 2020 Groundwater Monitoring and Corrective Action Annual Report in January 2021 (2020 Annual Report, 40 CFR §257.90(e))
- Evaluation of the results of the sixth Assessment Monitoring event in February 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the groundwater protection standard (GWPS) in March 2021 (40 CFR §257.95(g))
- Performance of the seventh Assessment Monitoring event in April 2021 (40 CFR §257.95)
- Recertification of the ASD in May 2021 (40 CFR §257.95(g))
- Evaluation of the results of the seventh Assessment Monitoring event in August 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the GWPS in September 2021 (40 CFR §257.95(g))
- Performance of the eighth Assessment Monitoring event in September 2021 (40 CFR §257.95)
- Recertification of the ASD in November 2021 (40 CFR §257.95(g))

## 2.2 Monitoring System Modifications

The groundwater monitoring system did not require any modifications in 2021 (see Figure 2). Table 1 provides a summary of the well rationale/purpose and date of installation. An overview of the modified groundwater monitoring network is provided in the embedded table below.

| Background Monitoring Wells | Downgradient Monitoring Wells | Assessment Monitoring Wells |
|---|---|---|
| GAMW03, GAMW-03B, GAMW-68, and GAMW-68B | GAMW-01, GAMW-01B, GAMW-12, GAMW-12B, GAMW-13, GAMW-13B, GAMW-14, and GAMW-14B | GAMW-42, GAMW-42B, GAMW-42C, GAMW-43, GAMW-43B, GAMW-44, GAMW-44B, GAMW-51, GAMW-51B, GAMW-57, GAMW-57B, GAMW-58, GAMW-58B, GAMW-59, GAMW-59B, GAMW-60, and GAMW-60B |

## 2.3 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, Golder collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. Golder used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. Golder submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of 40 CFR Part 257 Appendix III and Appendix IV constituents. In addition, Golder personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set was included in the 2017 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report, Golder 2018).

Golder performed a periodic update of background datasets, which includes incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The CCR Rule Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). Golder incorporated the new data into the background dataset, updated the GWPS, in March 2020 (see Table 4).

## 2.4 Detection Monitoring

Golder performed the first Detection Monitoring event in October 2017, followed by a statistical evaluation and data analysis in January 2018. Golder collected groundwater samples from the CCR Unit background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report. Following receipt and validation of laboratory results, Golder evaluated the results of the first Detection Monitoring sampling event to compare the concentration of 40 CFR Part 257 Appendix III constituents relative to facility background concentrations. Using Sanitas™ software, Golder pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to identify SSIs. Due to the identification of SSIs, NIPSCO established an Assessment Monitoring program in April 2018.

## 2.5 Assessment Monitoring

Golder performed the first Assessment Monitoring event (i.e., Assessment and Verification sampling) in March and April 2018, followed by a statistical evaluation and data analysis in August 2018. In March 2018, Golder collected groundwater samples from each background and downgradient monitoring well for analysis of Appendix IV constituents per 40 CFR §257.95. In April 2018, Golder collected groundwater samples from the downgradient monitoring well locations for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. In August 2018, Golder developed GWPS to compare against the Assessment Monitoring results. Following receipt and validation of laboratory results, Golder evaluated the 40 CFR Part 257 Appendix IV constituent results relative to CCR Unit-specific GWPS (Table 4). At the time of the statistical evaluation, the GWPS was the higher value of either the Maximum Contaminant Level (MCL) or the CCR Unit-specific background concentration for each analyte calculated using a tolerance/prediction limit procedure in accordance with 40 CFR §257.95(h)(2). Golder assessed the groundwater results obtained from the downgradient monitoring wells by comparing the lower confidence limit (LCL) to the CCR Unit-specific GWPS for each Appendix IV analyte at each well. If the LCL exceeds the GWPS, there is statistical evidence of an SSL. Golder determined that SSLs existed for the WDA (molybdenum in GAMW-01, GAMW-13B, and GAMW-14B) but identified an alternative natural source for the

elevated levels of molybdenum detected in downgradient monitoring wells and prepared an ASD. A qualified Indiana-licensed professional engineer certified the ASD in November 2018 (Appendix A of the 2018 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2019 (2018 Annual Report, Golder 2019)).

Golder performed the second and third Assessment Monitoring events in October 2018 and April 2019, respectively, by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and Appendix IV constituents per 40 CFR §257.95. The results from the first and second Assessment Monitoring events are included in the 2018 Annual Report and the results from the third Assessment Monitoring event is included in the 2019 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2020 (2019 Annual Report, Golder 2020). Golder performed the statistical evaluation of the analytical results of the second and third Assessment Monitoring sampling events in February 2019 and August 2019, respectively. Golder identified SSLs for arsenic (GAMW-01) and cobalt (GAMW-14). In May 2019, Golder prepared, and a qualified Indiana-licensed professional engineer certified an ASD demonstrating that the arsenic and cobalt concentrations observed in the downgradient monitoring wells were due to natural variation and not to a release from the WDA (Appendix A of the 2019 Annual Report, Golder 2020). A qualified-licensed professional engineer recertified the ASD in November 2019 (Appendix B of the 2019 Annual Report).

Golder collected groundwater samples from the following property boundary Assessment Monitoring wells (see Figure 2):

- GAMW-42/42B, GAMW-43/43B, and GAMW-44/44B in March, April, June, July, August, October, and November 2019
- GAMW-42C, GAMW-57/57B, and GAMW-58/58B installed in June 2019 in July, August, October, and November 2019.

SSLs were not identified in groundwater samples collected from these property boundary wells.

Golder performed the fourth and fifth Assessment Monitoring event in November 2019 and April/May 2020, respectively, by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. The results from the fourth Assessment Monitoring events are included in the 2019 Annual Report. In March 2020, Golder performed the statistical evaluation of the analytical results of the fourth Assessment Monitoring sampling event and identified an SSL for molybdenum in well GAMW-51B. In June 2020, Golder prepared, and a qualified Indiana-licensed professional engineer certified, an ASD demonstrating that the SSL for molybdenum and observed lithium levels above the GWPS in GAMW-51B were not due to a release from the WDA (Appendix A of the 2020 Annual Report, Golder 2021). Golder performed the statistical evaluation of the analytical results of the fifth Assessment Monitoring sampling event in September 2020 and identified SSLs for molybdenum and lithium in well GAMW-51B. As these results were consistent with the previous Assessment Monitoring event, a qualified Indiana-licensed professional engineer recertified the ASD in December 2020 (Appendix B of the 2020 Annual Report, Golder 2021).

Golder performed the sixth Assessment Monitoring event in October 2020 by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. Golder performed the statistical evaluation of the analytical results from the sixth Assessment Monitoring sampling event in February 2021 and identified SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. As described in the 2019 Annual Report (Golder 2020), GAMW-60B was installed

downgradient of GAMW-51/51B in 2019 to further assess the nature and extent of groundwater quality further downgradient of the WDA. The October 2020 Assessment Monitoring event was the fourth round of sampling at this location, and therefore, was the first event for which SSLs were calculated. As these results are consistent with the primary lines of evidence presented in the June 2020 ASD, a qualified Indiana-licensed professional engineer recertified the ASD in May 2021 (Appendix A). The results from the fifth and sixth Assessment Monitoring events are included in the 2020 Annual Report (Golder, 2021).

Golder performed the seventh Assessment Monitoring event in April 2021 by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and Appendix IV constituents per 40 CFR §257.95. Golder performed the statistical evaluation of the analytical results of the seventh Assessment Monitoring sampling event in August 2021 and identified SSLs for molybdenum and lithium in well GAMW-51B and molybdenum in GAMW-60B. As these results were consistent with the previous Assessment Monitoring event, a qualified Indiana-licensed professional engineer recertified the ASD in November 2021 (Appendix B).

Golder performed the eighth Assessment Monitoring event in September 2021 by collecting groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and detected Appendix IV constituents per 40 CFR §257.95. Golder will perform the statistical evaluation of the analytical results from the eighth Assessment Monitoring event in January 2022.

## 2.6 Statistical Evaluation

After each monitoring event, Golder assessed the analytical data for outliers, anomalies, and trends that might be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur because of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence upon groundwater quality. Appropriate statistical methods are used to remove outliers from the database and manage trends with detrending routines, prior to the calculation of statistical limits. To assess the data for outliers, anomalies, and trends, Golder assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package. Golder has not identified any additional outliers since the 2020 Annual Report.

Golder evaluated the background data set for trends using Sanitas™ software. Golder will continue to monitor all trends and apply detrending routines, if applicable, before using these data to calculate GWPS. Golder identified the following 40 CFR Part 257 Appendix IV parameter trends in background monitoring wells:

- Arsenic concentrations detected in groundwater samples collected from GAMW-03B show a deceasing trend and arsenic has never been detected above the MCL in this well. No detrending routines are required.
- Beryllium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend, beryllium has never been detected above the laboratory reporting limit in these wells, and all background beryllium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Cadmium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend, cadmium has never been detected above the laboratory reporting limit in these wells, and all background cadmium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

- Chromium concentrations detected in groundwater samples collected from GAMW-03 show a decreasing trend, chromium has never been detected above the laboratory reporting limit in this well, and all background chromium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Lead concentrations detected in groundwater samples collected from GAMW-03B show a decreasing trend, lead has never been detected above the laboratory reporting limit in this well, and all background lead results are below the health-based standard, therefore the GWPS is equal to the health-based standard. No detrending routines are required.
- Molybdenum concentrations detected in groundwater samples collected from GAMW-03B show an increasing trend, all background results are below the health-based standard, therefore, the GWPS is equal to the health-based standard. No detrending routines are required.
- Thallium concentrations detected in groundwater samples collected from GAMW-03 and GAMW-03B show a decreasing trend, thallium has never been detected above the laboratory reporting limit in these wells, and all background thallium results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

## 2.7 Problems Encountered and Follow-Up Corrective Actions

One cooler containing the radium samples collected from GAMW-13/13B and GAMW-14/14B in the seventh Assessment Monitoring event (April 2021), was delayed during shipping (i.e., FedEx issue). The laboratory received the radium samples approximately one month after the sample collection date. Since the radium analyses have no temperature requirements and the laboratory received the samples within the method holding time, the samples were run despite the shipping delay. No follow up corrective action was required.

Golder encountered elevated turbidity levels (i.e., >5 nephelometric turbidity units - NTUs) during the 2021 Assessment Monitoring events including:

- Seventh Assessment Monitoring event (April 2021); Golder collected groundwater samples from monitoring wells GAMW-03 and GAMW-42C at turbidity levels of 5.99 and 7.69 NTUs, respectively.
- Eighth Assessment Monitoring event (September 2021); Golder collected the groundwater sample from monitoring well GAMW-42C at a turbidity level of 5.86 NTUs.

According to the CCR Groundwater Monitoring Program Implementation Manual (Golder 2017), groundwater samples are to be collected once groundwater has achieved a turbidity level below 5 NTUs. Due to time constraints in the field, Golder purged groundwater from the wells for a minimum of two hours and collected groundwater samples when turbidity appeared to stabilize (e.g., no downward or upward trend over three consecutive readings five minutes apart). Evaluation of the analytical results from these wells suggests that the slightly elevated turbidity levels had no significant effect on the representativeness of groundwater quality. During future monitoring events, Golder will purge groundwater for two hours or five well volumes, whichever is shorter and use professional judgement to assess whether the purge water is representative of groundwater for sampling. If an acceptable turbidity level cannot be achieved within a reasonable timeframe (i.e., three hours), Golder will redevelop the affected monitoring wells prior to the next sampling event.

# 3.0 KEY ACTIVITIES PROJECTED FOR 2022

During calendar year 2022, NIPSCO anticipates conducting the following key CCR Rule groundwater monitoring activities for the WDA:

- Prepare and submit the appropriate notifications according to the CCR Rule;
- Continue semi-annual Assessment Monitoring groundwater sampling per CCR Rule requirements; and,
- Inspect and maintain the monitoring system including wells, pumps, and equipment.

# 4.0 REFERENCES

Golder Associates, “2017 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, January 31, 2018.

Golder Associates, “2018 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, January 31, 2019.

Golder Associates, “2019 Annual Groundwater Monitoring and Corrective Action Report - Waste Disposal Area, NIPSCO R. M. Schafer Generating Station”, January 31, 2020.

Golder Associates 2020, “2020 Annual Groundwater Monitoring and Corrective Action Report – Waste Disposal Area, NIPSCO R. M. Schahfer Generating Station”, January 31, 2021.

Golder Associates, “CCR Groundwater Monitoring Program Implementation Manual,” October 2017.

Golder Associates, “Waste Disposal Area Alternative Source Demonstration,” November 19, 2018.

Golder Associates, “Alternative Source Demonstration - Waste Disposal Area,” May 17, 2019.

Golder Associates, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” November 26, 2019.

Golder Associates, “Alternative Source Demonstration – Waste Disposal Area,” June 9, 2020.

Golder Associates, “Recertification of R. M. Schahfer Waste Disposal Area Alternative Source Demonstration,” December 4, 2020.

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# Tables

**Table 1: Monitoring Well Network**
**CCR Unit Schahfer Waste Disposal Area**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| CCR Unit | Well Purpose | Monitoring Well ID | Installation Date | Decommission Date (If Applicable) | Basis For Action |
|---|---|---|---|---|---|
| Waste Disposal Area | Background Monitoring Well | GAMW-03 | 6/27/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-03B | 5/24/2016 | - | |
| | | GAMW-68 | 8/27/2020 | - | |
| | | GAMW-68B | 8/27/2020 | - | |
| | Downgradient Monitoring Well | GAMW-01 | 6/26/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-12 | 5/23/2016 | - | |
| | | GAMW-13 | 5/24/2016 | - | |
| | | GAMW-13B | 5/23/2016 | - | |
| | | GAMW-14 | 5/23/2016 | - | |
| | | GAMW-14B | 5/23/2016 | - | |
| | | GAMW-01B | 7/31/2018 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-12B | 7/31/2018 | - | |
| | | GAMW-51 | 7/25/2018 | - | |
| | | GAMW-51B | 7/25/2018 | - | |
| | | GAMW-42 | 7/24/2018 | - | Installed to monitor groundwater quality at the property boundary[3] |
| | | GAMW-42B | 7/24/2018 | - | |
| | | GAMW-42C | 6/8/2019 | - | |
| | | GAMW-43 | 5/16/2018 | - | |
| | | GAMW-43B | 5/16/2018 | - | |
| | | GAMW-44 | 5/16/2018 | - | |
| | | GAMW-44B | 5/16/2018 | - | |
| | | GAMW-57 | 6/7/2019 | - | |
| | | GAMW-57B | 6/7/2019 | - | |
| | | GAMW-58 | 6/6/2019 | - | |
| | | GAMW-58B | 6/6/2019 | - | |
| | | GAMW-59 | 6/8/2019 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-59B | 6/6/2019 | - | |
| | | GAMW-60 | 6/8/2019 | - | |
| | | GAMW-60B | 6/4/2019 | - | |

1) Per 40 CFR §257.93, Golder collected eight rounds of background data prior to October 17, 2017, excluding wells GAMW-68 and GAMW-68B.
2) Per 40 CFR §257.95(g)(1)(i) Rule requirements, Golder collected additional data to further characterize the nature and extent of potential groundwater impacts.
3) Per 40 CFR §257.95(g)(1)(iii), Golder collected data to monitor groundwater quality in the direction of flow at the property boundary.

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH

**Table 2: Summary of Sampling Events**
**CCR Unit Schahfer Waste Disposal Area**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Well Purpose | Monitoring Well ID | Sample Event #16 | Sample Event #17 | Total Number of Samples |
|---|---|---|---|---|
| Purpose of Sample | | Annual Assessment Monitoring | Semi-Annual Assessment Monitoring | |
| Sample Parameters | | Appendix III and Appendix IV | Appendix III and detected Appendix IV | |
| Background Monitoring Well | GAMW03 | 4/14/2021 | 9/17/2021 | 2 |
| | GAMW03B | 4/15/2021 | 9/17/2021 | 2 |
| | GAMW68 | 4/22/2021 | 9/17/2021 | 2 |
| | GAMW68B | 4/22/2021 | 9/17/2021 | 2 |
| Downgradient Monitoring Well | GAMW01 | 4/14/2021 | 9/16/2021 | 2 |
| | GAMW01B | 4/14/2021 | 9/16/2021 | 2 |
| | GAMW12 | 4/15/2021 | 9/16/2021 | 2 |
| | GAMW12B | 4/15/2021 | 9/16/2021 | 2 |
| | GAMW13 | 4/19/2021 | 9/17/2021 | 2 |
| | GAMW13B | 4/19/2021 | 9/17/2021 | 2 |
| | GAMW14 | 4/19/2021 | 9/17/2021 | 2 |
| | GAMW14B | 4/19/2021 | 9/17/2021 | 2 |
| | GAMW42 | 4/23/2021 | 9/14/2021 | 2 |
| | GAMW42B | 4/23/2021 | 9/14/2021 | 2 |
| | GAMW42C | 4/23/2021 | 9/15/2021 | 2 |
| | GAMW43 | 4/23/2021 | 9/14/2021 | 2 |
| | GAMW43B | 4/27/2021 | 9/14/2021 | 2 |
| | GAMW44 | 4/27/2021 | 9/15/2021 | 2 |
| | GAMW44B | 4/27/2021 | 9/15/2021 | 2 |
| | GAMW51 | 4/21/2021 | 9/29/2021 | 2 |
| | GAMW51B | 4/21/2021 | 9/29/2021 | 2 |
| | GAMW57 | 4/23/2021 | 9/15/2021 | 2 |
| | GAMW57B | 4/23/2021 | 9/15/2021 | 2 |
| | GAMW58 | 4/23/2021 | 9/15/2021 | 2 |
| | GAMW58B | 4/23/2021 | 9/15/2021 | 2 |
| | GAMW59 | 4/21/2021 | 9/29/2021 | 2 |
| | GAMW59B | 4/22/2021 | 9/29/2021 | 2 |
| | GAMW60 | 4/21/2021 | 9/24/2021 | 2 |
| | GAMW60B | 4/21/2021 | 9/24/2021 | 2 |
| Total Number of Samples | | 29 | 29 | 58 |

**Notes:**
Sample counts do not include QC/QA samples.

(1) Sample events #1-15 were completed prior to 2021. The purpose, sample parameters, and sample dates are included in the 2017, 2018, 2019, and 2020 Annual Reports.

(2) Semi-annual assessment monitoring parameters did not include radium.

(3) Sample events #16 and 17 correspond to the seventh and eighth Assessment Monitoring events, respectively.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

**Table 3: Analytical Data**
**CCR Unit R. M. Schahfer Waste Disposal Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW01 | | GAMW01B | | GAMW03 | | GAMW03B | | GAMW12 | | GAMW12B | | | GAMW13 | | GAMW13B | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2021-04-14 | 2021-09-16 | 2021-04-14 | 2021-09-16 | 2021-04-14 | 2021-09-17 | 2021-04-15 | 2021-09-17 | 2021-04-15 | 2021-09-16 | 2021-04-15 | | 2021-09-16 | 2021-04-19 | 2021-09-17 | 2021-04-19 | 2021-09-17 |
| Sample Type | | N | N | N | N | N | N | N | N | N | N | FD | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.78 | 0.26 | 0.35 | 0.29 | 0.22 | 0.13 | 0.25 | 0.27 | 0.1 U | 0.1 U | 0.29 | 0.31 | 0.32 | 0.16 | 0.19 | 0.71 | 0.8 |
| Calcium | mg/L | 86.2 | 78.7 | 103 | 112 | 90.3 | 70.2 | 96.4 | 102 | 87 | 80.7 | 103 | 104 | 107 | 96.6 | 71.2 | 92.7 | 77.8 |
| Chloride | mg/L | 10.1 | 5.9 | 20.6 | 16.6 | 4.3 | 4.2 | 20.1 | 23.1 | 2.3 | 3.2 | 20.5 | 20.6 | 20.6 | 4.3 | 10.5 | 28.3 | 26 |
| Fluoride | mg/L | 0.25 | 0.36 J- | 0.076 | 0.094 J- | 0.13 | 0.2 | 0.2 | 0.23 | 0.16 | 0.19 J- | 0.079 | 0.082 | 0.079 J- | 0.27 | 0.31 | 0.31 | 0.25 |
| pH | SU | 7.11 | 6.61 | 6.96 | 6.5 | 6.77 | 6.9 | 7.03 | 6.97 | 7.31 | 6.49 | | 7.55 | 6.99 | 6.95 | 6.67 | 7.73 | 7.32 |
| Sulfate | mg/L | 157 | 42.3 | 85.2 | 80.3 | 97.5 | 40.2 | 58 | 78.6 | 9.2 | 24.2 | 63.5 | 66.5 | 57.5 | 48.6 | 49.3 | 146 | 137 |
| Total Dissolved Solids | mg/L | 574 | 294 | 450 | 443 | 390 | 258 | 400 | 430 | 336 | 325 | 435 | 433 | 451 | 356 | 317 | 376 | 395 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.012 | 0.02 | 0.001 U | 0.001 U | 0.0064 | 0.019 | 0.001 U | 0.001 U | 0.012 | 0.043 | 0.001 U | 0.001 U | 0.001 U | 0.027 | 0.0076 | 0.0012 | 0.001 |
| Barium | mg/L | 0.051 | 0.049 | 0.17 | 0.17 | 0.074 | 0.08 | 0.11 | 0.12 | 0.095 | 0.094 | 0.13 | 0.13 | 0.14 | 0.11 | 0.08 | 0.081 | 0.077 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 J | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.0019 | 0.001 | 0.001 | 0.001 U | 0.0055 | 0.001 U | 0.001 U | 0.001 J | 0.0025 | 0.0028 | 0.001 J | 0.001 U | 0.001 U | 0.0012 | 0.001 J | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.25 | 0.36 J- | 0.076 | 0.094 J- | 0.13 | 0.2 | 0.2 | 0.23 | 0.16 | 0.19 J- | 0.079 | 0.082 | 0.079 J- | 0.27 | 0.31 | 0.31 | 0.25 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 J | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 J | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.011 | 0.0076 | 0.001 U | 0.001 U | 0.011 | 0.0084 | 0.0051 | 0.0066 | 0.0025 | 0.0041 | 0.0012 | 0.0012 | 0.0013 | 0.0096 | 0.004 | 0.016 | 0.016 |
| Radium, Total | pCi/l | 0.842 U | | 2.02 | | 0.152 U | | 1.58 J | | 1.1 U | | 1.65 | 2.22 | | 1.08 U | | 0.82 U | |
| Selenium | mg/l | 0.01 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U |
| Thallium | mg/l | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.6 | 0.49 | 0.51 | 0.5 | 1.47 | 0.27 | 0.95 | 0.28 | 0.2 | 0.28 | | 0.13 | 0.46 | 0.46 | 0.29 | 0.23 | 0.32 |
| Oxidation-Reduction Potential | millivolts | -37.2 | -240.2 | -88 | -217.5 | -33.4 | -225.9 | -81.5 | -255.4 | -90.7 | -191.9 | | -107 | -265.3 | -16.8 | -155.2 | -120.6 | -259.6 |
| pH | SU | 7.11 | 6.61 | 6.96 | 6.5 | 6.77 | 6.9 | 7.03 | 6.97 | 7.31 | 6.49 | | 7.55 | 6.99 | 6.95 | 6.67 | 7.73 | 7.32 |
| Specific Conductance | uS/cm | 721 | 524 | 752 | 705 | 605 | 479 | 695 | 634 | 583 | 625 | | 709 | 704 | 461 | 560 | 527 | 568 |
| Temperature | deg c | 9.7 | 18.22 | 12.1 | 14.36 | 9.5 | 16.05 | 11.6 | 13.22 | 9.04 | 18.11 | | 11.67 | 14.01 | 9.5 | 10.34 | 11.97 | 14.13 |
| Turbidity | ntu | 4.06 | 0.51 | 3.19 | 2.19 | 5.99 | 2.0 | 4.06 | 3.19 | 4.70 | 4.53 | | 3.56 | 3.64 | 3.79 | 2.17 | 3.92 | 0.5 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/l = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+"= Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

**Table 3: Analytical Data**
**CCR Unit R. M. Schahfer Waste Disposal Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW14 | | GAMW14B | | | GAMW42 | | GAMW42B | | GAMW42C | | GAMW43 | | GAMW43B | | | GAMW44 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2021-04-19 | 2021-09-17 | 2021-04-19 | | 2021-09-17 | 2021-04-23 | 2021-09-14 | 2021-04-23 | 2021-09-14 | 2021-04-23 | 2021-09-15 | 2021-04-23 | 2021-09-14 | 2021-04-27 | | 2021-09-14 | 2021-04-27 | 2021-09-15 |
| Sample Type | | N | N | FD | N | N | N | N | N | N | N | N | N | N | FD | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.28 | 0.2 | 2.8 | 2.8 | 2.7 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.89 | 0.82 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Calcium | mg/L | 67.7 | 82.6 | 146 | 143 | 112 | 47.1 | 59.9 | 57.9 | 62.6 | 48.6 | 53.9 | 28 | 32.6 | 41.2 | 40.4 | 38.2 | 21.6 | 20.2 |
| Chloride | mg/L | 11.5 | 10.6 | 112 | 108 | 85.2 | 4.2 | 11.4 | 8.6 | 10.3 | 8.3 | 8.3 | 0.53 | 0.53 | 1.7 | 1.7 | 1.8 | 2.3 | 1.7 |
| Fluoride | mg/L | 0.26 | 0.26 | 0.29 | 0.29 | 0.28 | 0.17 J- | 0.19 | 0.15 J- | 0.12 | 0.2 J- | 0.22 | 0.13 J- | 0.11 | 0.19 | 0.19 | 0.15 | 0.19 | 0.13 |
| pH | SU | 7.03 | 6.61 | | 7.71 | 7.39 | 7.62 | 7 | 7.72 | 8 | 7.59 | 7.36 | 7.22 | 7.22 | | 8.04 | 7.64 | 6.21 | 6.21 |
| Sulfate | mg/L | 40.6 | 31.8 | 1330 | 1350 | 841 | 29.9 | 66.5 | 37.7 | 31.8 | 4.4 | 4.3 | 30 | 28.4 | 28.9 J+ | 27.9 J+ | 22.3 | 63.0 J+ | 44.9 |
| Total Dissolved Solids | mg/L | 270 | 330 | 1730 | 1740 | 1660 | 148 | 253 | 193 | 241 | 203 | 254 | 86 | 137 | 145 | 151 | 137 | 165 | 136 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.018 | 0.036 | 0.001 U | 0.001 U | 0.001 U | 0.0012 | 0.0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0016 | 0.0026 | 0.001 U | 0.001 U | 0.001 U | 0.096 | 0.052 |
| Barium | mg/L | 0.051 | 0.081 | 0.08 | 0.08 | 0.059 | 0.018 | 0.023 | 0.016 | 0.021 | 0.0092 | 0.0069 | 0.019 | 0.026 | 0.012 | 0.011 | 0.01 | 0.018 | 0.02 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0034 | 0.002 U |
| Cobalt | mg/L | 0.017 | 0.024 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0024 | 0.0022 | 0.001 U | 0.001 U | 0.001 U | 0.0026 | 0.0029 |
| Fluoride | mg/L | 0.26 | 0.26 | 0.29 | 0.29 | 0.28 | 0.17 J- | 0.19 | 0.15 J- | 0.12 | 0.2 J- | 0.22 | 0.13 J- | 0.11 | 0.19 | 0.19 | 0.15 | 0.19 | 0.13 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.032 | 0.024 | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0073 | 0.0077 | 0.028 | 0.028 | 0.01 | 0.0022 | 0.0033 | 0.0029 | 0.0027 | 0.0026 | 0.0021 | 0.0015 | 0.002 | 0.0023 | 0.0021 | 0.0021 | 0.0044 | 0.004 |
| Radium, Total | pCi/l | 0.883 U | | 1.92 | 1.85 | | 0 U | | 0.852 U | | 0.902 U | | 0.568 U | | 0.985 U | 0.731 U | | 0.385 U | |
| Selenium | mg/l | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/l | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.2 | 0.29 | | 0.29 | 0.42 | 0.59 | 0.17 | 0.49 | 0.15 | 0.43 | 0.12 | 0.7 | 0.54 | | 0.51 | 0.27 | 1.97 | 0.83 |
| Oxidation-Reduction Potential | millivolts | -31.7 | -234.5 | | -103.5 | -193.7 | -80.8 | -191 | -125.5 | -251 | -123.3 | -231 | 35.1 | -329 | | -108.7 | -323.9 | -8.1 | -294.6 |
| pH | SU | 7.03 | 6.61 | | 7.71 | 7.39 | 7.62 | 7 | 7.72 | 8 | 7.59 | 7.36 | 7.22 | 7.22 | | 8.04 | 7.64 | 6.21 | 6.21 |
| Specific Conductance | uS/cm | 577 | 566 | | 2126 | 2053 | 326.1 | 413 | 407 | 414 | 455.1 | 475 | 209 | 226 | | 282 | 191 | 257.8 | 192 |
| Temperature | deg c | 10.2 | 16.00 | | 12.37 | 13.90 | 9.9 | 14.9 | 11.0 | 13.1 | 11.0 | 12.7 | 9.7 | 17.01 | | 11.4 | 12.80 | 11.2 | 16.11 |
| Turbidity | ntu | 4.15 | 0.05 | | 1.66 | 1.1 | 2.56 | 1.76 | 4.07 | 0.98 | 7.39 | 5.36 | 4.3 | 2.99 | | 2.36 | 1.37 | 4.66 | 2.04 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/l = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+"= Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

**Table 3: Analytical Data**
**CCR Unit R. M. Schahfer Waste Disposal Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | GAMW44B | | GAMW51 | | | GAMW51B | | GAMW57 | | GAMW57B | | GAMW58 | | GAMW58B | | | GAMW59 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2021-04-27 | 2021-09-15 | 2021-04-21 | 2021-09-29 | | 2021-04-21 | 2021-09-29 | 2021-04-29 | 2021-09-15 | 2021-04-29 | 2021-09-15 | 2021-04-29 | 2021-09-15 | 2021-04-29 | 2021-09-15 | | 2021-04-21 | 2021-09-29 |
| Sample Type | | N | N | N | FD | N | N | N | N | N | N | N | N | N | N | FD | N | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.43 | 0.51 | 0.5 | 7.2 | 7 | 0.1 U | 0.1 U | 0.1 U | 0.13 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.89 | 1 |
| Calcium | mg/L | 31.2 | 31.7 | 144 | 148 | 147 | 281 | 282 | 3.9 | 21.8 | 43.1 | 47.5 | 7.3 | 10.9 | 37.8 | 29.2 | 36.6 | 209 | 217 |
| Chloride | mg/L | 1.6 | 1.5 | 1.5 | 2.3 | 2.3 | 54.8 | 53.2 | 1.6 | 1 | 11.2 | 12.4 | 0.85 | 1.1 | 3.6 | 2.1 | 4 | 11.3 | 21.1 |
| Fluoride | mg/L | 0.14 | 0.10 | 0.26 | 0.34 | 0.34 | 0.45 | 0.62 | 0.05 UJ | 0.073 | 0.13 J- | 0.17 | 0.22 J- | 0.35 | 0.15 J- | 0.12 | 0.18 | 0.42 | 0.7 |
| pH | SU | 6.22 | 7.01 | 7.19 | | 7.04 | 6.11 | 7.63 | 6.22 | 8.03 | 7.95 | 7.33 | 4.4 | 5.07 | 7.92 | | 7.32 | 7.53 | 7.28 |
| Sulfate | mg/L | 12.3 J+ | 7.5 | 156 | 161 | 153 | 1460 | 1480 | 38 | 25.8 | 10.1 | 24.4 | 45 | 38.0 | 24.9 | 32.1 | 23.6 | 473 | 434 |
| Total Dissolved Solids | mg/L | 85 | 113 | 604 | 597 | 600 | 2180 J | 2270 | 58 | 101 | 160 | 205 | 44 J | 82 | 124 | | 136 | 761 | 866 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.0016 | 0.0016 | 0.0016 | 0.004 | 0.0044 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.0012 | 0.002 |
| Barium | mg/L | 0.0084 | 0.0082 | 0.1 | 0.1 | 0.11 | 0.072 | 0.077 | 0.014 | 0.0025 | 0.02 | 0.022 | 0.059 | 0.041 | 0.015 | 0.0044 | 0.015 | 0.048 | 0.056 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 J | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 | 0.00075 | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 J | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.00025 | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 J | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.0033 | 0.0031 | 0.0031 | 0.001 U | 0.001 U | 0.0014 | 0.001 U | 0.001 U | 0.001 U | 0.01 | 0.0093 | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.14 | 0.10 | 0.26 | 0.34 | 0.34 | 0.45 | 0.62 | 0.05 UJ | 0.073 | 0.13 J- | 0.17 | 0.22 J- | 0.35 | 0.15 J- | 0.12 | 0.18 | 0.42 | 0.7 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.012 | 0.012 | 0.071 | 0.078 | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 J | 0.008 U | 0.012 | 0.018 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 J | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0022 | 0.002 | 0.011 | 0.0092 | 0.0098 | 0.16 | 0.15 | 0.0011 | 0.003 | 0.0028 | 0.0067 | 0.001 U | 0.001 U | 0.0037 | 0.001 J | 0.0041 | 0.03 | 0.015 |
| Radium, Total | pCi/l | 1.03 U | | 1.23 U | | | 3.57 | | 0.194 U | | 0.368 U | | 1.95 | | 0.705 U | | | 1.17 U | |
| Selenium | mg/l | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0025 | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/l | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.5 | 0.36 | 0.48 | | 0.27 | 0.55 | 0.29 | 4.93 | 6.33 | 0.22 | 0.37 | 4.1 | 0.98 | 0.3 | | 0.73 | 0.21 | 0.25 |
| Oxidation-Reduction Potential | millivolts | -125.8 | -318 | -100.6 | | 0.197 | -108.7 | 0.246 | 111.6 | -237.7 | -132.7 | -316.7 | 291 | -314 | -140.4 | | -298.9 | -105.5 | 0.232 |
| pH | SU | 6.22 | 7.81 | 7.19 | | 7.04 | 6.11 | 7.63 | 6.22 | 8.03 | 7.95 | 7.33 | 4.4 | 5.87 | 7.92 | | 7.32 | 7.53 | 7.28 |
| Specific Conductance | uS/cm | 210.9 | 156 | 873 | | 937 | 3094 | 303.9 | 124 | 136 | 291 | 264 | 110 | 102 | 252 | | 215 | 1035 | 125.5 |
| Temperature | deg c | 11.5 | 12.16 | 11.1 | | 13.9 | 12.4 | 14.2 | 10.25 | 12.45 | 11.2 | 11.54 | 9.27 | 13.67 | 10.04 | | 11.37 | 11.28 | 22.2 |
| Turbidity | ntu | 2.15 | 1.19 | 4.2 | | 4.12 | 1.02 | 1.43 | 2.7 | 2.83 | 3.04 | 1.85 | 0.04 | 1.27 | 2.96 | | 2.66 | 4.0 | 4.52 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/l = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+"= Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

**Table 3: Analytical Data**
**CCR Unit R. M. Schahfer Waste Disposal Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | GAMW59B | | GAMW60 | | GAMW60B | | GAMW63 | | GAMW63B | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 2021-04-22 | 2021-09-29 | 2021-04-21 | 2021-09-24 | 2021-04-21 | 2021-09-24 | 2021-04-22 | 2021-09-17 | 2021-04-22 | 2021-09-17 |
| | Sample Type | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | |
| Boron | mg/L | 5.4 | 6.3 | 1 | 0.97 | 6.5 | 7.3 | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Calcium | mg/L | 292 | 253 | 343 | 379 | 351 | 309 | 60.7 | 66.4 | 43.5 | 44.7 |
| Chloride | mg/L | 52 | 51.3 | 17.2 | 16.5 | 14.3 | 69.8 | 22.6 | 20.4 | 19.3 | 18.4 |
| Fluoride | mg/L | 0.45 | 0.53 | 0.3 | 0.51 | 0.34 | 1.1 | 0.16 | 0.26 | 0.1 | 0.2 |
| pH | SU | 7.6 | 7.57 | 7.05 | 7.01 | 7.74 | 7.76 | 7.52 | 7.75 | 8.35 | 7.99 |
| Sulfate | mg/L | 1180 | 1180 | 748 | 1050 | 1140 | 443 | 68.6 | 81.3 | 62.5 | 63.6 |
| Total Dissolved Solids | mg/L | 1960 | 1960 | 1300 | 1540 | 2710 | 1440 | 320 | 316 | 2040 | 242 |
| **CCR Appendix IV** | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Barium | mg/L | 0.037 | 0.04 | 0.027 | 0.031 | 0.077 | 0.063 | 0.065 | 0.1 | 0.11 | 0.1 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.0013 | 0.002 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.45 | 0.53 | 0.3 | 0.51 | 0.34 | 1.1 | 0.16 | 0.26 | 0.1 | 0.2 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.017 | 0.016 | 0.012 | 0.015 | 0.034 | 0.045 | 0.006 U | 0.0061 | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.041 | 0.05 | 0.013 | 0.015 | 0.35 | 0.37 | 0.0035 | 0.0045 | 0.0022 | 0.0027 |
| Radium, Total | pCi/l | 1.76 | | 1.29 U | | 3.02 | | 0.285 U | | 1.35 U | |
| Selenium | mg/l | 0.001 U | 0.001 U | 0.0017 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/l | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.49 | 0.29 | 1.34 | 0.29 | 0.56 | 0.25 | 0.51 | 0.28 | 0.5 | 0.21 |
| Oxidation-Reduction Potential | millivolts | -119.4 | 0.231 | 64.3 | 0.56 | -121.3 | 0.238 | -39.2 | 0.187 | -154.3 | 0.216 |
| pH | SU | 7.6 | 7.57 | 7.05 | 7.01 | 7.74 | 7.76 | 7.52 | 7.75 | 8.35 | 7.99 |
| Specific Conductance | uS/cm | 2650 | 264.7 | 1747 | 167.2 | 2181 | 209.6 | 490 | 515 | 4[illegible]1 | 413 |
| Temperature | deg c | 10.1 | 17.4 | 11.5 | 20.7 | 12.2 | 14.9 | 9.7 | 18 | 11.8 | 13.5 |
| Turbidity | ntu | 1.46 | 1.58 | 0.9 | 1.56 | 1.04 | 2.05 | 2.02 | 0.99 | 3.57 | 3.56 |

Note:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
pCi/l = picocuries per liter

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased low.
"J-" = Indicates the result is estimated and may be biased high.

"UJ"= Indicates the result was not detected above MDL for the sample and the RL is estimated. The estimated RL is provided.

Prepared by: SLG
Checked by: DPSC
Reviewed by: JSD

**Table 4: Groundwater Protection Standards**
**CCR Unit Schahfer Waste Disposal Area**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

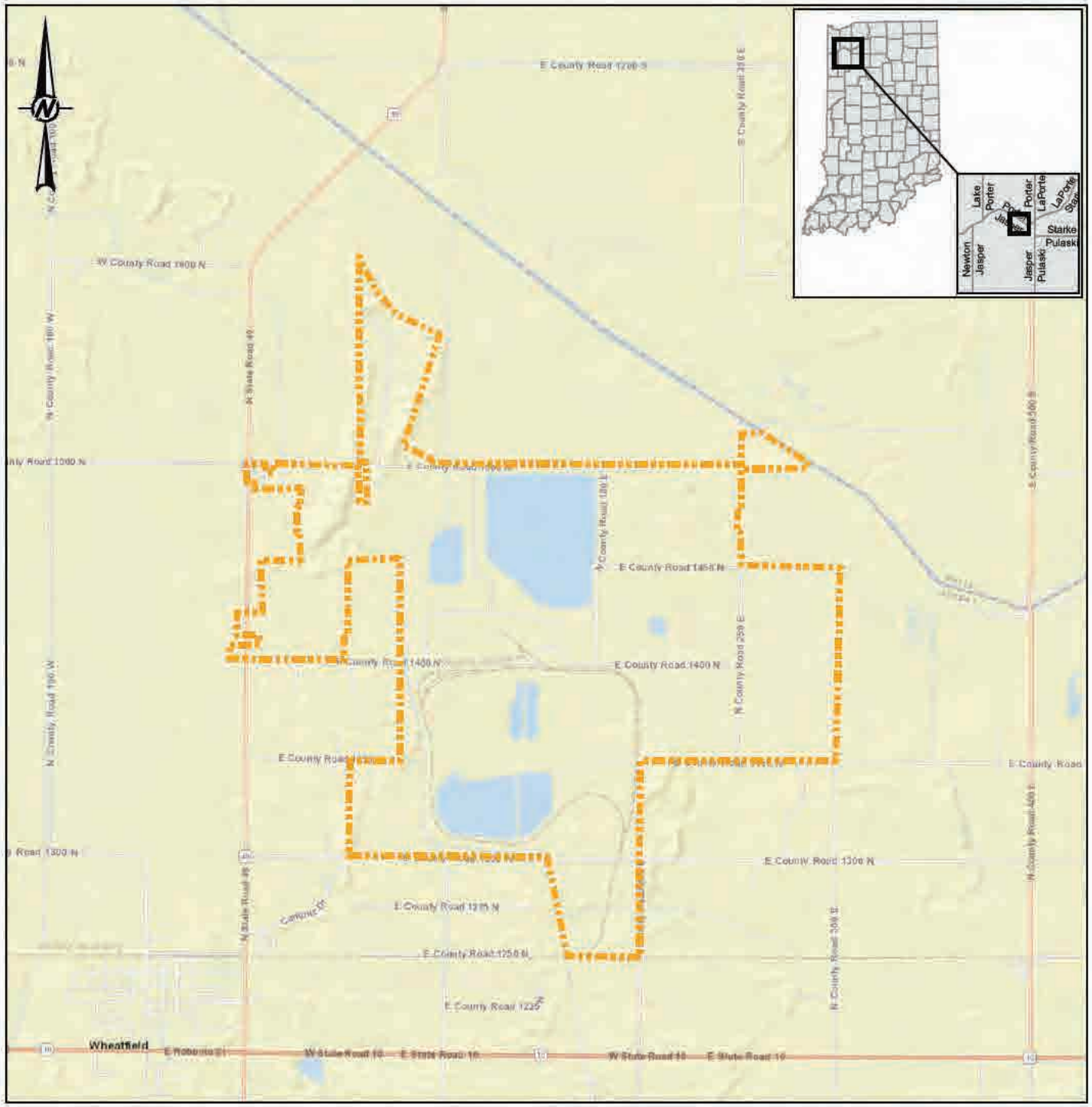
| Analyte | MCL (mg/L) | GWPS (mg/L)[2] | GWPS (mg/L)[3] |
|---|---|---|---|
| Antimony | 0.006 | 0.006 | 0.006 |
| Arsenic | 0.01 | 0.015 | 0.018 |
| Barium | 2 | 2 | 2 |
| Beryllium | 0.004 | 0.004 | 0.004 |
| Cadmium | 0.005 | 0.005 | 0.005 |
| Chromium | 0.1 | 0.1 | 0.1 |
| Cobalt[1] | 0.006 | 0.015 | 0.015 |
| Fluoride | 4 | 4 | 4 |
| Lead[1] | 0.015 | 0.015 | 0.015 |
| Lithium[1] | 0.04 | 0.04 | 0.04 |
| Mercury | 0.002 | 0.002 | 0.002 |
| Molybdenum[1] | 0.1 | 0.1 | 0.1 |
| Radium 226+228 | 5 | 5 | 5 |
| Selenium | 0.05 | 0.05 | 0.05 |
| Thallium | 0.002 | 0.002 | 0.002 |

**Notes:**
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard
mg/L= milligrams per liter

1) As of August 29, 2018, these four constituents have health-based standards that can be used when calculating the GWPS, these health-based standards are not MCLs but are provided in the MCL column.
2) GWPS calculated in August 2018.
3) GWPS calculated in March 2020.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

# Figures




**LEGEND**

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

**REFERENCE(S)**

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

**SITE LOCATION MAP**

CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 1/4/2021 |
| DESIGNED | DFS |
| PREPARED | SHL |
| REVIEWED | JSP |
| APPROVED | MAH |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19121567 | A | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A




LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- Approximate Property Line
- CCR Unit

0 400 800

1" = 400 feet

NOTE(S)

1. DEPICTION(S) IS APPROXIMATE; WATER FEATURES SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

WELL LOCATION MAP
WASTE DISPOSAL AREA

CONSULTANT

GOLDER

| | |
|---|---|
| DESIGNED | DFS |
| PREPARED | TEH |
| REVIEWED | BKH |
| APPROVED | MHH |

PROJECT NO. 19121567 | CONTROL A | REV. 0 | FIGURE 2

**APPENDIX A**

# Waste Disposal Area Alternative Source Demonstration May 2021

**Northern Indiana Public Service Company LLC (NIPSCO LLC)**

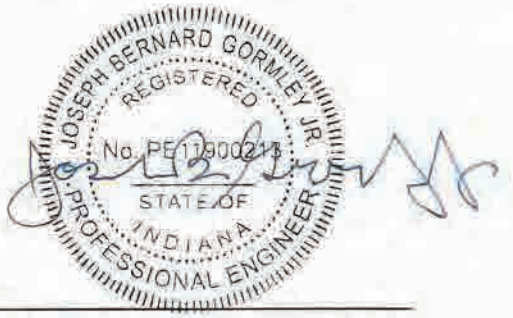
**R. M. Schahfer Generating Station – Waste Disposal Area**

**Wheatfield, Indiana**

**Recertification of Alternative Source Demonstration**

**40 CFR §257.95**

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated May 2021. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.




**Joseph Bernard Gormley, Jr.**
**Indiana Professional Engineer**
**License #: PE11900213**

5/18/2021
**Date**

# TECHNICAL MEMORANDUM

**DATE** May 18, 2021 **Project No.** 19121567

**TO** Jeff Loewe, Dan Sullivan, NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the sixth (October 2020) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the sixth Assessment Monitoring event was completed on February 17, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) exceeded the background concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and the background concentration for molybdenum in assessment monitoring well GAMW60B, which are interpreted as apparent evidence of a statistically-significant levels (SSLs). Although determination of an SSL generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSL.

Golder identified similar concentrations of lithium and molybdenum in groundwater samples collected from GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the source of the lithium and molybdenum SSLs observed in GAMW51B was not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020), which confirmed the molybdenum and lithium results observed in GAMW-51B.

## 1.0 SUMMARY OF OCTOBER 2020 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in October 2020 were 0.063 milligrams per liter (mg/L) and 0.17 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.38 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The October 2020 Assessment Monitoring event was the fourth



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round of sampling at this location. The most recent molybdenum and lithium results collected at both locations are within the range of the previous data. Overall, the data are consistent with the previous Assessment Monitoring event.

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION

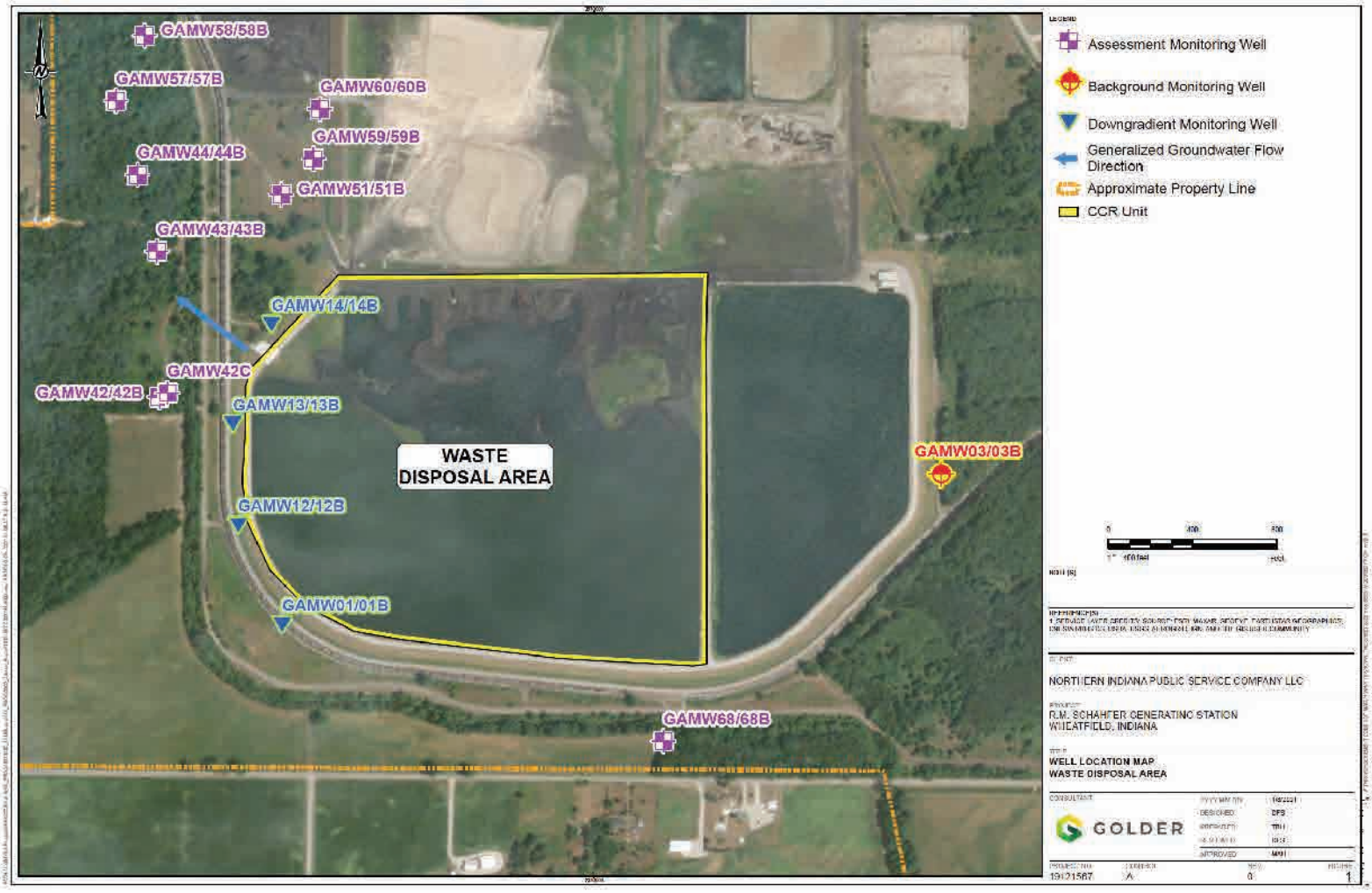
As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of GAMW51/51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that upgradient wells would have similar or higher concentrations of molybdenum, which they do not.

The 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS, . Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

The information presented above confirms the results of the sixth Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the February 17, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B and the molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

## 3.0 REFERENCES

Golder 2020. Alternative Source Demonstration - Waste Disposal Area, Golder Associates Inc., June 9, 2020.


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
Approximate Property Line
CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
GOLDER
DESIGNED
DFS
APPROVED
MW1
19121587
A
0
1

**APPENDIX B**

# Waste Disposal Area Alternative Source Demonstration November 2021

**Northern Indiana Public Service Company LLC (NIPSCO LLC)**

**R. M. Schahfer Generating Station – Waste Disposal Area**

**Wheatfield, Indiana**

**Recertification of Alternative Source Demonstration**

**40 CFR §257.95**

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated November 2021. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.




**Joseph Bernard Gormley, Jr.**
**Indiana Professional Engineer**
**License #: PE11900213**

11/12/2021
**Date**

GOLDER

# TECHNICAL MEMORANDUM

**DATE** November12, 2021 **Project No.** 19121567

**TO** Jeff Loewe, Dan Sullivan, NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (April 2021) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the seventh Assessment Monitoring event was completed on August 19, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and molybdenum in assessment monitoring well GAMW60B exceeded background concentrations, which are interpreted as apparent evidence of statistically-significant levels (SSLs) in those wells. Although determination of apparent SSLs generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (e.g., NIPSCO) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSLs.

Golder identified similar concentrations of lithium and molybdenum in GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the apparent lithium and molybdenum SSLs observed in GAMW51B were not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020) and sixth Assessment Monitoring event (October 2020), which confirmed the molybdenum and lithium results observed previously in GAMW51B.

## 1.0 SUMMARY OF APRIL 2021 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in April 2021 were 0.071 milligrams per liter (mg/L) and 0.16 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.35 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The most recent molybdenum and lithium results collected at



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both locations are within the range of the previous concentrations and are consistent with the previous Assessment Monitoring event.

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION

As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of wells GAMW51 and GAMW51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that wells upgradient of GAMW60B would have similar or higher concentrations of molybdenum, which they do not.

The June 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS. Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

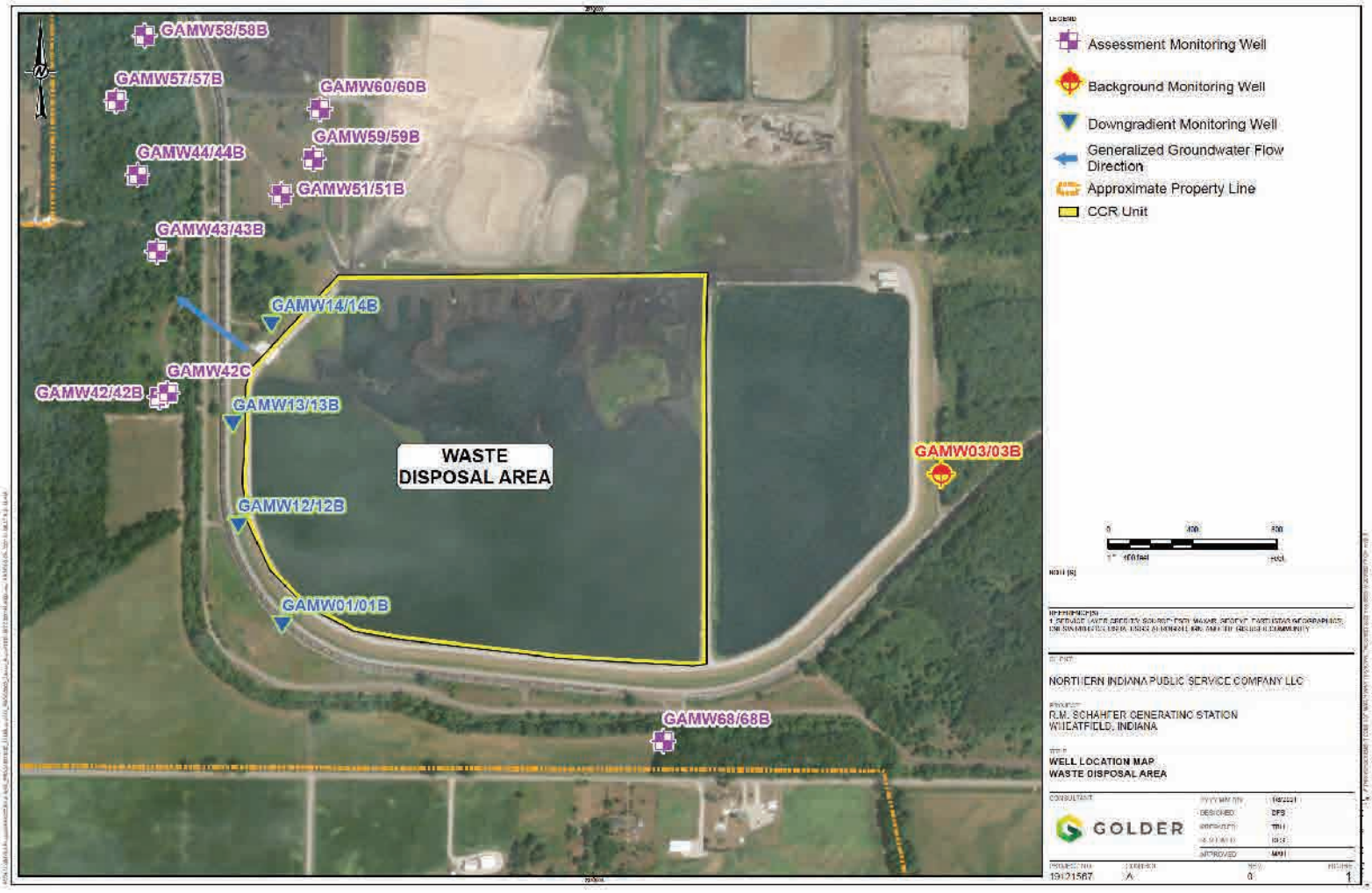
The information presented above confirms the results of the seventh Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the August 19, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the apparent lithium and molybdenum SSLs observed in GAMW51B and the apparent molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

## 3.0 REFERENCES

Golder 2020. Alternative Source Demonstration – Waste Disposal Area, Golder Associates Inc., June 9, 2020.

Golder 2020. Recertification of R.M. Schahfer Waste Diposal Area Alternative Source Demonstration, Golder Associates Inc., December 4, 2020.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., May 18, 2021.


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
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Generalized Groundwater Flow Direction
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CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
GOLDER
DESIGNED
DFS
APPROVED
MW1
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MEMBER OF WSP

# 2021 Annual Groundwater Monitoring and Corrective Action Report - Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area

*NIPSCO LLC R. M. Schahfer Generating Station*

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana Administrative Code 10-9-1

Submitted to:

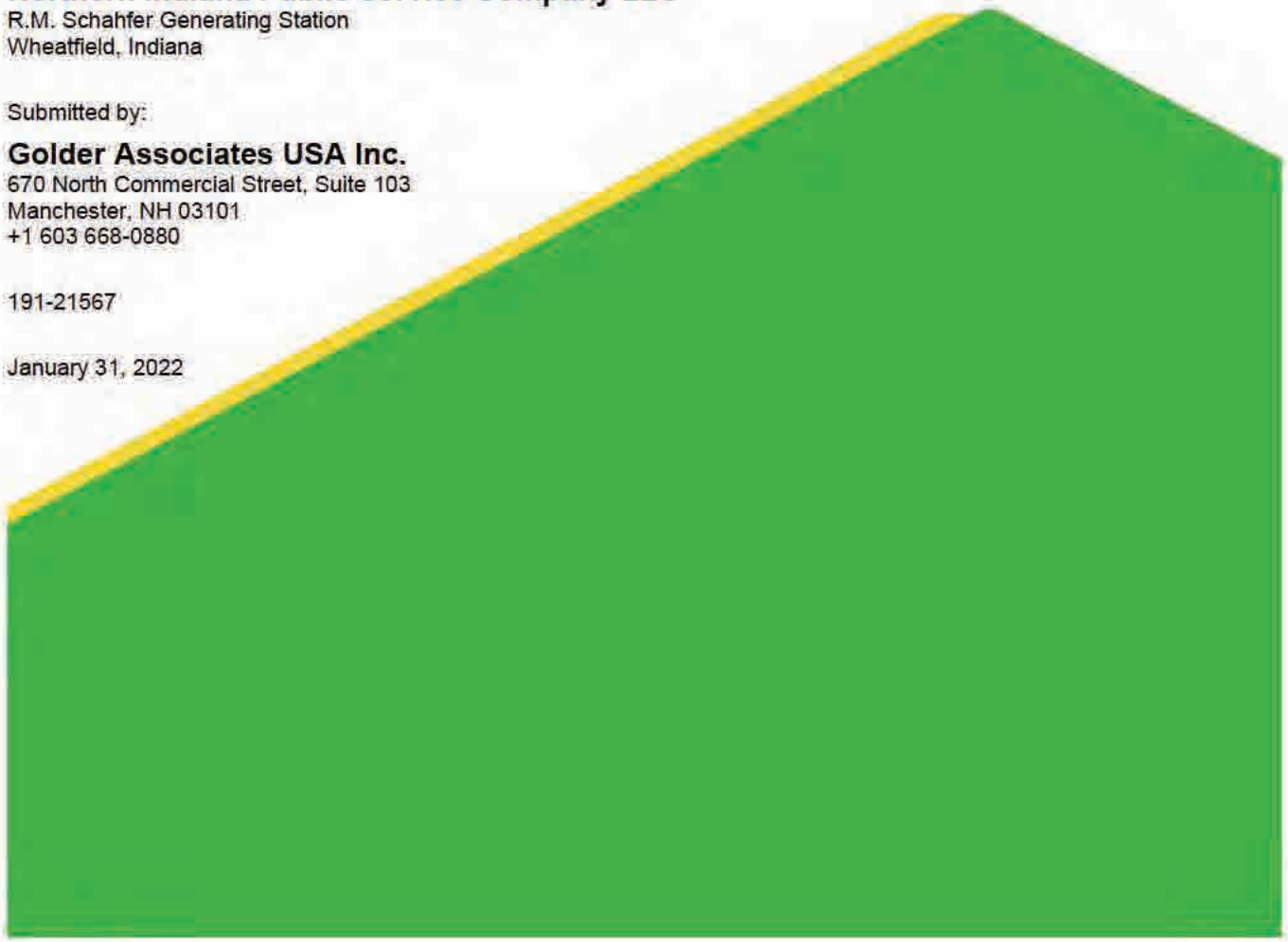
**Northern Indiana Public Service Company LLC**
R.M. Schahfer Generating Station
Wheatfield, Indiana

Submitted by:

**Golder Associates USA Inc.**
670 North Commercial Street, Suite 103
Manchester, NH 03101
+1 603 668-0880

191-21567

January 31, 2022



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Figure 1 Site Location Map
Figure 2 Well Location Map Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area

# 1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc., *a member of WSP* (Golder), prepared this 2021 Annual Groundwater Monitoring and Corrective Action Report (2021 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and the Drying Area (together, the CCR Unit) located at 2723 E 1500 N, Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" and Longitude 87° 01' 48", see Figure 1). As shown in Figure 2, the Drying Area is an approximately 5.5-acre impoundment that has been filled with CCR. The MSRB and MCWB consist of two rectangular, approximately 15-acre impoundments, separated by a narrow berm, located adjacent to one another. Golder prepared the 2021 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

To comply with the CCR Rule, NIPSCO and Golder decided to monitor the MSRB, MCWB, and Drying Area as one CCR Unit due to the proximity of the MSRB, MCWB, and the Drying Area to one another, and because there are no practical means of monitoring groundwater between the impoundments. The CCR Unit is currently in Assessment Monitoring pursuant to 40 CFR §257.95. Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of groundwater samples for laboratory analysis.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2021 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit and monitoring well locations
- Summarizes key CCR Rule groundwater activities completed during calendar year 2021
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2021
- Describes any problems encountered during the monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year

# 2.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM OVERVIEW OF CURRENT STATUS

Starting in 2016 following the installation of a groundwater monitoring system (Table 1) and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring at the CCR Unit pursuant to the requirements of 40 CFR §257.94. Due to the identification of significantly statistical increases (SSIs) in January 2018, NIPSCO established an Assessment Monitoring program in April 2018 pursuant to the requirements of 40 CFR §257.95. In 2018, Golder performed the first and second Assessment Monitoring sampling events. Following the first Assessment Monitoring sampling event, including verification sampling, NIPSCO posted a notification to the publicly-accessible website that there were detections of 40 CFR Part 257 Appendix IV parameters downgradient of the MSRB, MCWB, and Drying Area above applicable groundwater

protection standards (GWPS). Consequently, NIPSCO initiated the assessment of corrective measures (ACM). process in November 2018. Golder performed subsequent monitoring events including:

- Third and fourth Assessment Monitoring events in 2019
- Fifth and sixth Assessment Monitoring events in 2020
- Seventh and Eighth Assessment Monitoring events in 2021

The sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling associated with the seventh and eighth Assessment Monitoring events are provided in Table 2. The 2021 analytical results are presented in Table 3. The CCR Unit began and ended the current annual reporting period in Assessment Monitoring pursuant to §257.95. Golder identified cobalt as an Appendix IV statistically significant level (SSL) in a groundwater sample collected from monitoring well GAMW-08 in 2021.

NIPSCO completed the assessment of corrective measures for groundwater impacts and prepared the ACM Report in April 2019. NIPSCO prepared Addendum #1 to the ACM Report in November 2020 and Addendum #2 to the ACM Report in July 2021. NIPSCO is continuing to evaluate the feasibility and design of potential groundwater remedial alternatives in accordance with the provisions of 40 CFR §259.97(a). NIPSCO has not selected a groundwater remedy nor completed the pond closure activities; therefore, no remediation activities were performed in 2021. NIPSCO will schedule a public meeting to present the proposed remedial approach for public comment at least 30 days prior to the selection of remedy.

## 2.1 Key Actions Completed - 2021

NIPSCO completed the following key actions relative to CCR Rule groundwater monitoring at the MSRB, MCWB, and Drying Area during calendar year 2021:

- Preparation of the 2020 Groundwater Monitoring and Corrective Action Annual Report in January 2021 (2020 Annual Report, 40 CFR §257.90(e))
- Evaluation of the results of the sixth Assessment Monitoring event in February 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the GWPS in March 2021 (40 CFR §257.95(g))
- Performance of the seventh Assessment Monitoring event in April 2021 (40 CFR §257.95)
- Preparation of the fourth semi-annual Selection of Remedy Progress Report in April 2021 (40 CFR §257.97)
- Preparation of Addendum #2 to the Assessment of Corrective Measures Report in July 2021 (40 CFR §257.96)
- Evaluation of the results of the seventh Assessment Monitoring event in August 2021 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the GWPS in September 2021 (40 CFR §257.95(g))
- Performance of the eighth Assessment Monitoring event in September/October 2021 (40 CFR §257.95)
- Preparation of the fifth semi-annual Selection of Remedy Progress Report in October 2021 (40 CFR §257.97)

## 2.2 Monitoring System Modifications

The groundwater monitoring system did not require any modifications in 2021 (see Figure 2). Attached Table 1 provides a summary of the well rationale/purpose and date of installation. An overview of the modified groundwater monitoring network is provided in the embedded table below.

| Background Monitoring Wells | Downgradient Monitoring Wells | Assessment Monitoring Wells |
|---|---|---|
| GAMW-04, GAMW-07, GAMW-07B, GAMW-15 and GAMW-15B | GAMW-08, GAMW-08B, GAMW-09, GAMW-09B, GAMW-16R, GAMW-16BR, GAMW-17, GAMW-17B, GAMW-18 and GAMW-18B | GAMW-46, GAMW-46B, GAMW-52, GAMW-52B, GAMW-53, GAMW-53B, GAMW-54, GAMW-54B, GAMW-55R, GAMW-55B, GAMW-56, and GAMW-56B |

## 2.3 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, Golder collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. Golder used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. Golder submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of 40 CFR Part 257 Appendix III and Appendix IV constituents. In addition, Golder personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set is included in the 2017 CCR Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report, Golder 2018).

Golder performed a periodic update of background datasets, which includes incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The CCR Rule Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). Golder incorporated the new data into the background dataset, updated the GWPS, in March 2020.

## 2.4 Detection Monitoring

Golder performed the first Detection Monitoring event in October 2017, followed by a statistical evaluation and data analysis in January 2018. Golder collected groundwater samples from the CCR Unit background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report. Following receipt and validation of laboratory results, Golder evaluated the results of the first Detection Monitoring sampling event to compare the concentration of 40 CFR Part 257 Appendix III constituents relative to facility background concentrations. Using Sanitas™ software, Golder pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to identify SSIs. Due to the identification of SSIs, NIPSCO established an Assessment Monitoring program in April 2018.

## 2.5 Assessment Monitoring

Golder performed the first Assessment Monitoring event (i.e., Assessment and Verification sampling) in March and April 2018, followed by a statistical evaluation and data analysis in August 2018. In March 2018, Golder collected groundwater samples from each background and downgradient monitoring well for analysis of Appendix IV constituents per 40 CFR §257.95. In April 2018, groundwater samples were collected at the downgradient monitoring well locations and analyzed for Appendix III and detected Appendix IV constituents per 40 CFR §257.95. In August 2018, Golder developed GWPS to compare with the Assessment Monitoring results. Following receipt and validation of laboratory results, Golder evaluated the 40 CFR Part 257 Appendix IV constituent results relative to CCR Unit-specific GWPS (see Table 4). At the time of the statistical evaluation the GWPS was the higher value of either the Maximum Contaminant Level (MCL) or the CCR Unit-specific background concentration for each analyte calculated using a tolerance/prediction limit procedure in accordance with 40 CFR §257.95(h)(2). Results from the downgradient monitoring wells were evaluated by comparing the lower confidence limit (LCL) to the CCR Unit-specific GWPS for each 40 CFR Part 257 Appendix IV analyte at each well. If the LCL exceeds the GWPS, there is statistical evidence of a statistically significant level (SSL). Golder determined that SSLs existed for the MSRB, MCWB, and Drying Area in August 2018 and initiated the assessment of corrective measures in November 2018.

Golder performed additional Assessment Monitoring events by collecting groundwater samples from each background and downgradient monitoring well per 40 CFR §257.95 including:

- Second Assessment Monitoring Event – October 2018: Golder performed the second Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the second Assessment Monitoring sampling event in February 2019. The results identified an SSL for cobalt at GAMW-08. The results from the first and second Assessment Monitoring events are included in the 2018 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2019 (2018 Annual Report, Golder 2019).
- Third Assessment Monitoring Event – April 2019: Golder performed the third Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the third Assessment Monitoring sampling event in August 2019. The results confirmed the SSLs cobalt at GAMW-08.
- Fourth Assessment Monitoring Event – November 2019: Golder performed the fourth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the second Assessment Monitoring sampling event in March 2020. The groundwater results confirmed the SSL for cobalt at well GAMW-08. The results from the third Assessment Monitoring event are included in the 2019 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2020 (2019 Annual Report, Golder 2020).
- Boundary Well Sampling – 2019: Golder collected groundwater samples from property boundary Assessment Monitoring wells GAMW-46/46B (see Figure 2) in March, April, June, July, August, October, and November 2019. SSLs were not identified in these groundwater samples. These results are included in the 2019 Annual Report (Golder, 2020).

- Fifth Assessment Monitoring Event – April/May 2020: Golder performed the fifth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the third Assessment Monitoring sampling event in September 2020. The results confirmed the SSLs cobalt at GAMW-08.
- Sixth Assessment Monitoring Event – October 2020: Golder performed the sixth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the second Assessment Monitoring sampling event in February 2021. The groundwater results confirmed the SSL for cobalt at well GAMW-08. The results from the fifth and sixth Assessment Monitoring events are included in the 2020 Annual Report (Golder 2021).
- Seventh Assessment Monitoring Event – April 2021: Golder performed the seventh Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and Appendix IV constituents. Golder performed the statistical evaluation of the analytical results of the third Assessment Monitoring sampling event in August 2021. The results confirmed the SSLs cobalt at GAMW-08.
- Eighth Assessment Monitoring Event – September/October 2021: Golder performed the eighth Assessment Monitoring event by collecting groundwater samples for analysis of Appendix III and detected Appendix IV constituents. Golder will perform the statistical evaluation of the analytical results of the eighth Assessment Monitoring sampling event in January 2022.

## 2.6 Corrective Action

NIPSCO is evaluating the feasibility and design of the potential groundwater remedial alternatives presented in the Assessment of Corrective Measures (ACM) report (Golder, 2019). As discussed in the ACM, NIPSCO plans to close this CCR Unit by removal in accordance with 40 CFR §257.102(c). NIPSCO submitted a Closure Application to the Indiana Department of Environmental Management (IDEM) in April 2019. In November 2020, Golder submitted Addendum #1 to the Assessment of Corrective Measures Report that provided further details of Golder's evaluation of the potential corrective measures. Golder performed the following remedy selection-related activities in 2021:

- NIPSCO continued to refine the Closure Application/Design of the MCU in response to IDEM comments and submitted the final Closure Application on May 13, 2021.
- Following submittal of the final Closure Application and confirmation that IDEM was in general agreement with the modified cap design, Golder prepared the MCU Assessment of Corrective Measures - Addendum #2 to reevaluate the list of potential corrective measures identified in the ACM based on their compatibility with the modified cap design. ACM Addendum #2 revised and updated information provided in the predecessor documents and incorporated the low permeability cap design in all corrective measure alternatives identified in the ACM and in Addendum #1, effectively eliminating four of the ACM alternatives from further consideration.
- Golder performed additional engineering evaluations of the four remaining alternatives accounting for the low permeability cap design and its impact on the selection of remedy for groundwater Corrective Measures.

In 2022, Golder will continue to prepare a detailed evaluation/comparison of the groundwater corrective measure alternatives, including conceptual designs and engineering cost estimates, that will provide NIPSCO with sufficient

information to select a remedy that effectively meets the requirements of 40 CFR §257.97 including protection of public health and the environment. This detailed evaluation/comparison of corrective measures will be documented in a future Selection of Remedy Report for the CCR Unit.

## 2.7 Statistical Evaluation

After each monitoring event, Golder assessed the analytical data for outliers, anomalies, and trends that might be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur because of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence upon groundwater quality. Appropriate statistical methods are used to remove outliers from the database and manage trends with detrending routines, prior to the calculation of statistical limits. To assess the data for outliers, anomalies, and trends, Golder assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package.

In addition to the outliers identified in the 2018 Annual Report and 2020 Annual Report, Golder identified the following outliers in 2021 (no outliers were identified in the 2019 Annual Report).

Golder identified all groundwater data obtained from GAMW-15, GAMW-15B, GAMW-16R, and GAMW-16BR in October 2020 and April 2021 as outliers and removed these data from the data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified several of the results from each event as outliers; and
- In Summer 2020, NIPSCO performed planned dewatering activities in near these wells during construction activities to divert discharges to the MCU. Trend charts indicate that the dewatering activities drastically affected the October 2020 data. The April 2021 data indicate that the results are trending toward preconstruction concentrations.

Golder identified the April 2021 pH results from GAMW-09, GAMW-09B, and GAMW-18 as outliers and removed these data from the data set for the following reasons:

- Statistical testing, including the Dixon outlier test, identified these results as outliers;
- Trend charts indicated that these results were inconsistent with other concentrations detected in these wells; and
- The pH field calibration check associated with these samples failed.

Golder evaluated the background data set for trends using Sanitas™ software. Golder will continue to monitor trends and apply detrending routines, if applicable, before using these data to calculate GWPS. Golder identified the following 40 CFR Part 257 Appendix IV parameter trends in background monitoring wells:

- Antimony concentrations detected in groundwater samples collected from GAMW-07 show a decreasing trend. Antimony has never been detected at concentrations above the laboratory reporting limit in groundwater samples collected from this well and all background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

- Arsenic concentrations detected in groundwater samples collected from wells GAMW-07 and GAMW-15B show a decreasing trend, arsenic has never been detected at concentrations above the above the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Barium concentrations detected in groundwater samples collected from well GAMW-15B show an increasing trend. All barium background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Beryllium concentrations detected in groundwater samples collected from wells GAMW-07, GAMW-15, and GAMW-15B show a decreasing trend. Beryllium has never been detected at concentrations above the laboratory reporting limit in these wells and all background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Cadmium concentrations detected in groundwater samples collected from wells GAMW-04, GAMW-15, and GAMW-15B show a decreasing trend. All background results are below the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.
- Lead concentrations detected in groundwater samples collected from well GAMW-15B show a decreasing trend. Lead has never been detected at concentrations above the laboratory reporting limit in this well and all background results are below the health-based standard, therefore, the GWPS is equal to the health-based standard. No detrending routines are required.
- Lithium concentrations detected in groundwater samples collected from well GAMW-15B show an increasing trend. All results are below the health-based standard, therefore, the GWPS is equal to the health-based standard. No detrending routines are required.
- Thallium concentrations detected in groundwater samples collected from wells GAMW-04, GAMW-07, and GAMW-15 show a decreasing trend. All results are below the laboratory reporting limit and the MCL, therefore, the GWPS is equal to the MCL. No detrending routines are required.

## 2.8 Problems Encountered and Follow-Up Corrective Actions

One cooler containing the radium samples collected from GAMW-54 and GAMW-54B in the seventh Assessment Monitoring event (April 2021), was delayed during shipping. The samples were received approximately one month after collection. Since the radium analyses have no temperature requirements and the samples were received within the method holding time, the samples were analyzed despite the shipping delay. No follow-up corrective action was required.

During the seventh Assessment Monitoring event (April 2021), the pH calibration check failed on April 20, 2021. Samples were collected from wells GAMW-09, GAMW-09B, and GAMW-18 on this date. The pH values for these samples were 1 to 3 standard pH units higher than all previous events and were removed from the dataset as outliers. Golder performed maintenance on the groundwater quality meter used for sampling on April 20, 2021 and subsequent calibration checks passed.

During the seventh Assessment Monitoring event (April 2021), Golder collected groundwater from monitoring wells GAMW-15, GAMW-16BR, GAMW-54, GAMW-54B, and GAMW-56B at turbidity levels of approximately 9.82, 7.82, 6.79, 6.74, and 6.72 nephelometric turbidity units (NTUs), respectively. During the eighth Assessment Monitoring event (September/October 2021), groundwater was sampled from monitoring wells GAMW-04, GAMW-15, GAMW-16BR at turbidity levels of approximately 7.06, 6.36, and 20.19NTUs, respectively. According

to the CCR Groundwater Monitoring Program Implementation Manual (Golder 2017), groundwater samples will be collected once groundwater has achieved a turbidity level below 5 NTUs. Due to time constraints in the field, Golder purged groundwater from the wells for a minimum of two hours and sampled when turbidity appeared to stabilize (e.g., no downward or upward trend over three consecutive readings five minutes apart). Evaluation of the analytical results from these wells suggests that the slightly elevated turbidity levels had no significant effect on the representativeness of the samples of groundwater quality. During future monitoring events, Golder will purge groundwater for two hours or five well volumes, whichever is shorter. Golder will use professional judgement to assess whether purge water is representative of groundwater for sampling. If an acceptable turbidity level cannot be achieved within a reasonable timeframe (e.g., three hours), Golder will redevelop the affected monitoring wells prior to the next sampling event.

# 3.0 KEY ACTIVITIES PROJECTED FOR 2022

During calendar year 2022, NIPSCO anticipates conducting the following key CCR Rule groundwater monitoring activities for the MSRB, MCWB, and Drying Area:

- Prepare and submit the appropriate notifications according to the CCR Rule;
- Continue semi-annual Assessment Monitoring groundwater sampling per CCR Rule requirements;
- Continue to evaluate potential remedial alternatives and prepare semi-annual reports describing the progress in selecting and designing the remedy; and
- Inspect and maintain the monitoring system including wells, pumps, and equipment.

# 4.0 REFERENCES

Golder Associates, “2017 Annual Groundwater Monitoring and Corrective Action Report- Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area NIPSCO R. M. Schahfer Generating Station”, January 31, 2018.

Golder Associates, “2018 Annual Groundwater Monitoring and Corrective Action Report- Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area NIPSCO R. M. Schahfer Generating Station”, January 31, 2019.

Golder Associates, “2019 Annual Groundwater Monitoring and Corrective Action Report- Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area NIPSCO R. M. Schahfer Generating Station”, January 31, 2020.

Golder Associates, “2020 Annual Groundwater Monitoring and Corrective Action Report- Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area NIPSCO R. M. Schahfer Generating Station”, January 31, 2021.

Golder Associates, “CCR Assessment of Corrective Measures,” April 19, 2019.

Golder Associates, “CCR Groundwater Monitoring Implementation Manual” October 2017.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #19-01” October 16, 2019.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #20-01” April 13, 2020.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #20-02” October 9, 2020.

Golder Associates, “CCR Assessment of Corrective Measures Report – Addendum” November 30, 2020.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #21-01” April 9, 2021.

Golder Associates, “CCR Assessment of Corrective Measures Report- Addendum #2” July 29, 2021.

Golder Associates, “NIPSCO R.M. Schahfer Generating Station, CCR Unit Consisting of MSRB, MCWB, and DA Corrective Measures Selection of Remedy, Semi-Annual Progress Report #21-02” October 11, 2021.

# TABLES

**Table 1 Monitoring Well Network**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| CCR Unit | Well Purpose | Monitoring Well ID | Installation Date | Decommission Date (If Applicable) | Basis For Action |
|---|---|---|---|---|---|
| Material Storage Runoff Basin, Metal Cleaning Waste Basin, and Drying Area | Background Monitoring Well | GAMW-04 | 6/27/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-07 | 6/29/2015 | - | |
| | | GAMW-15 | 5/25/2016 | - | |
| | | GAMW-15B | 5/24/2016 | - | |
| | | GAMW-07B | 7/25/2018 | - | Installed to provide additional groundwater quality data |
| | Downgradient Monitoring Well | GAMW-08 | 6/28/2015 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-09 | 6/28/2015 | - | |
| | | GAMW-09B | 5/24/2016 | - | |
| | | GAMW-16 | 5/26/2016 | NA | Removed during construction activities[5] |
| | | GAMW-16R | 9/23/2020 | - | Installed to replace GAMW-16[5] |
| | | GAMW-16B | 5/25/2016 | 9/22/2020 | Decommissioned due to construction activities[6] |
| | | GAMW-16BR | 9/22/2020 | - | Installed to replace GAMW-16B[6] |
| | | GAMW-17 | 5/25/2016 | - | Installed for groundwater quality monitoring[1] |
| | | GAMW-17B | 5/25/2016 | - | |
| | | GAMW-18 | 5/24/2016 | - | |
| | | GAMW-08B | 7/25/2018 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-18B | 7/26/2018 | - | |
| | | GAMW-52 | 7/30/2018 | - | |
| | | GAMW-52B | 7/30/2018 | - | |
| | | GAMW-53 | 7/30/2018 | - | |
| | | GAMW-53B | 7/30/2018 | - | |
| | | GAMW-54 | 7/30/2018 | - | |
| | | GAMW-54B | 7/27/2018 | - | |
| | | GAMW-55 | 7/26/2018 | 6/8/2019 | Decommissioned due to well casing damage[4] |
| | | GAMW-55R | 6/8/2019 | - | Installed to replace GAMW-55[4] |
| | | GAMW-55B | 7/26/2018 | - | Installed to characterize the nature and extent of a potential release[2] |
| | | GAMW-56 | 7/27/2018 | - | |
| | | GAMW-56B | 7/27/2018 | - | |
| | | GAMW-46 | 5/15/2018 | - | Installed to monitor groundwater quality at the property boundary[3] |
| | | GAMW-46B | 5/15/2018 | - | |

Notes:

1) Per 40 CFR §257.93, Golder collected eight rounds of background data prior to October 17, 2017.

2) Per 40 CFR §257.95(g)(1)(i) Rule requirements, Golder collected additional data to further characterize the nature and extent of potential groundwater impacts.

3) Per 40 CFR §257.95(g)(1)(iii), Golder collected data to monitor groundwater quality in the direction of flow at the property boundary

4) Golder field personnel were unable to collect a groundwater sample from monitoring well GAMW-55 during the April 2019 Assessment Monitoring sampling event due to surface damage (i.e., tubing above the permanent pump was pinched at less than 10 feet below ground surface). The well was replaced with GAMW-55R in June 2019.

5) Monitoring well GAMW-16 was completely removed during construction excavation activities in 2020. No decommissioning was required. The well was replaced with GAMW-16R in September 2020.

6) Monitoring well GAMW-16B was decommissioned during construction activities in 2020. The well was replaced with GAMW-16BR in September 2020.

NA= Not applicable

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

**Table 2: Summary of Sampling Events**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Well Purpose | Monitoring Well ID | Sample Event #16 | Sample Event #17 | Total Number of Samples |
|---|---|---|---|---|
| Purpose of Sample | | Annual Assessment Monitoring | Semi-Annual Assessment Monitoring | |
| Sample Parameters | | Appendix III and Appendix IV | Appendix III and Detected Appendix IV | |
| Background Monitoring Well | GAMW-04 | 4/15/2021 | 9/23/2021 | 2 |
| | GAMW-07 | 4/16/2021 | 9/21/2021 | 2 |
| | GAMW-07B | 4/16/2021 | 9/23/2021 | 2 |
| | GAMW-15 | 4/16/2021 | 9/22/2021 | 2 |
| | GAMW-15B | 4/16/2021 | 9/22/2021 | 2 |
| Downgradient Monitoring Well | GAMW-08 | 4/22/2021 | 9/24/2021 | 2 |
| | GAMW-08B | 4/22/2021 | 9/24/2021 | 2 |
| | GAMW-09 | 4/20/2021 | 9/23/2021 | 2 |
| | GAMW-09B | 4/20/2021 | 9/23/2021 | 2 |
| | GAMW-16R | 4/22/2021 | 9/21/2021 | 2 |
| | GAMW-16BR | 4/22/2021 | 9/21/2021 | 2 |
| | GAMW-17 | 4/14/2021 | 9/22/2021 | 2 |
| | GAMW-17B | 4/14/2021 | 9/22/2021 | 2 |
| | GAMW-18 | 4/20/2021 | 9/16/2021 | 2 |
| | GAMW-18B | 4/21/2021 | 9/17/2021 | 2 |
| | GAMW-46 | 4/27/2021 | 9/15/2021 | 2 |
| | GAMW-46B | 4/27/2021 | 9/15/2021 | 2 |
| | GAMW-52 | 4/16/2021 | 9/30/2021 | 2 |
| | GAMW-52B | 4/16/2021 | 9/30/2021 | 2 |
| | GAMW-53 | 4/16/2021 | 9/30/2021 | 2 |
| | GAMW-53B | 4/16/2021 | 9/30/2021 | 2 |
| | GAMW-54 | 4/19/2021 | 10/1/2021 | 2 |
| | GAMW-54B | 4/19/2021 | 10/1/2021 | 2 |
| | GAMW-55R | 4/20/2021 | 10/1/2021 | 2 |
| | GAMW-55B | 4/20/2021 | 10/1/2021 | 2 |
| | GAMW-56 | 4/20/2021 | 10/4/2021 | 2 |
| | GAMW-56B | 4/21/2021 | 10/4/2021 | 2 |
| Total Number of Samples | | 27 | 27 | 54 |

**Notes:**
Sample counts do not include QA/QC samples.
(1) Sample events #1-#15 were completed prior to 2021. The purpose, sample parameters, and sample dates are included in the 2017, 2018, 2019, and 2020 Annual Reports.
(2) Semi-annual assessment monitoring parameters did not include radium.
(3) Sample events #16 and 17 correspond to the seventh and eighth Assessment Monitoring events, respectively.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

**Table 3: Analytical Data**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Location | | CAMW34 | | | CAMW37 | | | CAMW07E | | CAMW09 | | CAMW09E | | CAMW09 | | CAMW09B | | | CAMW15 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2021-04-15 | 2021-09-23 | | 2021-04-16 | 2021-09-21 | | 2021-04-16 | 2021-09-23 | 2021-04-22 | 2021-09-24 | 2021-04-22 | 2021-09-24 | 2021-04-20 | 2021-09-23 | 2021-04-20 | | 2021-09-23 | 2021-04-16 | 2021-09-22 |
| Sample Type | | N | FD | N | N | FD | N | N | N | N | N | N | N | N | N | FD | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.1 | 0.36 | 0.35 | 0.81 | 0.91 | 0.85 | 5.9 | 6.9 | 0.89 | 1.1 | 7.7 | 8.4 | 3.5 | 3.8 | 8.1 | 6.2 | 6.7 | 8 D | 3.5 |
| Calcium | mg/L | 173 | 108 | 107 | 198 | 215 | 212 | 327 | 373 | 266 | 260 | 196 | 235 | 166 | 227 | 189 | 177 | 183 | 180 D | 136 |
| Chloride | mg/L | 3.2 | 3.7 | 3.6 | 11.7 | 11.9 | 12 | 38 | 60.3 | 50 | 14.9 | 175 | 179 | 41.8 | 64.7 | 102 | 64 | 113 | 99.3 D | 49.6 |
| Fluoride | mg/L | 0.2 | 0.35 | 0.35 | 0.66 | 0.85 | 0.85 | 0.79 | 0.65 | 0.97 | 0.44 | 0.9 | 0.73 | 0.26 | 0.54 | 1.4 | 1.4 | 1.3 | 0.76 D | 0.77 J- |
| pH | SU | 7.26 | | 7.4 | 7.14 | | 7.14 | 7.94 | 7.58 | 7.04 | 7.04 | 7.49 | 7.44 | 8.48 D | 7.51 | | 10.49 D | 7.56 | 7.1 D | 7.12 |
| Sulfate | mg/l | 375 | 116 | 121 | 352 | 362 | 358 | 1010 | 1060 | 477 | 841 | 751 | 1060 | 418 | 909 | 582 J | 1040 J | 773 | 371 D | 265 |
| Total Dissolved Solids | mg/L | 726 | 381 | 380 | 840 | 887 | 894 | 1700 | 1790 | 1120 | 2380 | 1620 | 2040 | 959 | 1040 | 1030 | 952 | 1430 | 770 D | 675 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U |
| Arsenic | mg/l | 0.0018 | 0.0041 | 0.0036 | 0.001 U | 0.0012 | 0.0013 | 0.0022 | 0.0022 | 0.001 U | 0.0013 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0033 | 0.0034 | 0.0031 | 0.046 D | 0.09 |
| Barium | mg/L | 0.079 | 0.057 | 0.056 | 0.048 | 0.053 | 0.052 | 0.041 | 0.037 | 0.07 | 0.076 | 0.039 | 0.046 | 0.037 | 0.053 | 0.039 | 0.035 | 0.059 | 0.038 D | 0.05 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UQ | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.00022 | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UQ | 0.0002 U |
| Chromium | mg/l | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 UQ | 0.002 U |
| Cobalt | mg/L | 0.0016 | 0.001 U | 0.001 U | 0.0026 | 0.0061 | 0.006 | 0.0011 | 0.004 U | 0.017 | 0.015 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.003 D | 0.0021 |
| Fluoride | mg/L | 0.2 | 0.35 | 0.35 | 0.66 | 0.85 | 0.85 | 0.79 | 0.65 | 0.97 | 0.44 | 0.9 | 0.73 | 0.26 | 0.54 | 1.4 | 1.4 | 1.3 | 0.76 D | 0.77 J- |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U |
| Lithium | mg/l | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.0091 | 0.0085 | 0.008 U | 0.013 | 0.012 | 0.015 | 0.012 | 0.014 | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.0095 | 0.008 UQ | 0.01 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UQ | 0.0002 U |
| Molybdenum | mg/L | 0.008 | 0.015 | 0.016 | 0.0078 | 0.01 | 0.01 | 0.029 | 0.023 | 0.034 | 0.043 | 0.011 | 0.01 | 0.04 | 0.058 | 0.012 | 0.012 | 0.015 | 0.023 D | 0.027 |
| Radium, Total | pci/l | 0.859 U | | | 1.29 U | | | 2.16 | | 1.87 | | 2.53 | | 0.619 U | | 0.934 U | 1.67 J | | 0.191 UQ | |
| Selenium | mg/l | 0.0033 | 0.001 U | 0.001 U | 0.0055 | 0.0044 | 0.0039 | 0.001 U | 0.004 U | 0.01 | 0.005 | 0.001 U | 0.001 U | 0.0053 | 0.0079 | 0.001 U | 0.001 U | 0.001 U | 0.0036 D | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.002 U | 0.001 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 1.71 | | 0.31 | 0.39 | | 0.25 | 0.23 | 0.26 | 1 | 0.35 | 0.29 | 0.27 | 3.42 | 6.2 | | 6.2 | 0.31 | 0.2 | 0.26 |
| Oxidation-Reduction Potential | millivolts | -23 | | 0.149 | 55.5 | | 0.1 | -174.1 | 0.274 | 22 | 19.3 | -170.1 | 0.218 | -20.8 | 0.2 | | -115.1 | 0.204 | -84.1 | 0.195 |
| pH | SU | 7.26 | | 7.4 | 7.14 | | 7.14 | 7.94 | 7.58 | 7.04 | 7.04 | 7.49 | 7.44 | 8.48 | 7.51 | | 10.49 | 7.56 | 7.1 | 7.12 |
| Specific Conductance | uS/cm | 950 | | 595 | 1064 | | 123 | 1970 | 2224 | 1452 | 167.2 | 2157 | 2863 | 970 | 138.1 | | 1159 | 201.2 | 1153 | 104.8 |
| Temperature | deg c | 9.24 | | 15.9 | 11.06 | | 17 | 12.2 | 14.7 | 11.2 | 18.6 | 13 | 15.2 | 10.6 | 18.7 | | 13.4 | 16.4 | 14.33 | 19.2 |
| Turbidity | ntu | 4.87 | | 7.08 | 5.4 | | 2.85 | 2.8 | 4.84 | 1.89 | 1.46 | 2.78 | 3.9 | 1.02 | 2.85 | | 4.28 | 3.02 | 9.87 | 6.36 |

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample, the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"O" = Indicates result is an outlier.

**Table 3: Analytical Data**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | CAMW15B | | | CAMW16R | | CAMW16BR | | CAMW17 | | CAMW17B | | CAMW18 | | CAMW18B | | | CAMW46 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 2021-04-15 | | 2021-09-23 | 2021-04-22 | 2021-09-21 | 2021-04-22 | 2021-09-21 | 2021-04-14 | 2021-09-22 | 2021-04-14 | 2021-09-22 | 2021-04-20 | 2021-09-16 | 2021-04-21 | 2021-09-17 | | 2021-04-27 | 2021-09-15 |
| | Sample Type | FD | N | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 32.7 O | 32.5 O | 28.1 | 3.6 O | 4.1 | 21.8 O | 25.3 | 1.3 | 12.5 | 10.2 | 7.3 | 3.1 | 5.9 | 8.4 | 8.2 | 8.2 | 0.1 U | 0.1 U |
| Calcium | mg/L | 355 O | 321 O | 352 | 410 C | 275 | 380 O | 265 | 139 | 346 | 164 | 155 | 436 | 466 | 317 | 325 | 323 | 29 | 25.3 |
| Chloride | mg/L | 372 O | 390 O | 269 | 61.1 O | 112 | 331 O | 516 | 79 | 176 | 136 | 105 | 40.3 | 97 | 112 | 90.8 | 89.3 | 2.1 | 2.1 |
| Fluoride | mg/L | 0.37 C | 0.35 O | 0.44 J- | 0.39 O | 0.57 | 0.41 O | 2.6 | 1.2 | 1.3 J- | 0.3 | 0.49 J- | 0.16 | 0.18 J- | 0.35 | 0.6 | 0.6 | 0.078 | 0.11 |
| pH | SU | | 7.15 O | 7.08 | 7.16 O | 7.1 | 7.21 O | 7.5 | 7.3 | 7.18 | 7.84 | 7.6 | 10.36 O | 7.1 | 7.51 | | 7.34 | 8.36 | 8.16 |
| Sulfate | mg/l | 566 O | 643 O | 900 | 1060 C | 633 | 723 O | 2570 | 358 | 964 | 549 | 965 | 1310 | 1160 | 1760 | 1100 | 1120 | 33 J+ | 31.8 |
| Total Dissolved Solids | mg/L | 1740 O | 1670 O | 2030 | 1850 C | 1270 | 2080 C | 5870 | 800 | 1890 | 1200 | 928 | 1440 | 2C20 | 3340 | 1830 | 2010 | 112 | 127 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0.001 U | 0.001 UO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/l | 0.001 UO | 0.001 UO | 0.001 U | 0.0047 O | 0.0086 | 0.001 UO | 0.0042 | 0.0074 | 0.0027 | 0.0012 | 0.0021 | 0.001 U | 0.001 U | 0.0035 | 0.0026 | 0.0027 | 0.001 U | 0.001 U |
| Barium | mg/L | 0.18 C | 0.18 O | 0.17 | 0.074 O | 0.09 | 0.073 O | 0.041 | 0.059 | 0.17 | 0.084 | 0.053 | 0.044 | 0.057 | 0.041 | 0.028 | 0.029 | 0.025 | 0.0044 |
| Beryllium | mg/L | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 UO | 0.0002 U | 0.0002 UO | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 UO | 0.0002 U | 0.0002 UO | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/l | 0.002 UO | 0.002 UO | 0.002 U | 0.002 UO | 0.002 U | 0.002 UO | 0.0025 | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.0011 O | 0.001 O | 0.001 U | 0.0064 O | 0.0036 | 0.001 UO | 0.001 U | 0.0012 | 0.001 U | 0.0015 | 0.001 U | 0.001 U | 0.0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.37 O | 0.35 O | 0.44 J- | 0.39 O | 0.57 | 0.41 O | 2.6 | 1.2 | 1.3 J- | 0.3 | 0.49 J- | 0.16 | 0.18 J- | 0.35 | 0.6 | 0.6 | 0.078 | 0.11 |
| Lead | mg/L | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0.001 U | 0.001 UO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/l | 0.011 O | 0.012 O | 0.028 | 0.008 UO | 0.011 | 0.033 O | 0.031 | 0.008 U | 0.021 | 0.008 U | 0.008 U | 0.008 U | 0.011 | 0.037 | 0.031 | 0.026 | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 UO | 0.0002 UO | 0.0002 U | 0.0002 UO | 0.0002 U | 0.0002 UO | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0012 O | 0.0012 O | 0.0029 | 0.027 O | 0.013 | 0.001 UO | 0.043 | 0.012 | 0.01 | 0.0058 | 0.012 | 0.082 | 0.14 | 0.074 | 0.03 | 0.031 | 0.001 U | 0.001 U |
| Radium, Total | pci/l | 2.99 C | 2.15 O | | 0.868 UO | | 2.06 O | | 1.05 U | | 1.47 U | | 0.538 U | | 2.14 | | | 1.28 U | |
| Selenium | mg/l | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0.001 U | 0.001 UO | 0.0013 | 0.01 | 0.0036 | 0.001 U | 0.001 U | 0.042 | 0.028 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 UO | 0.001 UO | 0.001 U | 0.001 UO | 0.001 U | 0.001 UO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | | 0.36 | 0.32 | 0.27 | 0.29 | 0.28 | 0.31 | 2.52 | 3.75 | 0.2 | 0.29 | 6.82 | 5.39 | 0.25 | | 0.19 | 1.59 | 1.26 |
| Oxidation-Reduction Potential | millivolts | | -85.7 | 0.184 | -78.9 | 0.208 | -85.1 | 0.212 | 29.8 | 10.2 | -117.5 | 0.215 | -84.3 | 56.6 | -104.5 | | 0.182 | 109.8 | -130 |
| pH | SU | | 7.15 | 7.08 | 7.16 | 7.1 | 7.21 | 7.5 | 7.3 | 7.18 | 7.84 | 7.6 | 10.36 | 7.1 | 7.51 | | 7.34 | 8.36 | 8.16 |
| Specific Conductance | uS/cm | | 2491 | 286.6 | 2025 | 185 | 2510 | 706.5 | 1152 | 236.5 | 1778 | 139.9 | 1899 | 246.9 | 2494 | | 247.3 | 238.2 | 235 |
| Temperature | deg c | | 17.5 | 17 | 15.08 | 25 | 16.38 | 16.5 | 11.85 | 21.8 | 15.18 | 16.7 | 10.29 | 21.4 | 17.15 | | 15.8 | 10.7 | 15.1 |
| Turbidity | ntu | | 1.1 | 1.7 | 4.65 | 1.79 | 2.82 | 26.19 | 1.25 | 1.47 | 1.44 | 4.92 | 2.84 | 3.74 | 4.19 | | 4.58 | 1.73 | 3.21 |

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample, the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"O" = Indicates result is an outlier.

**Table 3: Analytical Data**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | CAMW43B | | CAMW52 | | CAMW52B | | CAMW53 | | CAMW53B | | CAMW54 | | CAMW54B | | CAMW55R | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Date | 2021-04-27 | 2021-09-15 | 2021-04-16 | 2021-09-30 | 2021-04-16 | 2021-09-30 | 2021-04-16 | 2021-09-30 | 2021-04-16 | 2021-09-30 | 2021-04-19 | 2021-10-01 | 2021-04-19 | 2021-10-01 | 2021-04-20 | 2021-10-01 |
| | Sample Type | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.1 U | 0.1 U | 0.1 | 0.1 | 1.2 | 0.61 | 0.1 U | 0.1 U | 1.9 | 2.7 | 0.5 | 0.53 | 3.1 | 3.1 | 0.87 | 1.7 |
| Calcium | mg/L | 54.3 | 51 | 59.8 | 62.5 | 94.9 | 120 | 17.5 | 28.3 | 142 | 128 | 164 | 114 | 256 | 190 | 237 | 197 |
| Chloride | mg/L | 5.9 | 5.4 | 16.7 | 15.9 | 131 | 135 | 2.4 | 2.7 | 84.8 | 66.4 | 23.9 | 24.6 | 83.9 | 70.4 | 51.4 | 44.1 |
| Fluoride | mg/L | 0.077 | 0.12 | 0.22 | 0.3* | 0.24 | 0.38 | 0.05 U | 0.05 U | 0.4 | 0.46 | 0.2 | 0.5 | 0.53 | 0.52 | 0.46 | 0.51 |
| pH | SU | 7.69 | 7.73 | 7.6 | 7.6 | 7.46 | 7.57 | 5.76 | 6.17 | 7.28 | 7.48 | 6.52 | 6.52 | 7.3 | 7.36 | 7.6 | 7.27 |
| Sulfate | mg/L | 61 B,J+ | 55.3 | 55.8 | 50 | 181 | 156 | 35.7 | 49.4 | 904 | 795 | 492 | 191 | 891 | 501 | 867 | 789 |
| Total Dissolved Solids | mg/L | 190 | 243 | 269 | 270 | 573 | 667 | 97 | 147 | 746 | 802 | 730 | 503 | 1120 | 1030 | 842 | 943 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0013 | 0.0012 | 0.0017 | 0.001 U | 0.0014 | 0.0075 | 0.004 | 0.0044 | 0.004 | 0.001 U | 0.001 U |
| Barium | mg/L | 0.026 | 0.023 | 0.011 | 0.014 | 0.13 | 0.14 | 0.027 | 0.033 | 0.097 | 0.051 | 0.071 | 0.048 | 0.033 | 0.056 | 0.032 | 0.038 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.077 | 0.12 | 0.22 | 0.3* | 0.24 | 0.38 | 0.05 U | 0.05 U | 0.4 | 0.46 | 0.2 | 0.5 | 0.53 | 0.52 | 0.46 | 0.51 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.01 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0018 | 0.0018 | 0.0021 | 0.0025 | 0.013 | 0.011 | 0.0052 | 0.0097 | 0.016 | 0.011 | 0.011 | 0.025 | 0.017 | 0.025 | 0.013 | 0.017 |
| Radium, Total | pci/l | 1.66 U | | 0.29 U | | 1.05 U | | 0 U | | 1.21 U | | 0.894 U | | 1.43 | | 1.47 R | |
| Selenium | mg/L | 0.001 U | 0.001 U | 0.0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0018 | 0.001 U | 0.001 U | 0.0044 | 0.001 U | 0.001 U | 0.001 U | 0.0029 | 0.0048 |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.64 | 0.2 | 0.91 | 0.56 | 0.42 | 0.28 | 1.99 | 0.92 | 0.39 | 0.24 | 0.63 | 0.29 | 0.45 | 0.26 | 1.19 | 0.47 |
| Oxidation-Reduction Potential | millivolts | -101.9 | -241 | -231 | 0.38 | -175.5 | 0.741 | 111.7 | 94.9 | -104 | -232.6 | 61.7 | -163.5 | -125.3 | -211.7 | 32.3 | -16.8 |
| pH | SU | 7.69 | 7.73 | 7.6 | 7.6 | 7.46 | 7.57 | 5.76 | 6.17 | 7.28 | 7.48 | 6.52 | 6.52 | 7.3 | 7.36 | 7.6 | 7.27 |
| Specific Conductance | uS/cm | 351 | 388 | 545 | 601 | 1159 | 1104 | 173 | 201 | 1227 | 1256 | 1097 | 782 | 1626 | 1449 | 1319 | 1391 |
| Temperature | deg c | 11.37 | 12.2 | 12 | 20 | 15.8 | 18 | 12 | 20.4 | 17.6 | 20 | 11.8 | 20.1 | 14.3 | 17.3 | 11.3 | 20.6 |
| Turbidity | ntu | 4.98 | 4.5 | 1.79 | 1.38 | 5.9 | 1.27 | 4.66 | 4.5** | 3.27 | 3.67 | 8.79 | 3.78 | 8.74 | 8.54 | 2.35 | 1.58 |

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample, the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"O" = Indicates result is an outlier.

**Table 3: Analytical Data**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Location | CAMW55B | | CAMW56 | | CAMW56B | |
|---|---|---|---|---|---|---|---|
| | Sample Date | 2021-04-20 | 2021-10-01 | 2021-04-20 | 2021-10-04 | 2021-04-21 | 2021-10-04 |
| | Sample Type | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | |
| **CCR Appendix III** | | | | | | | |
| Boron | mg/L | 9.9 | 8.3 | 0.23 | 0.19 | 1.8 | 1.7 |
| Calcium | mg/L | 254 | 235 | 139 | 108 | 157 | 163 |
| Chloride | mg/L | 120 | 78.4 | 2.9 | 1.7 | 70.9 | 73.7 |
| Fluoride | mg/L | 0.3 | 0.3 | 0.35 J | 1 | 0.41 | 0.46 |
| pH | SU | 7.7 | 7.44 | 7.05 | 7.09 | 7.55 | 7.34 |
| Sulfate | mg/l | 565 | 435 | 57.6 | 64.8 | 277 | 265 |
| Total Dissolved Solids | mg/L | 1370 | 1120 | 480 | 378 | 738 | 602 |
| **CCR Appendix IV** | | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | mg/l | 0.001 U | 0.001 U | 0.007 | 0.0018 | 0.001 U | 0.001 U |
| Barium | mg/L | 0.061 | 0.05 | 0.042 | 0.04 | 0.071 | 0.081 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | mg/l | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.016 | 0.0043 | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.3 | 0.3 | 0.35 J | 1 | 0.41 | 0.46 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/l | 0.008 U | 0.012 | 0.008 U | 0.008 U | 0.008 U | 0.0091 |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0068 | 0.0053 | 0.0063 | 0.011 | 0.0074 | 0.0082 |
| Radium, Total | pci/l | 1.69 U | | 0.222 U | | 2.97 | |
| Selenium | mg/l | 0.001 U | 0.001 U | 0.001 | 0.001 U | 0.001 U | 0.001 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | |
| Dissolved Oxygen | mg/L | 0.65 | 0.26 | 1 | 0.37 | 0.23 | 0.29 |
| Oxidation-Reduction Potential | millivolts | -97.3 | -215.9 | 65.8 | -133.7 | -110.5 | -214.1 |
| pH | SU | 7.7 | 7.44 | 7.05 | 7.09 | 7.55 | 7.34 |
| Specific Conductance | uS/cm | 1596 | 1823 | 700 | 655 | 1100 | 1214 |
| Temperature | deg.c | 15.3 | 18.7 | 9 | 17.2 | 12 | 14.3 |
| Turbidity | ntu | 4.78 | 4.48 | 2.87 | 3.48 | 6.72 | 4.65 |

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
pCi/L = picocuries per liter
SU = Standard Units
"U" = Indicates the result was not detected above the method detection limit. (MDL) for the sample, the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"R" = Indicates the result is unusable. The sample result was rejected due to serious deficiencies in meeting quality control criteria, the analyte may or may not be present in the sample.
"OI" = Indicates result is an outlier.

Prepared by: SLG
Checked by: DFSC
Reviewed by: JSP

GOLDER
ARCADIS COMPANY

**Table 4: Groundwater Protection Standards**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

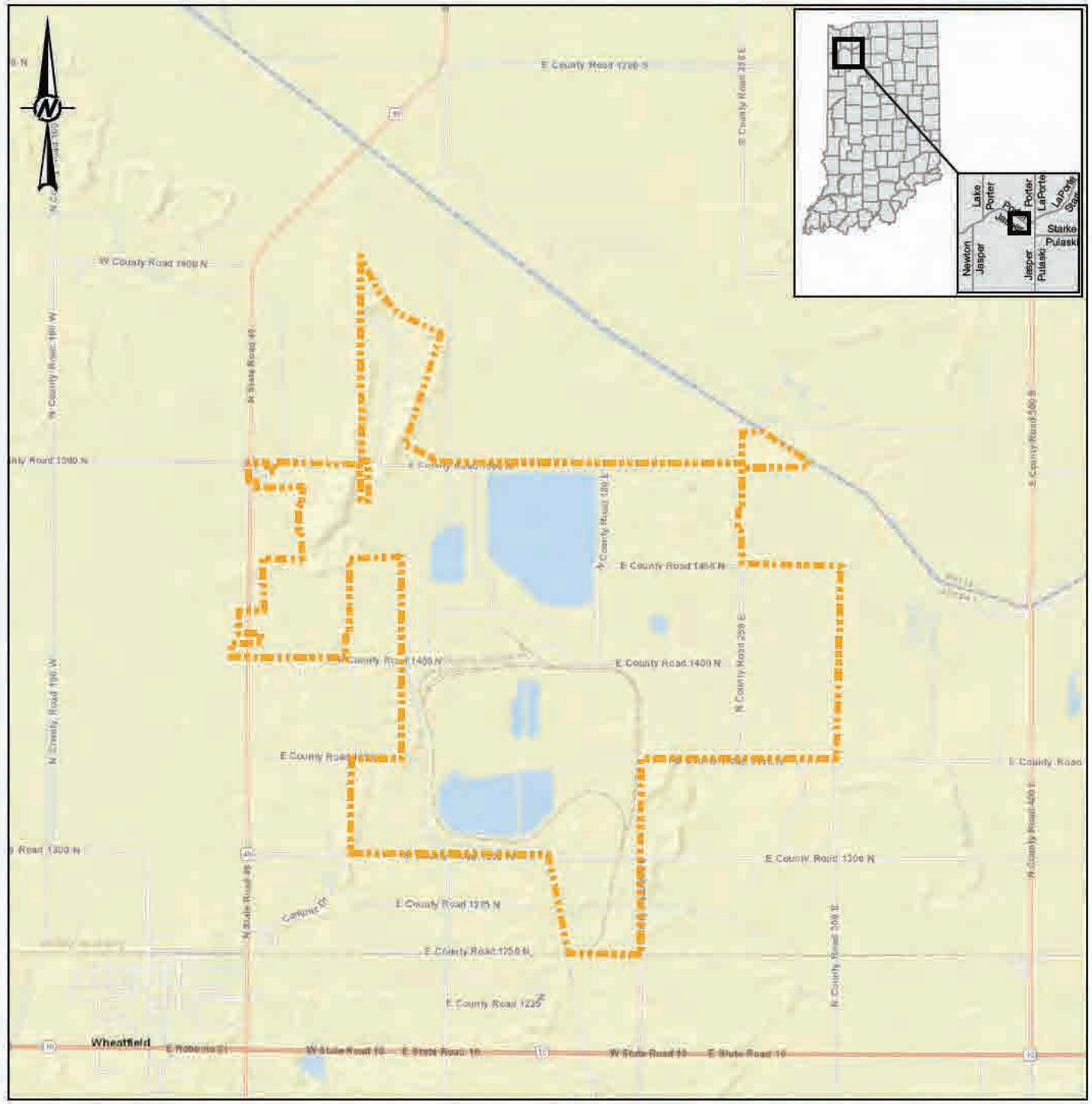
| Analyte | MCL (mg/L) | GWPS (mg/L)[2] | GWPS (mg/L)[3] |
|---|---|---|---|
| Antimony | 0.006 | 0.006 | 0.006 |
| Arsenic | 0.01 | 0.078 | 0.091 |
| Barium | 2 | 2 | 2 |
| Beryllium | 0.004 | 0.004 | 0.004 |
| Cadmium | 0.005 | 0.005 | 0.005 |
| Chromium | 0.1 | 0.1 | 0.1 |
| Cobalt[1] | 0.006 | 0.01 | 0.01 |
| Fluoride | 4 | 4 | 4 |
| Lead[1] | 0.015 | 0.015 | 0.015 |
| Lithium[1] | 0.04 | 0.04 | 0.04 |
| Mercury | 0.002 | 0.002 | 0.002 |
| Molybdenum[1] | 0.1 | 0.1 | 0.1 |
| Radium 226+228 | 5 | 5 | 5 |
| Selenium | 0.05 | 0.05 | 0.05 |
| Thallium | 0.002 | 0.002 | 0.002 |

**Notes:**
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard
mg/L= milligrams per liter

1) As of August 29, 2018, these four constituents have health-based standards that can be used when calculating the GWPS, these health-based standards are not MCLs but are provided in the MCL column.
2) GWPS calculated in August 2018.
3) GWPS calculated in March 2020.

Prepared by: KMC
Checked by: DFSC
Review by: JSP

# FIGURES




**LEGEND**

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

**REFERENCE(S)**

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

**SITE LOCATION MAP**

CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 1/4/2021 |
| DESIGNED | DFS |
| PREPARED | SHL |
| REVIEWED | JSP |
| APPROVED | MAH |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19121567 | A | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A




Assessment Monitoring Well

Background Monitoring Well

Downgradient Monitoring Well

Generalized Groundwater Flow Direction

CCR Units

Approximate Property Line

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

**WELL LOCATION MAP**
**MATERIAL STORAGE RUNOFF BASIN, METAL CLEANING WASTE BASIN, AND DRYING AREA**

GOLDER
MEMBER OF WSP

DESIGNED DPS

APPROVED MW

19121587 A 0 2




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MEMBER OF WSP

# 2021 Annual Groundwater Monitoring and Corrective Action Report Landfill Phase V, Phase VI, and Phase VII

*NIPSCO LLC R. M. Schahfer Generating Station*

Prepared Pursuant to 40 CFR §257.90(e) and Corresponding Regulations under 329 Indiana Administrative Code 10-9-1

Submitted to:

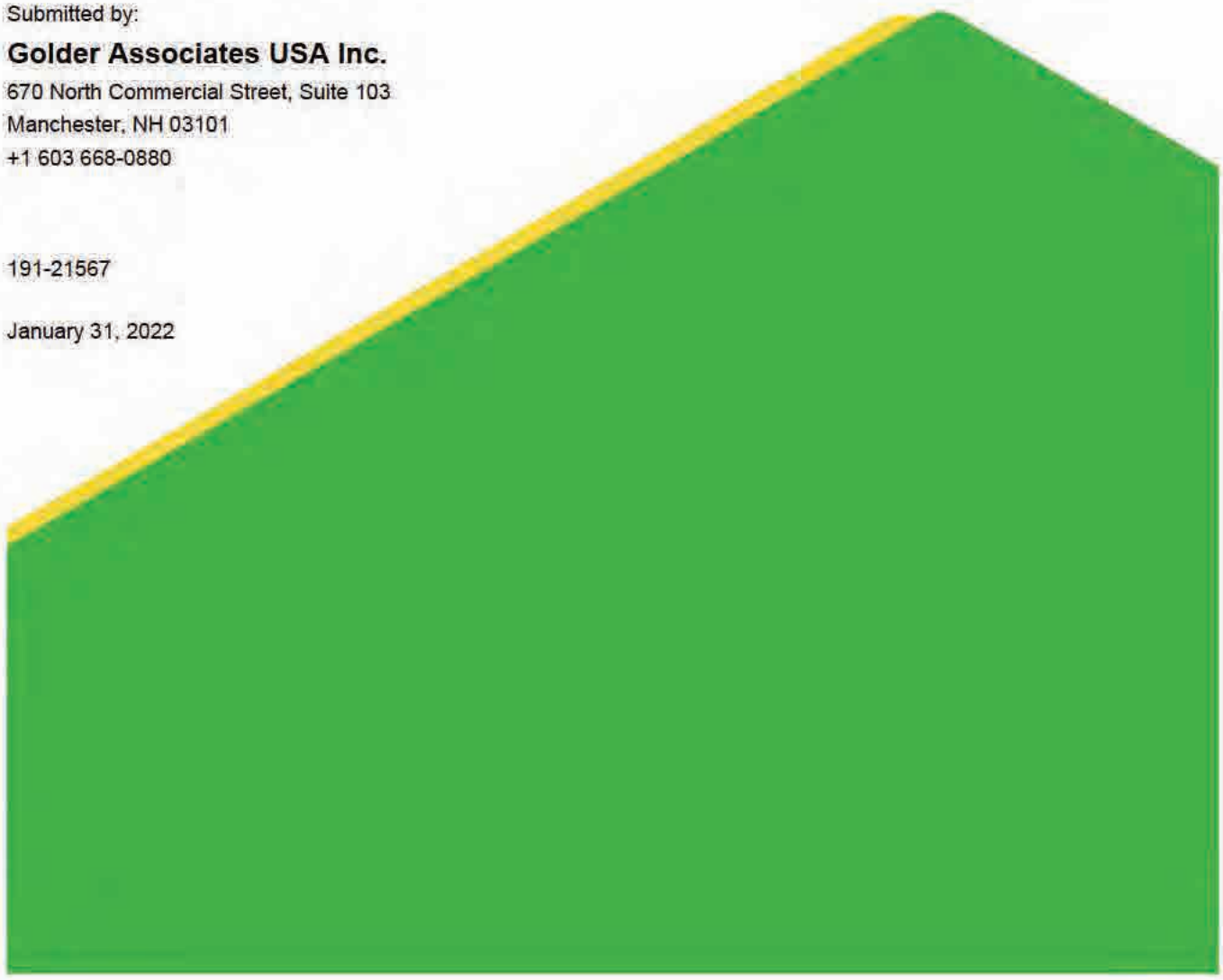
**Northern Indiana Public Service Company LLC**
R.M. Schahfer Generating Station
Wheatfield, Indiana

Submitted by:

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191-21567

January 31, 2022



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**APPENDIX A**
RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration March 2021

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RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration October 2021

# 1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc., *a member of WSP* (Golder), prepared this 2021 Annual Groundwater Monitoring and Corrective Action Report (2021 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) Landfill Phases V, VI, and VII (together, the CCR Unit) located at 2723 E 1500 N in Wheatfield, Jasper County, Indiana (Latitude 41° 12' 36" N and Longitude 87° 01' 48" W, see Figure 1). The three landfill phases include:

- Phase V is an approximately 18-acre cell that stopped receiving CCR on April 1, 2017
- Phase VI is an approximately 15-acre cell located due north of Phase V, which began receiving CCR on August 1, 2016 and stopped receiving CCR on June 25, 2021
- Phase VII is an approximately 14-acre lined cell located immediately north of Phase VI, which began receiving waste on June 24, 2021. NIPSCO designed Phase VII to meet the CCR Rule liner requirements.

Closed, non-regulated (under the CCR Rule) Schahfer Landfill Phases I through IV are primarily located east of the CCR Rule-regulated landfill cells as shown in Figure 2. Golder prepared the 2021 Annual Report in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals From Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

To comply with the CCR Rule, NIPSCO and Golder decided to monitor Phases V, VI, and VII as one CCR Unit due to the design, construction, and proximity of historical non-regulated landfill cells (i.e., Phases II and III) and because there is no practical means of monitoring groundwater between the three CCR landfill cells (i.e., Phases V, VI, and VII). NIPSCO updated the monitoring well network in 2018 concurrent with construction of Phase VII. The CCR Unit is currently in Detection Monitoring pursuant to 40 CFR §257.94. Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection to assess groundwater flow direction, and collection of samples for laboratory analysis.

In conformance with the applicable requirements of 40 CFR §257.90(e)(1) through (5) and corresponding State of Indiana requirements, the 2021 Annual Report:

- Documents the status of the groundwater monitoring and corrective action program
- Provides figures showing the CCR Unit and monitoring well locations
- Summarizes key CCR Rule groundwater activities completed during calendar year 2021
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2021
- Describes any problems encountered during monitoring activities
- Discusses actions taken to resolve the problems, if applicable
- Projects key activities for the upcoming year

## 2.0 GROUNDWATER MONITORING AND CORRECTIVE ACTION PROGRAM OVERVIEW OF CURRENT STATUS

Starting in 2016 following the installation of a groundwater monitoring system (Table 1) and throughout calendar years 2017 and 2018, Golder collected background groundwater samples and performed Detection Monitoring at the CCR Unit pursuant to the requirements of 40 CFR §257.94. Following the identification of statistically significant increases (SSIs) in January 2018, Golder prepared an alternative source demonstration (ASD) in April 2018, consequently, the CCR Unit remained in Detection Monitoring. Golder performed the fourth and fifth Detection Monitoring sampling events in 2019, the sixth and seventh Detection Monitoring sampling events in 2020, and the eighth and ninth Detection Monitoring events in 2021. The sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling associated with the eighth and ninth Detection Monitoring events are provided in Table 2. The 2021 analytical results are presented in Table 3. The SSIs identified in 2021 are summarized in the embedded table below.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH[1] | TDS |
|---|---|---|---|---|---|---|---|
| GAMW26 | | | | X | | | |
| GAMW27 | X | X | | | X | | X |
| GAMW27B | X | X | X | | X | | X |
| GAMW38B | X | X | | | X | | X |
| GAMW39B | X | X | X | | X | | X |
| GAMW40 | X | X | | | | | X |
| GAMW40B | X | | X | | X | X | X |
| GAMW41 | X | | X | | X | | X |
| GAMW41B | X | X | X | | X | | X |

"X" represents an SSI
1 = pH value is based on field water quality meter reading

Pursuant to 40 CFR §257.94, a qualified Indiana-licensed professional engineer recertified the ASD in March and October 2021; thus, the CCR Unit began and ended the current annual reporting period in Detection Monitoring. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, no corrective measures program requirements as outlined in 40 CFR §257.96-98 have either been triggered or implemented at the CCR Unit.

### 2.1 Key Actions Completed - 2021

NIPSCO completed the following key actions relative to CCR Rule groundwater monitoring at the CCR Unit during calendar year 2021:

- Preparation of the of 2020 Groundwater Monitoring and Corrective Action Annual Report in January 2021 (2020 Annual Report, 40 CFR §257.90(e))

- Recertification of the RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration (ASD) in March 2021 (40 CFR §257.94(e))
- Performance of the eighth Detection Monitoring event in April 2021 (40 CFR §257.94)
- Evaluation of the results of the eighth Detection Monitoring event in July 2021 (40 CFR §257.95(d))
- Performance of the ninth Detection Monitoring event in September 2021 (40 CFR §257.94)
- Recertification of the RMSGS Landfill Phases V, VI, and VII ASD in October 2021 (40 CFR §257.94(e))
- Evaluation of the results of the ninth Detection Monitoring event in December 2021 (40 CFR §257.95(d))

## 2.2 Monitoring System Modifications

The groundwater monitoring system did not require any modifications in 2021 (see Figure 2). Table 1 provides a summary of the well rationale/purpose and date of installation. An overview of the groundwater monitoring network is provided below.

| Background Monitoring Wells | Downgradient Monitoring Wells | Decommissioned Monitoring Wells |
|---|---|---|
| GAMW-20, GAMW-24, GAMW-24B, GAMW-25, GAMW-25B | GAMW-26, GAMW-26B, GAMW-27, GAMW-27B, GAMW-38, GAMW-38B, GAMW-39, GAMW-39B, GAMW-40, GAMW-40B, GAMW-41, GAMW-41B | GAMW-21, GAMW-21B, GAMW-22, GAMW-22B, GAMW-23, GAMW-23B, GAMW-28, GAMW-28B |

## 2.3 Background Monitoring (2016 to 2017)

Per the requirements of 40 CFR §257.94, Golder collected eight independent background groundwater samples from each background and downgradient well between July 2016 and August 2017. Golder used the results of the background monitoring phase to develop appropriate, statistically valid background values for each constituent/monitoring well. Golder submitted the samples to a contract laboratory, in accordance with chain of custody and quality assurance/quality control procedures, for analysis of 40 CFR Part 257 Appendix III and Appendix IV constituents. In addition, Golder personnel measured field water quality parameters including specific conductance, temperature, dissolved oxygen, turbidity, oxidation-reduction potential, and pH. The background data set is included in the 2017 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2018 (2017 Annual Report, Golder 2018).

Golder performed a periodic update of background datasets, which includes incorporation of additional background data, to improve statistical power and accuracy by providing a more conservative estimate of the true background populations. The CCR Rule Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) allows for the statistical limits to be updated after four to eight new measurements are available (i.e., every two to four years of semi-annual monitoring). Golder incorporated new data into the background dataset, updating the prediction limits, in June 2019 and July 2021.

## 2.4 Detection Monitoring

Golder performed the first Detection Monitoring event in October 2017, followed by a statistical evaluation and data analysis in January 2018. Golder collected groundwater samples from Landfill Phases V and VI background and downgradient monitoring wells for analysis of Appendix III constituents per 40 CFR §257.94 and included the results in the 2017 Annual Report. Following receipt and validation of laboratory results, Golder evaluated the results of the first Detection Monitoring sampling event to compare the concentration of 40 CFR Part 257 Appendix III constituents relative to facility background concentrations. Using Sanitas™ software, Golder pooled the background data to calculate prediction limits and compared the October 2017 results to the calculated prediction limits to identify SSIs.

Golder determined that SSIs existed for Phases V and VI in January 2018. Golder identified a potential alternative source that could explain the SSIs and prepared an ASD. A qualified Indiana-licensed professional engineer certified the ASD in April 2018. The ASD supports the findings that the SSIs determined in January 2018 do not result from a release from the CCR Unit. The key supporting lines of evidence described in the ASD indicate that the closed, non-regulated phases of the landfill (i.e., Phases I and II) are the source of the SSIs. Therefore, no further action (i.e., Assessment Monitoring) was warranted, and Phases V and VI appropriately remained in Detection Monitoring. The ASD is presented in Appendix A of the 2018 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2019 (2018 Annual Report, Golder 2019).

Golder performed the second and third Detection Monitoring events in 2018, the fourth and fifth detection monitoring events in 2019, and the sixth and seventh Detection Monitoring events in 2020. After each Detection Monitoring event, Golder determined that SSIs existed. Consistent with the previous evaluation, Golder identified a potential alternative source that explained the SSIs and a qualified Indiana-licensed professional engineer recertified the ASD, confirming that Phases V, VI, and VII remain in Detection Monitoring.

Golder performed the seventh Detection Monitoring event in September 2020 followed by a statistical evaluation and data analysis in December 2020 that determined that SSIs existed for Phases V, VI, and VII. Consistent with previous evaluations, Golder identified a potential alternative source that explained the SSIs. A qualified Indiana-licensed professional engineer recertified the ASD in March 2021 (Appendix A), confirming Phases V, VI, and VII appropriately remain in Detection Monitoring. The results from the second to seventh Detection Monitoring events and the corresponding ASDs are included in the 2018, 2019, and 2020 Annual Groundwater Monitoring and Corrective Action Reports (Golder 2019, 2020, 2021).

Golder performed the eighth Detection Monitoring event in April 2021 followed by a statistical evaluation and data analysis in July 2021 that determined that SSIs existed for Phases V, VI, and VII. Consistent with previous evaluations, Golder identified a potential alternative source that explained the SSIs. A qualified Indiana-licensed professional engineer recertified the ASD in October 2021 (Appendix B), confirming Phases V, VI, and VII appropriately remain in Detection Monitoring. The SSIs from the eighth Detection Monitoring event are summarized in the table below by downgradient monitoring well and constituent.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH[1] | Total Dissolved Solids |
|---|---|---|---|---|---|---|---|
| GAMW26 | | | | X | | | |
| GAMW27 | X | X | | | X | | X |
| GAMW27B | X | X | X | | X | | X |
| GAMW38B | X | X | | | X | | X |
| GAMW39B | X | X | X | | X | | X |
| GAMW40 | | X | | | | | X |
| GAMW40B | X | | X | | X | X | X |
| GAMW41 | X | | X | | X | | X |
| GAMW41B | X | | X | | X | | X |

"X" represents an SSI
1 = pH value is based on field water quality meter reading

Golder performed the ninth Detection Monitoring event in September 2021 followed by a statistical evaluation and data analysis in December 2021 that determined that SSIs existed for Phases V, VI, and VII. The SSIs are summarized in the table below by downgradient monitoring well and constituent.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH[1] | Total Dissolved Solids |
|---|---|---|---|---|---|---|---|
| GAMW-27 | X | X | | | X | | X |
| GAMW-27B | X | X | X | | X | | X |
| GAMW-38B | X | X | | | X | | X |
| GAMW-39B | X | X | X | | X | | X |
| GAMW-40 | X | X | | | | | X |
| GAMW-40B | X | | X | | X | | X |
| GAMW-41 | X | | | | X | | X |
| GAMW-41B | X | X | X | | X | | X |

"X" represents an SSI
1 = pH value is based on field water quality meter reading

## 2.5 Statistical Evaluation

Subsequent to each monitoring event, Golder assessed the analytical data for outliers, anomalies, and trends that may be an indication of a sampling or analytical error. Outliers and anomalies are generally defined as inconsistently large or small values that can occur because of sampling, laboratory, transportation, or transcription errors, or even by chance alone. Significant trends may indicate natural geochemical variability, a source of systematic error, influence of an upgradient/off-site source, or an actual occurrence of CCR Unit influence upon groundwater quality. Appropriate statistical methods are used to remove outliers from the database and manage trends with detrending routines, prior to the calculation of statistical limits. To assess the data for outliers, anomalies, and trends, Golder assessed the data using time vs. concentration graphs, and statistical routines included in the Sanitas™ statistical analysis software package. Golder did not identify any new outliers since the 2020 Annual Report.

Golder will continue to monitor trends and, if the CCR Unit enters Assessment Monitoring, detrending routines will be performed before using these data to calculate groundwater protection standards (GWPS).

## 2.6 Problems Encountered and Follow-Up Corrective Actions

In the eighth Detection Monitoring event (April 2021), Golder collected a groundwater sample from GAMW-24B at a turbidity level of approximately 7.77 nephelometric turbidity units (NTUs) and from GAMW-38 at approximately 7.49 NTUs. In the ninth Detection Monitoring event (September 2021), Golder collected a groundwater sample from GAMW-20 at a turbidity of approximately 5.22 NTUs and from GAMW-24B at approximately 5.64 NTUs. According to the CCR Groundwater Monitoring Program Implementation Manual (Golder 2017), groundwater samples are to be collected once a well has achieved a turbidity level below 5 NTUs. Due to time constraints in the field, groundwater is purged for a minimum of two hours and sampled when turbidity appeared to stabilize (e.g., no downward or upward trend over three consecutive readings five minutes apart). Evaluation of the analytical results from these wells suggests that the slightly elevated turbidity levels had no significant effect on the representativeness of the samples of groundwater quality. During future monitoring events, Golder will purge groundwater for two hours or five well volumes, whichever is shorter. Golder will use professional judgement to assess when the purge water is representative of groundwater for sampling. If an acceptable turbidity level cannot be achieved within a reasonable timeframe (e.g., three hours), Golder will redevelop the affected monitoring wells prior to the next sampling event.

# 3.0 KEY ACTIVITIES PROJECTED FOR 2022

During calendar year 2022, NIPSCO anticipates conducting the following key CCR Rule groundwater monitoring activities for the RMSGS Landfill Phases V, VI, and VII:

- Prepare and submit the appropriate notifications according to the CCR Rule
- Continue semi-annual Detection Monitoring groundwater sampling per CCR Rule requirements
- Inspect and maintain the monitoring system including wells, pumps, and equipment.

# 4.0 REFERENCES

Golder Associates, “2017 Annual Groundwater Monitoring and Corrective Action Report- Landfill Phase V and Phase VI NIPSCO R. M. Schahfer Generating Station”, January 31, 2018.

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Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 21, 2019.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI – Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI – Alternative Source Demonstration”, September 29, 2020.

# TABLES

**Table 1: Monitoring Well Network**
**CCR Unit Schahfer Landfill Phases V, VI, and VII**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| CCR Unit | Well Purpose | Monitoring Well ID | Installation Date | Decommission Date (If Applicable) | Basis For Action |
|---|---|---|---|---|---|
| LANDFILL Phase V, Phase VI, and Phase VII | Background Monitoring Well | GAMW-20 | 5/27/2016 | - | Installed for Groundwater Quality Monitoring[1] |
| | | GAMW-24 | 9/26/2016 | - | |
| | | GAMW-24B | 9/26/2016 | - | |
| | | GAMW-25 | 10/4/2016 | - | |
| | | GAMW-25B | 10/5/2016 | - | |
| | Downgradient Monitoring Well | GAMW-21 | 5/31/2016 | 4/5/2018 | Abandoned due to Landfill Construction Activities[2] |
| | | GAMW-21B | 5/31/2016 | 4/5/2018 | |
| | | GAMW-22 | 5/31/2016 | 4/5/2018 | |
| | | GAMW-22B | 6/2/2016 | 4/5/2018 | |
| | | GAMW-23 | 6/2/2016 | 4/6/2018 | |
| | | GAMW-23B | 6/2/2016 | 4/6/2018 | |
| | | GAMW-28 | 9/29/2016 | 4/6/2018 | |
| | | GAMW-28B | 9/29/2016 | 4/6/2018 | |
| | | GAMW-26 | 10/4/2016 | - | Installed for Groundwater Quality Monitoring[1] |
| | | GAMW-26B | 10/4/2016 | - | |
| | | GAMW-27 | 10/3/2016 | - | |
| | | GAMW-27B | 10/4/2016 | - | |
| | | GAMW-38 | 4/4/2018 | - | Installed to Replace Abandoned Well[3] |
| | | GAMW-38B | 4/3/2018 | - | |
| | | GAMW-39 | 4/4/2018 | - | |
| | | GAMW-39B | 4/4/2018 | - | |
| | | GAMW-40 | 4/5/2018 | - | |
| | | GAMW-40B | 4/4/2018 | - | |
| | | GAMW-41 | 5/17/2018 | - | |
| | | GAMW-41B | 5/17/2018 | - | |

Notes:
1) Per the CCR Rule requirements, Golder collected eight rounds of background data prior to October 17, 2017.
2) Monitoring well was abandoned due to the construction of landfill Phase VII.
3) Monitoring well was installed to replace an abandoned monitoring well. Well was first sampled in September 2018.

Prepared by: KMC
Checked by: DFSC
Reviewed by: MAH

**Table 2: Summary of Sampling Events**
**CCR Unit Schahfer Landfill Phases V, VI, and VII**
**NIPSCO LLC Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Well Purpose | Monitoring Well ID | Sample Event #18 | Sample Event #19 | Total Number of Samples |
|---|---|---|---|---|
| Purpose of Sample | | Detection Monitoring | Detection Monitoring | |
| Sample Parameters | | Appendix III | Appendix III | |
| Background Monitoring Well | GAMW-20 | 4/12/2021 | 9/13/2021 | 2 |
| | GAMW-24 | 4/12/2021 | 9/13/2021 | 2 |
| | GAMW-24B | 4/13/2021 | 9/13/2021 | 2 |
| | GAMW-25 | 4/12/2021 | 9/10/2021 | 2 |
| | GAMW-25B | 4/12/2021 | 9/10/2021 | 2 |
| | GAMW-26 | 4/12/2021 | 9/10/2021 | 2 |
| | GAMW-26B | 4/12/2021 | 9/10/2021 | 2 |
| | GAMW-27 | 4/13/2021 | 9/10/2021 | 2 |
| | GAMW-27B | 4/13/2021 | 9/13/2021 | 2 |
| | GAMW-38 | 4/13/2021 | 9/11/2021 | 2 |
| | GAMW-38B | 4/13/2021 | 9/11/2021 | 2 |
| | GAMW-39 | 4/13/2021 | 9/11/2021 | 2 |
| | GAMW-39B | 4/13/2021 | 9/11/2021 | 2 |
| | GAMW-40 | 4/14/2021 | 9/13/2021 | 2 |
| | GAMW-40B | 4/14/2021 | 9/13/2021 | 2 |
| | GAMW-41 | 4/14/2021 | 9/13/2021 | 2 |
| | GAMW-41B | 4/13/2021 | 9/13/2021 | 2 |
| Total Number of Samples | | 17 | 17 | 34 |

**Notes:**
Sample counts do not include QA/QC samples.

(1) Sample events #1-17 were completed prior to 2021. The purpose, sample parameters, and sample dates are included in the 2017, 2018, 2019, and 2020 Annual Reports.

(2) Sample events #18 and 19 correspond to the eighth and ninth Detection Monitoring events, respectively.

Prepared by: KMC
Checked by: DFSC
Reviewed by: JSP

Table 3: Analytical Data
CCR Unit R. M. Schahfer Landfill Phases V, VI, and VII
NIPSCO LLC R. M. Schahfer Schahfer Generating Station
Wheatfield, Indiana

| Location | | GAMW20 | | GAMW24 | | | GAMW24B | | GAMW25 | | GAMW25B | | | GAMW26 | | GAMW26B | | GAMW27 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2021-04-12 | 2021-09-13 | 2021-04-12 | 2021-09-13 | | 2021-04-13 | 2021-09-13 | 2021-04-12 | 2021-09-10 | 2021-04-12 | 2021-09-10 | | 2021-04-12 | 2021-09-10 | 2021-04-12 | 2021-09-10 | 2021-04-13 | 2021-09-10 | |
| Sample Type | | N | N | N | FD | N | N | N | N | N | FD | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 2.8 | 3.7 | 0.1 U | 0.12 | 0.1 U | 0.1 U | 0.1 U | 0.17 | 0.15 | 0.13 | 0.13 | 0.13 | 0.18 | 0.22 | 0.21 | 0.21 | 4.2 | 4.1 | 4.1 |
| Calcium | mg/L | 164 | 249 | 80.2 | 83.3 | 86.8 | 46.9 | 51.3 | 78.4 | 72.5 | 94 | 94.2 | 97.4 | 84.7 | 92.6 | 93.3 | 103 | 276 | 279 | 277 |
| Chloride | mg/L | 11.4 | 11.2 | 18.5 | 21.6 | 22 | 3.3 | 4.1 | 4.3 | 2.7 | 8.7 | 8.6 | 7.2 | 11.5 | 4.2 | 14.6 | 23.1 | 20.9 | 20.4 | 14.2 |
| Fluoride | mg/L | 0.19 | 0.22 | 0.083 | 0.067 | 0.15 | 0.12 | 0.19 | 1.1 | 1.2 J- | 0.18 | 0.18 | 0.13 J- | 2.9 | 2.8 J- | 0.18 | 0.11 J- | 0.66 | 0.63 | 0.56 J- |
| pH | SU | 7.17 | 7.2 | 7.68 | | 7.34 | 7.58 | 7.91 | 7.27 | 7.4 | | 7.16 | 7.36 | 7.51 | 7.54 | 7.79 | 7.8 | | 7.55 | 7.65 |
| Sulfate | mg/L | 500 | 529 | 70 | 70 | 69.6 | 26.7 | 24 | 44.9 | 48.5 | 67.2 | 67.2 | 66.9 | 59.2 | 80.2 | 86.8 | 189 | 693 | 701 | 756 |
| Total Dissolved Solids | mg/L | 1050 | 1170 | 316 | 351 | 349 | 184 | 190 | 288 | 329 | 378 | 377 | 417 | 350 | 449 | 437 | 624 | 1250 | 1270 | 1400 |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.87 | 0.12 | 0.14 | | 0.14 | 0.65 | 0.24 | 3.81 | 1.85 | | 0.49 | 0.27 | 0.66 | 0.33 | 1.31 | 3.45 | | 0.45 | 0.21 |
| Oxidation-Reduction Potential | millivolts | -94 | 0.188 | -14.8 | | 0.129 | -114.6 | 0.23 | 154.4 | 96.6 | | -127 | 0.185 | 59.2 | -309.6 | -0.1 | -96.1 | | -118 | 0.18 |
| pH | SU | 7.17 | 7.2 | 7.68 | | 7.34 | 7.58 | 7.91 | 7.27 | 7.4 | | 7.16 | 7.36 | 7.51 | 7.54 | 7.79 | 7.8 | | 7.55 | 7.65 |
| Specific Conductance | uS/cm | 1530 | 183.7 | 561 | | 809 | 912.5 | 340 | 472.3 | 514 | | 599 | 653 | 804 | 603 | 711 | 737 | | 1558 | 170 |
| Temperature | deg c | 10.6 | 17.1 | 9.95 | | 16.8 | 10.9 | 13.5 | 8.8 | 16 | | 11 | 12.1 | 10 | 18.74 | 11.53 | 13.63 | | 11.5 | 16.8 |
| Turbidity | ntu | 2.71 | 5.22 | 4.6 | | 4.84 | 7.77 | 5.84 | 1.99 | 1.9 | | 3 | 1.88 | 1.46 | 4.47 | 3.86 | 2.98 | | 4.24 | 1.26 |

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.

"J-" = Indicates the result is estimated and may be biased low.

Table 3: Analytical Data
CCR Unit R. M. Schahfer Landfill Ph
NIPSCO LLC R. M. Schahfer Schahf
Wheatfield, Indiana

| Location | | GAMW27B | | GAMW38 | | GAMW38B | | | GAMW39 | | GAMW39B | | GAMW40 | | GAMW40B | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2021-04-13 | 2021-09-13 | 2021-04-13 | 2021-09-11 | 2021-04-13 | 2021-09-11 | | 2021-04-13 | 2021-09-11 | 2021-04-13 | 2021-09-11 | 2021-04-14 | 2021-09-13 | 2021-04-14 | 2021-09-13 |
| Sample Type | | N | N | N | N | N | FD | N | N | N | N | N | N | N | N | N |
| Chemical Name | Unit | | | | | | | | | | | | | | | |
| **CCR Appendix III** | | | | | | | | | | | | | | | | |
| Boron | mg/L | 12.1 | 13.1 | 0.67 | 1 | 6.2 | 6.9 | 6.9 | 1.1 | 1.4 | 10.1 | 9.8 | 2.8 | 4.1 | 30 | 29.9 |
| Calcium | mg/L | 384 | 367 | 90.4 | 77.3 | 249 | 274 | 268 | 173 | 162 | 409 | 443 | 273 | 276 | 225 | 195 |
| Chloride | mg/L | 406 | 438 | 4.7 | 4.2 | 35.1 | 37.4 | 39.9 | 10.2 | 9.7 | 61.9 | 65.7 | 12.8 | 11.8 | 859 | 700 |
| Fluoride | mg/L | 0.05 U | 0.05 U | 0.15 | 0.15 | 0.05 U | 0.05 U | 0.05 U | 0.14 | 0.12 | 0.05 U | 0.5 U | 0.067 | 0.072 | 0.79 | 0.05 U |
| pH | SU | 7.41 | 7.36 | 7.44 | 7.03 | 7.11 | | 6.68 | 7.12 | 6.83 | 7.16 | 6.68 | 7.19 | 6.62 | 8.5 | 7.87 |
| Sulfate | mg/L | 6190 | 6530 | 211 | 164 | 687 | 726 | 785 | 359 | 396 | 1140 | 1330 | 388 | 501 | 6420 | 6580 |
| Total Dissolved Solids | mg/L | 9960 | 10800 | 522 | 471 | 1400 | 1590 | 1550 | 816 | 865 | 2230 | 2690 | 1360 | 1550 | 9860 | 11500 |
| **Field Parameters** | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 1.27 | 1.19 | 0.15 | 0.53 | 0.21 | | 0.33 | 0.14 | 0.43 | 0.16 | 0.48 | 0.3 | 0.46 | 0.23 | 0.3 |
| Oxidation-Reduction Potential | millivolts | -95.5 | -272.6 | -82.5 | -229.7 | -65.2 | | -329.8 | -42.6 | -284 | -47.6 | 310.6 | -39.8 | -304 | -162.9 | -288.3 |
| pH | SU | 7.41 | 7.36 | 7.44 | 7.03 | 7.11 | | 6.68 | 7.12 | 6.83 | 7.16 | 6.68 | 7.19 | 6.62 | 8.5 | 7.87 |
| Specific Conductance | uS/cm | 12351 | 10440 | 816 | 716 | 1913 | | 1747 | 1248 | 1109 | 2863 | 2913 | 1968 | 1933 | 13408 | 11500 |
| Temperature | deg c | 12.6 | 14.15 | 9.83 | 18.94 | 11.41 | | 14.37 | 11.05 | 17.47 | 12.32 | | 10 | 17.03 | 11.97 | 14.28 |
| Turbidity | ntu | 2.35 | 3.59 | 7.49 | 2.78 | 4.62 | | 2.92 | 4.27 | 1.25 | 4.4 | 2.47 | 2.46 | 0.63 | 1.37 | 1.18 |

Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.

"J-" = Indicates the result is estimated and may be biased low.

Table 3: Analytical Data
CCR Unit R. M. Schahfer Landfill Ph
NIPSCO LLC R. M. Schahfer Schahf
Wheatfield, Indiana

| | Location | GAMW41 | | GAMW41B | |
|---|---|---|---|---|---|
| | Sample Date | 2021-04-14 | 2021-09-13 | 2021-04-13 | 2021-09-13 |
| | Sample Type | N | N | N | N |
| Chemical Name | Unit | | | | |
| **CCR Appendix III** | | | | | |
| Boron | mg/L | 10 | 9.4 | 26.2 | 28.8 |
| Calcium | mg/L | 123 | 134 | 223 | 231 |
| Chloride | mg/L | 119 | 44.4 | 571 | 687 |
| Fluoride | mg/L | 0.2 | 0.33 | 0.79 | 0.05 U |
| pH | SU | 8.08 | 7.48 | 8.05 | 7.94 |
| Sulfate | mg/L | 2220 | 1750 | 6320 | 6250 |
| Total Dissolved Solids | mg/L | 3250 | 2750 | 10500 | 10800 |
| **Field Parameters** | | | | | |
| Dissolved Oxygen | mg/L | 0.14 | 0.21 | 0.42 | 0.19 |
| Oxidation-Reduction Potential | millivolts | -137.2 | -247 | -187.2 | -291.7 |
| pH | SU | 8.08 | 7.48 | 8.05 | 7.94 |
| Specific Conductance | uS/cm | 4802 | 9312 | 13008 | 11490 |
| Temperature | deg c | 10.15 | 19.2 | 13 | 15.88 |
| Turbidity | ntu | 4.43 | 1.91 | 3.81 | 1.8 |

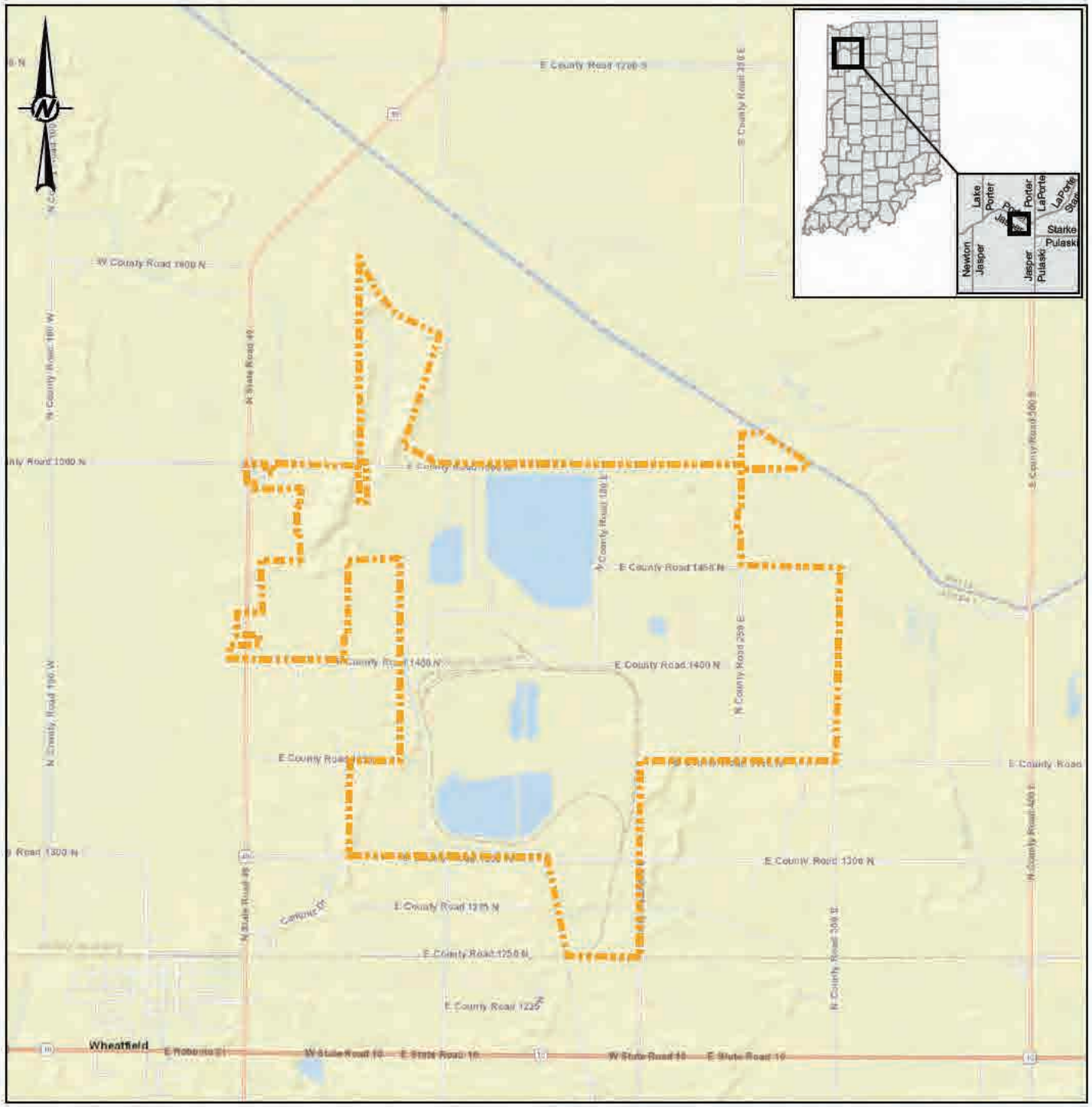
Notes:
mg/L = milligrams per liter
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.

"J-" = Indicates the result is estimated and may be biased low.

Prepared by: SLG
Checked by: DFSC
Reviewed by: JSP

# FIGURES




**LEGEND**

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

**REFERENCE(S)**

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

**SITE LOCATION MAP**

CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 1/04/2021 |
| DESIGNED | DFS |
| PREPARED | SHL |
| REVIEWED | JSP |
| APPROVED | MAH |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19121567 | A | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A




LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 400 800

1" = 400 feet

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

WELL LOCATION MAP
SCHAHFER LANDFILL PHASES V, VI, AND VII

GOLDER
MEMBER OF WSP

DESIGNED DFS
APPROVED MW

19491567 A 0 2

**APPENDIX A**

# RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration March 2021

**Northern Indiana Public Service Company LLC**
**(NIPSCO LLC)**

**R. M. Schahfer Generating Station**

**Wheatfield, Indiana**

**Schahfer Landfill Phase V, Phase VI, and Phase VII**

**Certification of Alternative Source Demonstration**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated March 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan

**Daniel Sullivan**
**Indiana Professional Engineer**
**License # 19600309**




3-31-2021

**Date**

# TECHNICAL MEMORANDUM

**DATE** March 31, 2021 **Project No.** 19121567

**TO** Dan Sullivan, Jeff Loewe NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Craig Myers, Joe Kutch, Mark Haney, Jim Peace, Danielle Sylvia Cofelice

**FROM** Krysta Cione **EMAIL kcione@golder.com**

**RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (September 2020) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; and the sixth (March 2020) Detection Monitoring Event, on September 29, 2020.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.



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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results. As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. The table below provides the original prediction limits calculated in January 2018 and the revised prediction limits calculated in June 2019. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

## 1.0 SUMMARY OF RESULTS

The results of the seventh Detection Monitoring event are included in the 2020 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| GAMW21* | | | | | | | |
| GAMW21B* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW22* | | 2 | | | | | |
| GAMW22B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW23* | 1,2 | 1,2 | | | 1,2 | 1,2 | 1,2 |
| GAMW23B* | 1,2 | 1,2 | 1,2 | | 1,2 | 1,2 | 1,2 |
| GAMW26 | | | | 1,3,5,6,7 | | | 2 |
| GAMW26B | | 1,3,7 | 3,7 | | 1,3,7 | 3 | 1,3,7 |
| GAMW27 | 1,2,3,4,5,6,7 | 1,2,3,4,5,6,7 | | | 1,2,3,4,6,7 | | 1,2,3,4,6,7 |
| GAMW27B | 1,2,3,4,5,6,7 | 1,2,3,5,6,7 | 1,2,3,4,5,6,7 | | 1,2,3,4,5,6,7 | 3 | 1,2,3,4,5,6,7 |
| GAMW28* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| GAMW28B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW38 | | | | | | | |
| GAMW38B | 3,4,5,6,7 | 3,4,5,6,7 | 3,4 | | 3,4,5,6,7 | | 3,4,5,6,7 |
| GAMW39 | 3 | 3,4,5,6,7 | | | 3 | 5 | 3 |
| GAMW39B | 3,4,5,6,7 | 3,4,5,6,7 | 3,4,5,6,7 | | 3,4,5,6,7 | 5 | 3,4,5,6,7 |
| GAMW40 | 3,4,6 | 3,4,5,6,7 | | | 3 | | 3,4,5,6,7 |
| GAMW40B | 3,4,5,6,7 | 3,4,5,6,7 | 3,4,5,6,7 | | 3,4,5,6,7 | 3,4,6 | 3,4,5,6,7 |
| GAMW41 | 4,5,6,7 | 4,5,6,7 | 4,5,6,7 | | 4,5,6,7 | | 4,5,6,7 |
| GAMW41B | 4,5,6,7 | 4,6,7 | 4,5,6,7 | | 4,5,6,7 | 6,7 | 4,5,6,7 |

"1" Indicates a statistically significant increase detected in the first Detection Monitoring event
"2" Indicates a statistically significant increase detected in the second Detection Monitoring event
"3" Indicates a statistically significant increase detected in the third Detection Monitoring event
"4" Indicates a statistically significant increase detected in the fourth Detection Monitoring event
"5" Indicates a statistically significant increase detected in the fifth Detection Monitoring event
"6" Indicates a statistically significant increase detected in the sixth Detection Monitoring event
"7" Indicates a statistically significant increase detected in the seventh Detection Monitoring event
"*" Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the seventh Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on December 18, 2020 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

## 3.0 REFERENCES

Golder Associates, "Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration", April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-march/draft/draft landfill asd recertification.docx

**APPENDIX B**

# RMSGS Landfill Phases V, VI, and VII Alternative Source Demonstration October 2021

**Northern Indiana Public Service Company LLC**
**(NIPSCO LLC)**

**R. M. Schahfer Generating Station**

**Wheatfield, Indiana**

**Schahfer Landfill Phase V, Phase VI, and Phase VII**

**Certification of Alternative Source Demonstration**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated October 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan

**Daniel Sullivan**
**Indiana Professional Engineer**
**License # 19600309**

10.26.2021

**Date**



# TECHNICAL MEMORANDUM

**DATE** October 26, 2021 **Project No.** 19121567

**TO** Dan Sullivan, Jeff Loewe NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the eighth (April 2021) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; the sixth (March 2020) Detection Monitoring Event, on September 29, 2020, and the seventh (October 2020) Detection Monitoring Event, on March 31, 2021.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Phase VII is constructed in a similar manner to Phase V and Phase VI. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.



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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results.

As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. Again, in July 2021, Golder reviewed the analytical data collected to date and considered the option to update the prediction limits. The Groundwater Monitoring Program Implementation Manual (GMPIM, 2017) and the Unified Guidance allow for updating the statistical limits after a minimum of four "new measurements" are available. The periodic update of background datasets improves statistical power and accuracy by providing a more complete approximation of the true background population. The analytical data collected, and groundwater flow directions observed to date, indicate the chosen background wells are still representative of background conditions. The table below provides the original prediction limits calculated in January 2018, the revised prediction limits calculated in June 2019, and the revised prediction limits calculated in July 2021. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

## 1.0 SUMMARY OF RESULTS

The results of the eighth Detection Monitoring event will be included in the 2021 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| **Prediction Level (2021)** | **3.8** | **230** | **50.21** | **2.3** | **670** | **6.184-8.163** | **1210** |
| GAMW21* | | | | | | | |
| GAMW21B* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW22* | | 2 | | | | | |
| GAMW22B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW23* | 1,2 | 1,2 | | | 1,2 | 1,2 | 1,2 |
| GAMW23B* | 1,2 | 1,2 | 1,2 | | 1,2 | 1,2 | 1,2 |
| GAMW26 | | | | 1,3,5,6,7, 8 | | | 2 |

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| **Prediction Level (2021)** | **3.8** | **230** | **50.21** | **2.3** | **670** | **6.184-8.163** | **1210** |
| GAMW26B | | 1,3,7 | 3,7 | | 1,3,7 | 3 | 1,3,7 |
| GAMW27 | 1,2,3,4,5,6,7,8 | 1,2,3,4,5,6,7,8 | | | 1,2,3,4,6,7,8 | | 1,2,3,4,6,7,8 |
| GAMW27B | 1,2,3,4,5,6,7,8 | 1,2,3,5,6,7,8 | 1,2,3,4,5,6,7,8 | | 1,2,3,4,5,6,7,8 | 3 | 1,2,3,4,5,6,7,8 |
| GAMW28* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW28B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW38 | | | | | | | |
| GAMW38B | 3,4,5,6,7,8 | 3,4,5,6,7,8 | 3,4 | | 3,4,5,6,7,8 | | 3,4,5,6,7,8 |
| GAMW39 | 3 | 3,4,5,6,7 | | | 3 | 5 | 3 |
| GAMW39B | 3,4,5,6,7,8 | 3,4,5,6,7,8 | 3,4,5,6,7,8 | | 3,4,5,6,7,8 | 5 | 3,4,5,6,7,8 |
| GAMW40 | 3,4,6 | 3,4,5,6,7,8 | | | 3 | | 3,4,5,6,7,8 |
| GAMW40B | 3,4,5,6,7,8 | 3,4,5,6,7 | 3,4,5,6,7,8 | | 3,4,5,6,7,8 | 3,4,6,8 | 3,4,5,6,7,8 |
| GAMW41 | 4,5,6,7,8 | 4,5,6,7 | 4,5,6,7,8 | | 4,5,6,7,8 | | 4,5,6,7,8 |
| GAMW41B | 4,5,6,7,8 | 4,6,7 | 4,5,6,7,8 | | 4,5,6,7,8 | 6,7 | 4,5,6,7,8 |

"1" Indicates a statistically significant increase detected in the first Detection Monitoring event
"2" Indicates a statistically significant increase detected in the second Detection Monitoring event
"3" Indicates a statistically significant increase detected in the third Detection Monitoring event
"4" Indicates a statistically significant increase detected in the fourth Detection Monitoring event
"5" Indicates a statistically significant increase detected in the fifth Detection Monitoring event
"6" Indicates a statistically significant increase detected in the sixth Detection Monitoring event
"7" Indicates a statistically significant increase detected in the seventh Detection Monitoring event
"8" Indicates a statistically significant increase detected in the eighth Detection Monitoring event
"*" Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the eighth Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on July 28, 2021 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

## 3.0 REFERENCES

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2021.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-october/draft/draft landfill asd recertification docx




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**APPENDIX G**

# Waste Disposal Area Alternative Source Demonstration- December 2020

**Northern Indiana Public Service Company LLC (NIPSCO LLC)**

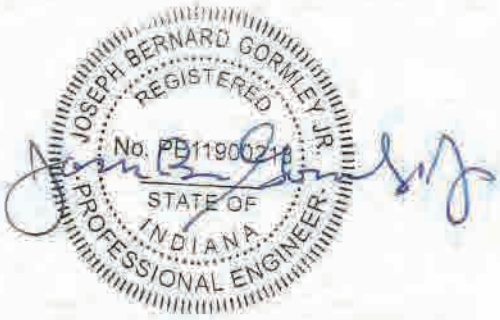
**R. M. Schahfer Generating Station – Waste Disposal Area**

**Wheatfield, Indiana**

**Recertification of Alternative Source Demonstration**

**40 CFR §257.95**

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated December 2020. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.




**Joseph Bernard Gormley, Jr.**
**Indiana Professional Engineer**
**License #: PE11900213**

12/4/2020
**Date**

# TECHNICAL MEMORANDUM

**DATE** December 4, 2020 **Project No.** 19121567

**TO** Marc Okin, Dan Sullivan, NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the fifth (April 2020) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of the fifth Assessment Monitoring event was completed on September 7, 2020. The results of the statistical evaluation indicated the lower confidence level (LCL) exceeded the background concentration for lithium and molybdenum in assessment monitoring well GAMW51B, which is interpreted as apparent evidence of a statistically-significant level (SSL). Although determination of an SSL generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSL. Golder identified similar concentrations of lithium and molybdenum in groundwater samples collected from GAMW51B after the fourth (October 2019) Assessment Monitoring event at the RMSGS Waste Disposal Area (WDA) and submitted an Alternative Source Demonstration (ASD) on June 9, 2020. As described in the ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B is not due to a release from the WDA.

## 1.0 SUMMARY OF RESULTS

The lithium and molybdenum sample results collected from GAMW51B in April 2020 were 0.076 milligram per liter (mg/L) and 0.18 mg/L, respectively. These results are less than two times the GWPS of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The most recent molybdenum result is within the range of the previous data, however, the lithium result is slightly above the previous maximum (0.064 mg/L). Overall, the data is consistent with the previous Assessment Monitoring event.

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION

The information presented above indicates the results of the fifth Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still

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670 North Commercial Street, Suite 103, Manchester, NH 03101 T: +1 603 668-0880 F: +1 603 668-1199

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applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the September 7, 2020 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

## 3.0 REFERENCES

Golder Associates, “Alternative Source Demonstration- Waste Disposal Area”, June 9, 2020.

**APPENDIX H**

# Waste Disposal Area Alternative Source Demonstration- May 2021

# TECHNICAL MEMORANDUM

**DATE** May 18, 2021 **Project No.** 19121567

**TO** Jeff Loewe, Dan Sullivan, NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the sixth (October 2020) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the sixth Assessment Monitoring event was completed on February 17, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) exceeded the background concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and the background concentration for molybdenum in assessment monitoring well GAMW60B, which are interpreted as apparent evidence of a statistically-significant levels (SSLs). Although determination of an SSL generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSL.

Golder identified similar concentrations of lithium and molybdenum in groundwater samples collected from GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the source of the lithium and molybdenum SSLs observed in GAMW51B was not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020), which confirmed the molybdenum and lithium results observed in GAMW-51B.

## 1.0 SUMMARY OF OCTOBER 2020 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in October 2020 were 0.063 milligrams per liter (mg/L) and 0.17 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.38 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The October 2020 Assessment Monitoring event was the fourth



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round of sampling at this location. The most recent molybdenum and lithium results collected at both locations are within the range of the previous data. Overall, the data are consistent with the previous Assessment Monitoring event.

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION

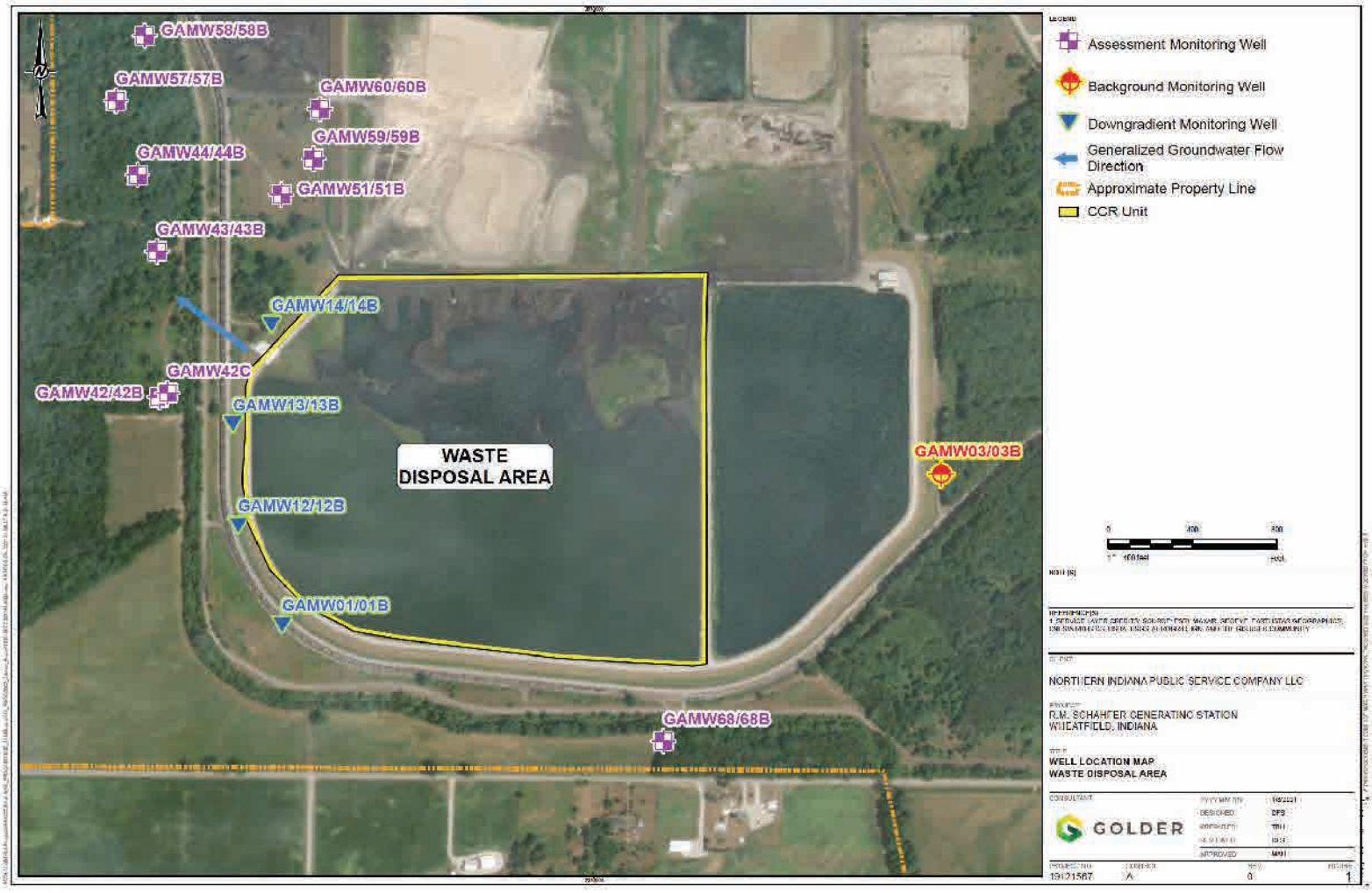
As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of GAMW51/51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that upgradient wells would have similar or higher concentrations of molybdenum, which they do not.

The 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS, . Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

The information presented above confirms the results of the sixth Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the February 17, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the lithium and molybdenum SSLs observed in GAMW51B and the molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

## 3.0 REFERENCES

Golder 2020. Alternative Source Demonstration - Waste Disposal Area, Golder Associates Inc., June 9, 2020.


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
Approximate Property Line
CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
GOLDER
DESIGNED
DFS
APPROVED
MW1
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**APPENDIX I**

# Waste Disposal Area Alternative Source Demonstration - November 2021

**Northern Indiana Public Service Company LLC (NIPSCO LLC)**

**R. M. Schahfer Generating Station – Waste Disposal Area**

**Wheatfield, Indiana**

**Recertification of Alternative Source Demonstration**

**40 CFR §257.95**

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated November 2021. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Final Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.




**Joseph Bernard Gormley, Jr.**
**Indiana Professional Engineer**
**License #: PE11900213**

11/12/2021
**Date**

GOLDER

# TECHNICAL MEMORANDUM

**DATE** November12, 2021 **Project No.** 19121567

**TO** Jeff Loewe, Dan Sullivan, NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Joe Gormley

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (April 2021) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Waste Disposal Area (WDA, CCR Unit). This evaluation was conducted in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

The statistical evaluation of analytical data from the seventh Assessment Monitoring event was completed on August 19, 2021. The results of the statistical evaluation indicated the lower confidence level (LCL) concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and molybdenum in assessment monitoring well GAMW60B exceeded background concentrations, which are interpreted as apparent evidence of statistically-significant levels (SSLs) in those wells. Although determination of apparent SSLs generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3) allows the owner or operator (e.g., NIPSCO) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSLs.

Golder identified similar concentrations of lithium and molybdenum in GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA and submitted an Alternative Source Demonstration (ASD) on June 9, 2020 (Golder 2020). As described in the ASD, the source material characteristics and site hydrogeology indicated that the apparent lithium and molybdenum SSLs observed in GAMW51B were not due to a release from the WDA. Golder recertified this ASD after the fifth Assessment Monitoring event (April 2020) and sixth Assessment Monitoring event (October 2020), which confirmed the molybdenum and lithium results observed previously in GAMW51B.

## 1.0 SUMMARY OF APRIL 2021 RESULTS

The lithium and molybdenum concentrations in samples collected from GAMW51B in April 2021 were 0.071 milligrams per liter (mg/L) and 0.16 mg/L, respectively. These results are less than two times the Groundwater Protection Standards (GWPS) of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively, which are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. The molybdenum concentrations in the samples collected to date from GAMW60B range from 0.35 mg/L to 0.49 mg/L (approximately four times the GWPS of 0.1 mg/L). The most recent molybdenum and lithium results collected at



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both locations are within the range of the previous concentrations and are consistent with the previous Assessment Monitoring event.

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION

As described in the June 2020 ASD, Assessment Monitoring well GAMW60B was installed downgradient of wells GAMW51 and GAMW51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Monitoring wells GAMW14, GAMW14B, GAMW51, and GAMW51B are all located between the WDA and Assessment Monitoring well GAMW60B (see Figure 1). The WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW60B, it would be expected that wells upgradient of GAMW60B would have similar or higher concentrations of molybdenum, which they do not.

The June 2020 WDA ASD discusses three primary lines of evidence: 1) the low concentrations of molybdenum in the WDA source materials and porewater, 2) the relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing, and 3) the waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B and GAMW60B, do not indicate molybdenum above the GWPS. Considered individually and together, these lines of evidence indicate the CCR Unit is not the source of the molybdenum in the groundwater monitored by GAMW51B and GAMW60B.

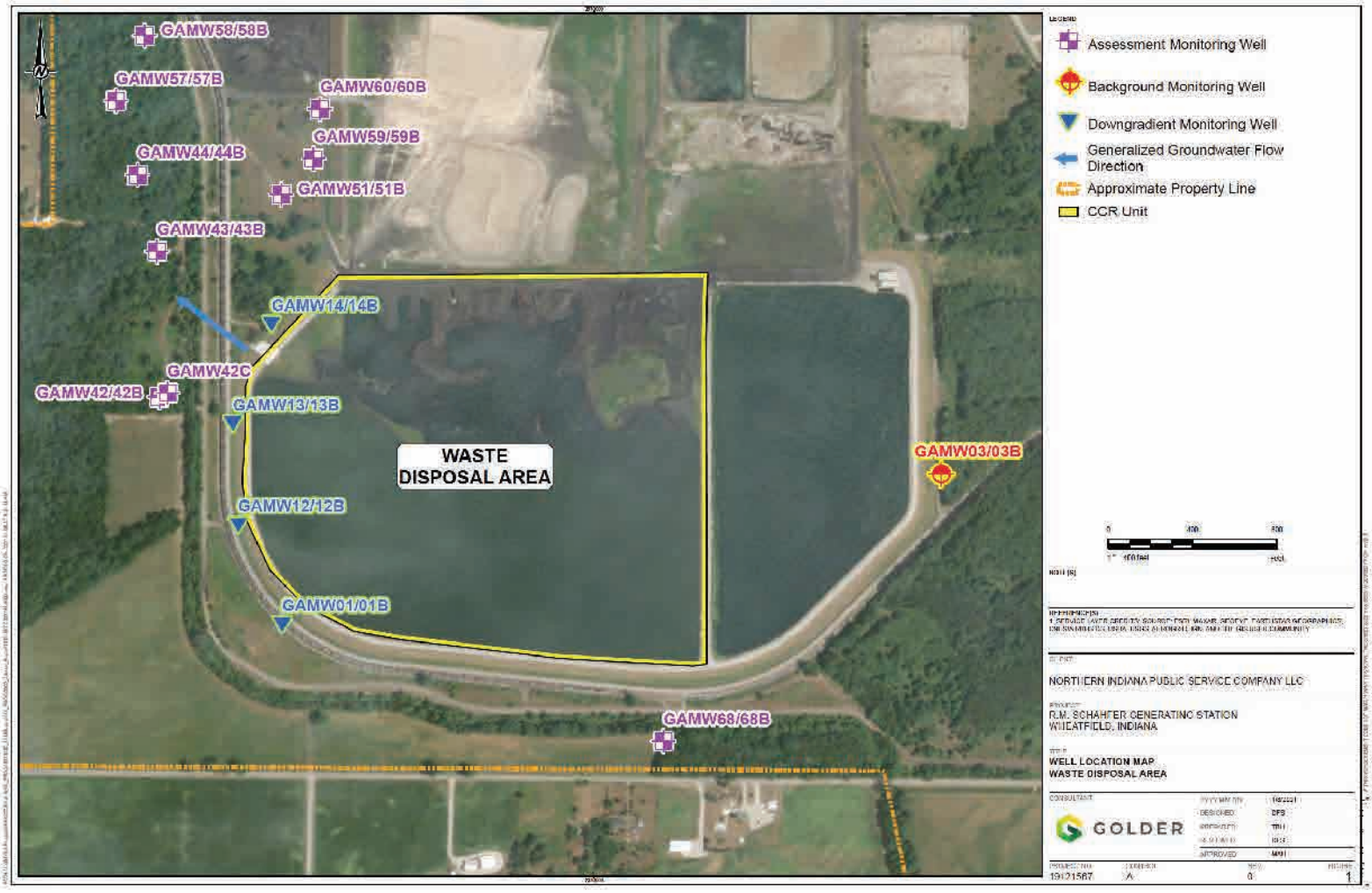
The information presented above confirms the results of the seventh Assessment Monitoring event are consistent with the previous Assessment Monitoring event, and the rationale presented in the June 9, 2020 ASD is still applicable. Golder prepared the current ASD in accordance with 40 CFR 257.95(g)(3) and it supports the finding that the SSLs determined in the August 19, 2021 statistical evaluation are not due to release from the CCR Unit. As described above and in the June 9, 2020 ASD, the source material characteristics and site hydrogeology indicate that the source of the apparent lithium and molybdenum SSLs observed in GAMW51B and the apparent molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

## 3.0 REFERENCES

Golder 2020. Alternative Source Demonstration – Waste Disposal Area, Golder Associates Inc., June 9, 2020.

Golder 2020. Recertification of R.M. Schahfer Waste Diposal Area Alternative Source Demonstration, Golder Associates Inc., December 4, 2020.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., May 18, 2021.


GAMW58/58B
GAMW57/57B
GAMW60/60B
GAMW59/59B
GAMW44/44B
GAMW51/51B
GAMW43/43B
GAMW14/14B
GAMW42C
GAMW42/42B
GAMW13/13B
WASTE DISPOSAL AREA
GAMW03/03B
GAMW12/12B
GAMW01/01B
GAMW68/68B
Assessment Monitoring Well
Background Monitoring Well
Downgradient Monitoring Well
Generalized Groundwater Flow Direction
Approximate Property Line
CCR Unit
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA
WELL LOCATION MAP
WASTE DISPOSAL AREA
GOLDER
DESIGNED
DFS
APPROVED
MW1
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**APPENDIX J**

# Waste Disposal Area Alternative Source Demonstration- April 2022

**Northern Indiana Public Service Company LLC (NIPSCO LLC)**

**R. M. Schahfer Generating Station – Waste Disposal Area**

**Wheatfield, Indiana**

**Recertification of Alternative Source Demonstration**

**40 CFR §257.95**

I have personally reviewed this recertification of the alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder Associates USA, Inc. and dated April 15, 2022. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this recertification of the ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as the WDA meets the applicable requirements of 40 CFR §257.95.




**Joseph Bernard Gormley, Jr.**
**Indiana Professional Engineer**
**License #: PE11900213**

4/15/2022
**Date**

# TECHNICAL MEMORANDUM

**DATE** April 15, 2022 **Project No.** 19121567

**TO** Jeff Loewe, Dan Sullivan, NIPSCO LLC

**CC** Maggie Rice, Joe Kutch, Mark Haney, Jim Peace

**FROM** Danielle Sylvia Cofelice, Joseph B. Gormley, Jr., PE **EMAIL dsylvia@golder.com, jgormley@golder.com**

**RE: RECERTIFICATION OF R.M. SCHAHFER WASTE DISPOSAL AREA ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO) and in accordance with 40 CFR §257.95(g)(3), Golder Associates USA Inc, *a member of WSP*. (Golder) has prepared this technical memorandum to confirm that the latest assessment monitoring results 1) are consistent with previous monitoring events, and 2) continue to support the findings of the June 9, 2020 Alternative Source Demonstration (ASD) for the Waste Disposal Area (WDA) Coal Combustion Residual Unit (CCR Unit) at the NIPSCO Rollin M. Schahfer Generating Station (RMSGS).

## 1.0 BACKGROUND

Following Detection Monitoring and the determination of statistically significant increases (SSIs) over background levels for one or more Appendix III constituents, NIPSCO established an Assessment Monitoring program in January 2018 to assess the nature and extent and overall groundwater quality farther downgradient of the WDA. The WDA and groundwater monitoring network are shown in Figure 1.

As part of the Assessment Monitoring program for the WDA, Golder collects groundwater samples from each background and downgradient monitoring well for analysis of Appendix III and IV constituents per 40 CFR §257.95. Following receipt and validation of laboratory results, Golder evaluates the results to determine the concentration of Appendix IV constituents in the wells relative to groundwater protection standards (GWPS). The GWPS for lithium (0.04 mg/L) and molybdenum (0.1 mg/L) are equal to the risk-based levels included in the CCR Rule, Part 1 Phase 1 Addendum. In addition, Golder's evaluations include statistical analysis of the results that are performed in accordance with40 CFR §257.95(h)(2).

Following the fourth Assessment Monitoring event in October/November 2019, Golder performed a statistical evaluation of analytical data in March 2020. The results of that statistical evaluation indicated an apparent statistically significant level (SSL) for molybdenum in well GAMW51B. While the results did not indicate an apparent SSL for lithium in well GAMW51B, they did show that three of the four samples collected from GAMW51B had detections of lithium above the GWPS. Although determination of apparent SSLs generally indicates that the groundwater monitoring program should transition from Assessment Monitoring to Assessment of Corrective Measures, 40 CFR §257.95(g)(3)(ii) allows the owner or operator (e.g., NIPSCO) to demonstrate that a source other than the CCR Unit or another condition caused the apparent SSLs. NIPSCO tasked Golder with further evaluating the data findings and, if appropriate, performing an ASD for the WDA.



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For the ASD, Golder presented a preliminary assessment of the Site history, geologic conditions, and data from porewater, CCR source materials, overburden, bedrock, and groundwater samples that indicated the potential for the SSL to be a result of another condition or a source other than the CCR Unit. Based on the preliminary assessment results, Golder performed additional evaluations to demonstrate that molybdenum and lithium concentrations in well GAMW51B were related to other sources and summarized those evaluations in the June 2020 ASD for the WDA.

As described in the June 2020 ASD, the WDA has generally received and managed the same waste streams and been operated in a consistent manner since its opening more than 35 years ago. Given the lengthy time horizon of operations and geochemical fingerprints of the source materials within the CCR Unit, if the WDA was the source of molybdenum in groundwater at GAMW51B, it would be expected that wells upgradient of GAMW51B would have similar or higher concentrations of molybdenum; however, they do not.

Furthermore, the June 2020 WDA ASD discussed the following three primary lines of evidence that demonstrated that the WDA is not the source of the molybdenum in the groundwater monitored by GAMW51B:

1) The low concentrations of molybdenum in the WDA source materials and porewater.

2) The relative major ion abundance in groundwater that demonstrates a distinct difference between WDA porewater and downgradient groundwater samples, with no indications of mixing.

3) The waste management boundary monitoring wells GAMW14 and GAMW14B, which are located upgradient of monitoring wells GAMW51B, do not indicate molybdenum above the GWPS.

Following the ASD and in accordance with 40 CFR §257.95(g)(3), Golder continued Assessment Monitoring of the WDA. Based on monitoring results from these subsequent monitoring events, Golder confirmed molybdenum and lithium concentrations were consistent with previous results for GAMW51B. As a result, Golder recertified the ASD after the fifth (April 2020), sixth (October 2020), and seventh (April 2021) Assessment Monitoring events.

## 2.0 SUMMARY OF SEPTEMBER 2021 ASSESSMENT MONITORING RESULTS

Golder performed the eighth Assessment Monitoring event for the WDA in September 2021. The monitoring results from that event showed lithium and molybdenum concentrations in the GAMW51B sample were 0.078 milligrams per liter (mg/L) and 0.15 mg/L, respectively. These results are 1.5 and 1.95 times greater than the GWPS of 0.04 mg/L and 0.1 mg/L for lithium and molybdenum, respectively. In addition, the monitoring results showed that the molybdenum concentration in the GAMW60B sample was 0.38 mg/L, which is 3.8 times the GWPS of 0.1 mg/l for molybdenum. It should be noted, however, that the results for both wells are within the range of the previous concentrations found at these wells.

## 3.0 DATA EVALUATION AND COMPARISON TO PREVIOUS RESULTS

Consistent with previous monitoring events and in accordance with the CCR Rule, Golder performed a statistical evaluation of groundwater analytical results from the eighth Assessment Monitoring event (September 2021) at the WDA. The statistical evaluation was completed on January 17, 2022 and the statistical evaluation results indicated the lower confidence level (LCL) concentrations for lithium and molybdenum in assessment monitoring well GAMW51B and molybdenum in assessment monitoring well GAMW60B exceeded the GWPS, which are interpreted as apparent evidence of SSLs in those wells.

As noted above, Golder previously identified similar concentrations of lithium and molybdenum in GAMW51B after the fourth (October 2019) Assessment Monitoring event at the WDA. In response, Golder prepared an ASD, dated June 9, 2020 (Golder 2020), that showed the source material characteristics and site hydrogeology indicate that the apparent lithium and molybdenum SSLs observed in GAMW51B were not due to a release from the WDA.

Furthermore, monitoring well GAMW60B was installed downgradient of wells GAMW51 and GAMW51B in 2019 to further assess the nature and extent and overall groundwater quality farther downgradient of the WDA. Since GAMW60B is further downgradient then GAMW51B from the WDA and the ASD determined that previous SSLs observed at GAMW51B were not due to a release from the WDA, it follows that the current apparent SSLs observed at both GAMW51B and GAMW60B are not due to a release from the WDA.

## 4.0 CONCLUSIONS

Golder's evaluation of the groundwater results for the eighth Assessment Monitoring event confirm that the lithium and molybdenum results are consistent with those from the previous Assessment Monitoring events, and the rationale presented in the June 9, 2020 ASD is still applicable.

As described above and in the ASD, the source material characteristics and site hydrogeology indicate that the source of the apparent lithium and molybdenum SSLs observed in GAMW51B and the apparent molybdenum SSL in GAMW60B are due to a different condition and not due to a release from the WDA. Therefore, no further action (e.g., Assessment of Corrective Measures) is warranted, and the WDA will remain in Assessment Monitoring.

## 5.0 REFERENCES

Golder 2020. Alternative Source Demonstration – Waste Disposal Area, Golder Associates Inc., June 9, 2020.

Golder 2020. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., December 4, 2020.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., May 18, 2021.

Golder 2021. Recertification of R.M. Schahfer Waste Disposal Area Alternative Source Demonstration, Golder Associates Inc., November 12, 2021.

**APPENDIX K**

# R. M. Schahfer Landfill Phase V and Phase VI Alternative Source Demonstration- March 2021

**Northern Indiana Public Service Company LLC**
**(NIPSCO LLC)**

**R. M. Schahfer Generating Station**

**Wheatfield, Indiana**

**Schahfer Landfill Phase V, Phase VI, and Phase VII**

**Certification of Alternative Source Demonstration**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated March 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan

**Daniel Sullivan**
**Indiana Professional Engineer**
**License # 19600309**




3-31-2021

**Date**

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

| | | |
|---|---|---|
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

# Exhibit 25B
# Schahfer CCR Part A Demonstration
# Addendum
# Part 2

# TECHNICAL MEMORANDUM

**DATE** March 31, 2021 **Project No.** 19121567

**TO** Dan Sullivan, Jeff Loewe NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Craig Myers, Joe Kutch, Mark Haney, Jim Peace, Danielle Sylvia Cofelice

**FROM** Krysta Cione **EMAIL kcione@golder.com**

**RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the seventh (September 2020) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule” (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; and the sixth (March 2020) Detection Monitoring Event, on September 29, 2020.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.



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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results. As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. The table below provides the original prediction limits calculated in January 2018 and the revised prediction limits calculated in June 2019. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

## 1.0 SUMMARY OF RESULTS

The results of the seventh Detection Monitoring event are included in the 2020 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| GAMW21* | | | | | | | |
| GAMW21B* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW22* | | 2 | | | | | |
| GAMW22B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW23* | 1,2 | 1,2 | | | 1,2 | 1,2 | 1,2 |
| GAMW23B* | 1,2 | 1,2 | 1,2 | | 1,2 | 1,2 | 1,2 |
| GAMW26 | | | | 1,3,5,6,7 | | | 2 |
| GAMW26B | | 1,3,7 | 3,7 | | 1,3,7 | 3 | 1,3,7 |
| GAMW27 | 1,2,3,4,5,6,7 | 1,2,3,4,5,6,7 | | | 1,2,3,4,6,7 | | 1,2,3,4,6,7 |
| GAMW27B | 1,2,3,4,5,6,7 | 1,2,3,5,6,7 | 1,2,3,4,5,6,7 | | 1,2,3,4,5,6,7 | 3 | 1,2,3,4,5,6,7 |
| GAMW28* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| GAMW28B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW38 | | | | | | | |
| GAMW38B | 3,4,5,6,7 | 3,4,5,6,7 | 3,4 | | 3,4,5,6,7 | | 3,4,5,6,7 |
| GAMW39 | 3 | 3,4,5,6,7 | | | 3 | 5 | 3 |
| GAMW39B | 3,4,5,6,7 | 3,4,5,6,7 | 3,4,5,6,7 | | 3,4,5,6,7 | 5 | 3,4,5,6,7 |
| GAMW40 | 3,4,6 | 3,4,5,6,7 | | | 3 | | 3,4,5,6,7 |
| GAMW40B | 3,4,5,6,7 | 3,4,5,6,7 | 3,4,5,6,7 | | 3,4,5,6,7 | 3,4,6 | 3,4,5,6,7 |
| GAMW41 | 4,5,6,7 | 4,5,6,7 | 4,5,6,7 | | 4,5,6,7 | | 4,5,6,7 |
| GAMW41B | 4,5,6,7 | 4,6,7 | 4,5,6,7 | | 4,5,6,7 | 6,7 | 4,5,6,7 |

"1" Indicates a statistically significant increase detected in the first Detection Monitoring event
"2" Indicates a statistically significant increase detected in the second Detection Monitoring event
"3" Indicates a statistically significant increase detected in the third Detection Monitoring event
"4" Indicates a statistically significant increase detected in the fourth Detection Monitoring event
"5" Indicates a statistically significant increase detected in the fifth Detection Monitoring event
"6" Indicates a statistically significant increase detected in the sixth Detection Monitoring event
"7" Indicates a statistically significant increase detected in the seventh Detection Monitoring event
"*" Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the seventh Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on December 18, 2020 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

## 3.0 REFERENCES

Golder Associates, "Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration", April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-march/draft/draft landfill asd recertification.docx

**APPENDIX L**

# R. M. Schahfer Landfill Phase V and Phase VI Alternative Source Demonstration- October 2021

**Northern Indiana Public Service Company LLC**
**(NIPSCO LLC)**

**R. M. Schahfer Generating Station**

**Wheatfield, Indiana**

**Schahfer Landfill Phase V, Phase VI, and Phase VII**

**Certification of Alternative Source Demonstration**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated October 2021. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan

**Daniel Sullivan**
**Indiana Professional Engineer**
**License # 19600309**

10.26.2021

**Date**



# TECHNICAL MEMORANDUM

**DATE** October 26, 2021 **Project No.** 19121567

**TO** Dan Sullivan, Jeff Loewe NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the eighth (April 2021) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for seven analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO LLC) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; the sixth (March 2020) Detection Monitoring Event, on September 29, 2020, and the seventh (October 2020) Detection Monitoring Event, on March 31, 2021.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Phase VII is constructed in a similar manner to Phase V and Phase VI. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.



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Golder collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in these subsequent events were consistent with historical analytical results.

As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. Again, in July 2021, Golder reviewed the analytical data collected to date and considered the option to update the prediction limits. The Groundwater Monitoring Program Implementation Manual (GMPIM, 2017) and the Unified Guidance allow for updating the statistical limits after a minimum of four "new measurements" are available. The periodic update of background datasets improves statistical power and accuracy by providing a more complete approximation of the true background population. The analytical data collected, and groundwater flow directions observed to date, indicate the chosen background wells are still representative of background conditions. The table below provides the original prediction limits calculated in January 2018, the revised prediction limits calculated in June 2019, and the revised prediction limits calculated in July 2021. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

## 1.0 SUMMARY OF RESULTS

The results of the eighth Detection Monitoring event will be included in the 2021 Annual Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| **Prediction Level (2021)** | **3.8** | **230** | **50.21** | **2.3** | **670** | **6.184-8.163** | **1210** |
| GAMW21* | | | | | | | |
| GAMW21B* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW22* | | 2 | | | | | |
| GAMW22B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW23* | 1,2 | 1,2 | | | 1,2 | 1,2 | 1,2 |
| GAMW23B* | 1,2 | 1,2 | 1,2 | | 1,2 | 1,2 | 1,2 |
| GAMW26 | | | | 1,3,5,6,7, 8 | | | 2 |

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| **Prediction Level (2021)** | **3.8** | **230** | **50.21** | **2.3** | **670** | **6.184-8.163** | **1210** |
| GAMW26B | | 1,3,7 | 3,7 | | 1,3,7 | 3 | 1,3,7 |
| GAMW27 | 1,2,3,4,5,6,7,8 | 1,2,3,4,5,6,7,8 | | | 1,2,3,4,6,7,8 | | 1,2,3,4,6,7,8 |
| GAMW27B | 1,2,3,4,5,6,7,8 | 1,2,3,5,6,7,8 | 1,2,3,4,5,6,7,8 | | 1,2,3,4,5,6,7,8 | 3 | 1,2,3,4,5,6,7,8 |
| GAMW28* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW28B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW38 | | | | | | | |
| GAMW38B | 3,4,5,6,7,8 | 3,4,5,6,7,8 | 3,4 | | 3,4,5,6,7,8 | | 3,4,5,6,7,8 |
| GAMW39 | 3 | 3,4,5,6,7 | | | 3 | 5 | 3 |
| GAMW39B | 3,4,5,6,7,8 | 3,4,5,6,7,8 | 3,4,5,6,7,8 | | 3,4,5,6,7,8 | 5 | 3,4,5,6,7,8 |
| GAMW40 | 3,4,6 | 3,4,5,6,7,8 | | | 3 | | 3,4,5,6,7,8 |
| GAMW40B | 3,4,5,6,7,8 | 3,4,5,6,7 | 3,4,5,6,7,8 | | 3,4,5,6,7,8 | 3,4,6,8 | 3,4,5,6,7,8 |
| GAMW41 | 4,5,6,7,8 | 4,5,6,7 | 4,5,6,7,8 | | 4,5,6,7,8 | | 4,5,6,7,8 |
| GAMW41B | 4,5,6,7,8 | 4,6,7 | 4,5,6,7,8 | | 4,5,6,7,8 | 6,7 | 4,5,6,7,8 |

"1" Indicates a statistically significant increase detected in the first Detection Monitoring event
"2" Indicates a statistically significant increase detected in the second Detection Monitoring event
"3" Indicates a statistically significant increase detected in the third Detection Monitoring event
"4" Indicates a statistically significant increase detected in the fourth Detection Monitoring event
"5" Indicates a statistically significant increase detected in the fifth Detection Monitoring event
"6" Indicates a statistically significant increase detected in the sixth Detection Monitoring event
"7" Indicates a statistically significant increase detected in the seventh Detection Monitoring event
"8" Indicates a statistically significant increase detected in the eighth Detection Monitoring event
"*" Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the eighth Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on July 28, 2021 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

## 3.0 REFERENCES

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2021.

https://golderassociates.sharepoint com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/landfill asd recertifications/2021-october/draft/draft landfill asd recertification docx

**APPENDIX M**

# R. M. Schahfer Landfill Phase V and Phase VI Alternative Source Demonstration- March 2022

**Northern Indiana Public Service Company LLC**
**(NIPSCO LLC)**

**R. M. Schahfer Generating Station**

**Wheatfield, Indiana**

**Schahfer Landfill Phase V, Phase VI, and Phase VII**

**Certification of Alternative Source Demonstration**

I, Daniel Sullivan, being a Professional Engineer in accordance with the laws of the State of Indiana, and having experience in the design, construction, and operation of restricted waste landfills and groundwater monitoring systems for them, do hereby state that I am qualified in the subject matter of CCR management, groundwater monitoring, data interpretation, and groundwater impacts. I have personally examined and am familiar with this alternative source demonstration (ASD) for the NIPSCO LLC R. M. Schahfer Generating Station, prepared by Golder, and dated March 2022. Based on an inquiry of those individuals immediately responsible, and on supporting data which I understand to be true, accurate and complete, I verify the information in this ASD is accurate and meets the applicable requirements of the CCR Rule. In consideration of the above, I certify to the best of my knowledge, information, and belief, that the ASD for the regulated CCR management unit referred to as Phase V, Phase VI, and Phase VII has been prepared and meets the applicable requirements of 40 CFR §257.94(e)(2).

Daniel Sullivan
Indiana Professional Engineer
License # 19600309




3.25.2022
Date

# TECHNICAL MEMORANDUM

**DATE** March 25, 2022 **Project No.** 19121567

**TO** Dan Sullivan, Jeff Loewe NIPSCO LLC

**CC** Maggie Rice, Maureen Turman, Joe Kutch, Mark Haney, Jim Peace, Thomas Haskins

**FROM** Danielle Sylvia Cofelice **EMAIL dsylvia@golder.com**

**RE: R.M. SCHAHFER LANDFILL PHASES V, VI, AND VII ALTERNATIVE SOURCE DEMONSTRATION**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the ninth (September 2021) groundwater Detection Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS) Landfill Phase V, Phase VI, and Phase VII (CCR Unit) in accordance with 40 Code of Federal Regulations (CFR) Parts 257 and 261, "Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities; Final Rule" (CCR Rule), as amended, and corresponding regulations under 329 Indiana Administrative Code (IAC) 10-9-1.

Statistical analyses of Appendix III groundwater Detection Monitoring results indicated statistically significant increases (SSIs) for five analytes detected in groundwater samples collected from downgradient wells compared to background levels. Although determination of an SSI generally indicates that the groundwater monitoring program should transition from Detection Monitoring to Assessment Monitoring, 40 CFR §257.94(e)(2) allows the owner or operator (i.e., NIPSCO) to demonstrate that a source other than the CCR unit or another condition caused the apparent SSI(s). Golder identified similar SSIs after the first (October 2017) Detection Monitoring event at the RMSGS Landfill Phase V and Phase VI and submitted an Alternative Source Demonstration (ASD) on April 13, 2018. As described in that ASD, the conceptual site model, historical groundwater data, and Phase V and Phase VI landfill design indicate the source of the identified SSIs is the unlined portion of the landfill, Phases I and II, which is not regulated by the CCR Rule. Golder recertified the ASD based on the second (February/March 2018) Detection Monitoring Event, on August 28, 2018; the third (September 2018) Detection Monitoring Event, on March 21, 2019; the fourth (March 2019) Detection Monitoring Event, on September 6, 2019; the fifth (October 2019) Detection Monitoring Event, on May 7, 2020; the sixth (March 2020) Detection Monitoring Event, on September 29, 2020, the seventh (October 2020) Detection Monitoring Event, on March 31, 2021; and the eighth (April 2021) Detection Monitoring Event, on October 26, 2021.

NIPSCO constructed a new landfill cell (Phase VII) immediately north of Phase VI in 2018. Phase VII is constructed in a similar manner to Phase V and Phase VI. Due to the proximity of Phase VII to Phase VI and landfill construction activities, Golder decommissioned monitoring wells GAMW-21/21B, GAMW-22/22B, GAMW-23/23B, and GAMW-28/28B, which were part of the original CCR Rule-required landfill monitoring network. Golder collected groundwater samples from these original four well pairs from July 2016 to March 2018. To replace the decommissioned wells, Golder installed monitoring wells GAMW-38/38B, GAMW-39/39B, GAMW-40/40B, and GAMW-41/41B downgradient and along the waste boundary of Phase VII in April and May 2018.

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670 North Commercial Street, Suite 103, Manchester, NH 03101 T: +1 603 668-0880 F: +1 603 668-1199

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Golder first collected groundwater samples from existing and replacement monitoring wells during the September 2020 semi-annual monitoring event. Groundwater analytical data obtained from groundwater samples collected from the downgradient wells in the subsequent events were consistent with historical analytical results.

As discussed in the ASD recertification dated September 6, 2019, Golder calculated new prediction limits in June 2019 using all background data collected through March 2019. Again, in July 2021, Golder reviewed the analytical data collected to date and chose the option to update the prediction limits. The Groundwater Monitoring Program Implementation Manual (GMPIM, 2017) and the Unified Guidance allow for updating the statistical limits after a minimum of four "new measurements" are available. The periodic update of background datasets improves statistical power and accuracy by providing a more complete approximation of the true background population. The analytical data collected, and groundwater flow directions observed to date, indicate the chosen background wells are still representative of background conditions. The table below provides the original prediction limits calculated in January 2018, the revised prediction limits calculated in June 2019, and the revised prediction limits calculated in July 2021. Golder will re-evaluate the background dataset following collection of an additional four rounds of groundwater data from the background wells.

## 1.0 SUMMARY OF RESULTS

The results of the ninth Detection Monitoring event were included in the 2021 Annual Groundwater Monitoring and Corrective Action Report and the results of the statistical analysis are summarized below. SSIs were detected in groundwater samples collected from monitoring wells downgradient of the RMSGS Landfill Phase V, Phase VI, and Phase VI, for all Appendix III parameters. Overall, results are consistent with those collected previously and indicate few differences from the SSIs detected during the previous Detection Monitoring events. The differences are likely due to normal or temporal fluctuations in groundwater quality. The SSI results are summarized in the table below by well location and timeframe of the SSI exceedance.

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| **Prediction Level (2021)** | **3.8** | **230** | **50.21** | **2.3** | **670** | **6.184-8.163** | **1210** |
| GAMW21* | | | | | | | |
| GAMW21B* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW22* | | 2 | | | | | |
| GAMW22B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW23* | 1,2 | 1,2 | | | 1,2 | 1,2 | 1,2 |
| GAMW23B* | 1,2 | 1,2 | 1,2 | | 1,2 | 1,2 | 1,2 |
| GAMW26 | | | | 1,3,5,6,7, 8 | | | 2 |

| Monitoring Well ID | Boron | Calcium | Chloride | Fluoride | Sulfate | pH | TDS |
|---|---|---|---|---|---|---|---|
| **Prediction Level (2018)** | **1.7** | **116.1** | **34.91** | **2.3** | **300** | **6.465-7.739** | **653.4** |
| **Prediction Level (2019)** | **3.2** | **130.9** | **39.93** | **2.3** | **470** | **6.353-7.82** | **1100** |
| **Prediction Level (2021)** | **3.8** | **230** | **50.21** | **2.3** | **670** | **6.184-8.163** | **1210** |
| GAMW26B | | 1,3,7 | 3,7 | | 1,3,7 | 3 | 1,3,7 |
| GAMW27 | 1,2,3,4,5,6,7,8,9 | 1,2,3,4,5,6,7,8,9 | | | 1,2,3,4,6,7,8,9 | | 1,2,3,4,6,7,8,9 |
| GAMW27B | 1,2,3,4,5,6,7,8,9 | 1,2,3,5,6,7,8,9 | 1,2,3,4,5,6,7,8,9 | | 1,2,3,4,5,6,7,8,9 | 3 | 1,2,3,4,5,6,7,8,9 |
| GAMW28* | 1,2 | 1,2 | 1 | | 1,2 | | 1,2 |
| GAMW28B* | 1,2 | 1,2 | 1,2 | | 1,2 | | 1,2 |
| GAMW38 | | | | | | | |
| GAMW38B | 3,4,5,6,7,8,9 | 3,4,5,6,7,8,9 | 3,4 | | 3,4,5,6,7,8,9 | | 3,4,5,6,7,8,9 |
| GAMW39 | 3 | 3,4,5,6,7 | | | 3 | 5 | 3 |
| GAMW39B | 3,4,5,6,7,8,9 | 3,4,5,6,7,8,9 | 3,4,5,6,7,8,9 | | 3,4,5,6,7,8,9 | 5 | 3,4,5,6,7,8,9 |
| GAMW40 | 3,4,6,9 | 3,4,5,6,7,8,9 | | | 3 | | 3,4,5,6,7,8,9 |
| GAMW40B | 3,4,5,6,7,8,9 | 3,4,5,6,7 | 3,4,5,6,7,8,9 | | 3,4,5,6,7,8,9 | 3,4,6,8 | 3,4,5,6,7,8,9 |
| GAMW41 | 4,5,6,7,8,9 | 4,5,6,7 | 4,5,6,7,8 | | 4,5,6,7,8,9 | | 4,5,6,7,8,9 |
| GAMW41B | 4,5,6,7,8,9 | 4,6,7,9 | 4,5,6,7,8,9 | | 4,5,6,7,8,9 | 6,7 | 4,5,6,7,8,9 |

"1" Indicates a statistically significant increase detected in the first Detection Monitoring event
"2" Indicates a statistically significant increase detected in the second Detection Monitoring event
"3" Indicates a statistically significant increase detected in the third Detection Monitoring event
"4" Indicates a statistically significant increase detected in the fourth Detection Monitoring event
"5" Indicates a statistically significant increase detected in the fifth Detection Monitoring event
"6" Indicates a statistically significant increase detected in the sixth Detection Monitoring event
"7" Indicates a statistically significant increase detected in the seventh Detection Monitoring event
"8" Indicates a statistically significant increase detected in the eighth Detection Monitoring event
"9" Indicates a statistically significant increase detected in the ninth Detection Monitoring event
"*" Indicates monitoring well was decommissioned prior to the third Detection Monitoring event

## 2.0 ALTERNATIVE SOURCE DEMONSTRATION CONCLUSION

The preceding information indicates the results of the ninth Detection Monitoring event are consistent with the previous Detection Monitoring events, and the rationale behind the ASD dated April 13, 2018 is still applicable. Golder prepared the ASD in accordance with 40 CFR 257.94(e)(2) and it supports the finding that the SSIs determined on December 27, 2021 are not due to a release from the CCR Unit. As described in that 2018 ASD, the conceptual site model, historical groundwater data, and the Phase V, Phase VI, and Phase VII landfill design indicate that a release from the unlined portion of the landfill not subject to the CCR Rule, Phases I and II, is the source of the identified SSIs. Therefore, no further action (i.e., Assessment Monitoring) is warranted, and the Schahfer Landfill Phases V, VI, and VII will remain in Detection Monitoring.

## 3.0 REFERENCES

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, April 13, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, August 28, 2018.

Golder Associates, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 6, 2019.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, May 7, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, September 29, 2020.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, March 31, 2021.

Golder Associates, “Northern Indiana Public Service Company LLC R.M. Schahfer Generating Station Wheatfield, Indiana- Schahfer Landfill Phase V and Phase VI - Alternative Source Demonstration”, October 26, 2021.

**APPENDIX N**

# CCR Assessment of Corrective Measures Addendum 2 – July 2021

REPORT

# MCU Assessment of Corrective Measures - Addendum #2

*Northern Indiana Public Service Company LLC*

*Rollin M. Schahfer Generating Station*

*Wheatfield, Indiana*

Submitted to:

**Northern Indiana Public Service Company LLC**
801 East 86th Avenue
Merriville, Indiana 46410

Submitted by:

**Golder Associates Inc.**
670 North Commercial Street, Suite 103
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20447130.01

July 2021

**Northern Indiana Public Service Company LLC (NIPSCO)**
**R. M. Schahfer Generating Station – MSRB, MCWB and DA (collectively the Multi-Cell Unit [MCU] or CCR Unit)**
**Wheatfield, Indiana**

## Certification of Addendum #2 to the Assessment of Corrective Measures Report 40 CFR §257.96 & Corresponding Regulations under Indiana Administrative Code

I have personally reviewed Addendum #2 to the assessment of corrective measures (ACM) report that was prepared by Golder Associates Inc. (Golder) and dated July 2021. The subject of Addendum #2 to the ACM Report is three impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), which are collectively referred to as the Multi-Cell Unit (MCU) or simply the CCR Unit, at the NIPSCO R. M. Schahfer Generating Station. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this Addendum #2 to the ACM Report is accurate and meets the applicable requirements of the CCR Rule and Indiana Administrative Code. In consideration of the above, I certify to the best of my knowledge, information, and belief, that Addendum #2 to the ACM Report for the regulated CCR management unit referred to as the MCU has been prepared and meets the applicable requirements of 40 CFR §257.96 and corresponding State of Indiana requirements.




**Joseph Bernard Gormley, Jr.**
**Indiana Professional Engineer**
**License #: PE11900213**

7/29/2021
**Date**

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# Acron ms

| | |
|---|---|
| ACM | Assessment of Corrective Measures |
| CCR | Coal Combustion Residuals |
| CFR | Code of Federal Regulations |
| cm/sec | Centimeter per second |
| COC | Constituents of Concern |
| CSM | Conceptual Site Model |
| DA | Drying Area |
| FGD | flue gas desulphurization |
| ft amsl | feet above mean sea level |
| ft bgs | feet below ground surface |
| GMPIM | Groundwater Monitoring Program Implementation Manual |
| gpm | gallons per minute |
| GWPS | Groundwater Protection Standards |
| IAC | Indiana Administrative Code |
| IDEM | Indiana Department of Environmental Management |
| IDNR | Indiana Department of Natural Resources |
| ISS | In situ Stabilization/Solidification |
| IRWDA | Inactive Retired Waste Disposal Area |
| MCL | Maximum Contaminant Level |
| MCWB | Metal Cleaning Waste Basin |
| mg/L | milligram per liter |
| MCU | Multi-Cell Unit |
| MNA | Monitored Natural Attenuation |
| MSRB | Material Storage Runoff Basin |
| MW | megawatt |
| NIPSCO | Northern Indiana Public Service Company |
| NPDES | National Pollutant Discharge Elimination System |
| O M | Operations Maintenance |
| POC | Point of Compliance |
| POTW | Publicly Owned Treatment Works |
| PRB | Permeable Reactive Barrier |
| RCG | Remediation Closure Guide |
| RMSGS | Rollin. M. Schahfer Generating Station |
| SSL | Statistically Significant Level |
| ug/L | microgram per liter |
| USEPA | United States Environmental Protection Agency |
| WDA | Waste Disposal Area |

# 1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder has prepared this Addendum 2 to supplement the findings of the April 2019 CCR Assessment of Corrective Measures (ACM) Report and replace the November 2020 ACM Addendum for three impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), collectively the Multi-Cell Unit (MCU) or simply the CCR Unit at the NIPSCO Rollin M. Schahfer Generating Station (RMSGS, Site) (ACM Report, Golder 2019 and ACM Addendum 1, Golder 2020).

ACM Addendum 1 was prepared to provide further details of Golder s evaluation of the potential corrective measures for the MCU and specifically focuses on addressing the following requirements under 40 Code of Federal Regulations (CFR) §257.96(c)

> *"The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under §257.97 addressing at least the following:*
>
> *1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies including safety impacts, cross-media impacts, and control of exposure to any residual contamination;*
>
> *2) The time required to begin and complete the remedy;*
>
> *3) The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s)."*

ACM Addendum 2, which supersedes and fully replaces ACM Addendum 1, revises and updates information provided in the predecessor document and incorporates an enhanced final cap design in all corrective measures alternatives. Inclusion of the revised cap design affects the implementability of certain alternatives originally identified in the ACM and Addendum 1, effectively eliminating these alternatives from further consideration in ACM Addendum 2.

Key technical aspects of the cap design revision and update have been proposed to and discussed with the approving state regulatory agency for closure of the CCR Unit, Indiana Department of Environmental Management (IDEM), and the complete Closure Application is currently under IDEM review. Finalization of the ACM as envisioned in Addendum 2 and completion of the Selection of Remedy (SOR) processes is predicated upon IDEM s approval, in particular the source removal and final cap design aspects.

This Addendum 2 and remaining applicable sections of the ACM Report (Golder 2019) should be consulted in combination with one another.

# 2.0 BAC GROUND

NIPSCO owns and operates the RMSGS at 2723 E 1500 N Road, in Wheatfield, Jasper County, Indiana (see Figure 1). RMSGS manages coal combustion residuals (CCR) in surface impoundments subject to applicable requirements of 40 CFR Part 257 as amended (CCR Rule). Pursuant to 40 CFR §257.96(a), the MCU was subject to an ACM, the results of which were presented in the ACM Report (Golder 2019). Figures 2 through 7 show the monitoring well network, geologic cross sections, groundwater elevation contours and shallow/deep boron isoconcentration contour maps for the Site. Regional and Site Hydrogeology are summarized in the ACM

and supported by volume calculations, slug test data and calculations, and vertical gradient calculation included in Appendices A, B, and C, respectively.

NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. To meet the requirements of 40 CFR §257.97-98, NIPSCO s approach combines CCR source removal/capping followed by groundwater corrective measures and monitoring to demonstrate achievement of applicable groundwater protection standards (GWPS) shown in Table 1.

In the ACM Report (Golder 2019), Golder presented the analytical data for the MCU monitoring wells (see Table 2), identified general groundwater response actions (see Table 3), and presented an initial screening of corrective measure alternatives/process options for groundwater (see Table 4). In addition, Golder identified eight potential groundwater corrective measures for further consideration following the excavation of source material, verification of adequate removal, backfilling, and closure of the MCU. The potential corrective measures and their key components were summarized in Table 5 of the ACM Report (Golder 2019).

After preparation of the ACM Report and ACM Addendum 1, NIPSCO performed additional work with respect to future performance of the initially proposed closure approach and its possible impact on groundwater conditions. Based upon this assessment, NIPSCO determined that an enhanced combination soil/geomembrane cap along with a minor modification of the existing slurry wall, designed to alleviate potential groundwater level build up under the cap, would provide better long-term performance post-closure than either no cap or a soil-only cap. Consequently, NIPSCO proposed this alternative design to IDEM. As referenced above, as of this writing, consideration of the alternative design remains under IDEM review.

Because of NIPSCO s decision and subsequent proposal to IDEM to construct a low permeability cap in conjunction with source removal, it effectively removed groundwater corrective measure Alternative 2 Capping with Monitored Natural Attenuation (MNA) from future consideration. Furthermore, other alternatives that did not previously include or consider the implications of constructing a low permeability cap immediately following source removal including Alternative 4 In situ Stabilization/Solidification (ISS) and MNA, Alternative 6 Capping, Pump-and-Treat and MNA, and Alternative 8 ISS, Pump-and-Treat, and MNA were likewise removed from future consideration. Also, Alternative 1 MNA, Alternative 3 Vertical Barrier/Hydraulic Controls and MNA, Alternative 5 - Pump-and-Treat and MNA, and Alternative 7 Vertical Barrier/Hydraulic Controls, Pump-and-Treat, and MNA were modified to reflect the inclusion of a low permeability cap. In summary and as identified in the embedded table below, Alternatives 2, 4, 6, and 8 have been removed from future consideration in ACM Addendum 2, leaving four remaining alternatives in original or modified form under consideration.

| **Alternative** | **Status** | **Comments** |
|---|---|---|
| Alternative 1 - Monitored Natural Attenuation (MNA) | Retained | MNA requires no modifications to the current closure strategy. |
| Alternative 2 - Capping and MNA | Removed | Capping is already included in the current closure strategy but remains under review by IDEM. |
| Alternative 3 - Vertical Barrier/Hydraulic Controls and MNA | Retained/Modified | Hydraulic controls can be integrated into the current closure strategy with limited modifications to the cap. |

| Alternative | Status | Comments |
|---|---|---|
| Alternative 4 - In situ Stabilization/Solidification (ISS) and MNA | Removed | ISS cannot be integrated into the current closure strategy without significant modifications and potentially severe damage to the cap. |
| Alternative 5 - Pump-and-Treat and MNA | Retained/Modified | Pump and treat can be integrated into the current closure strategy with no impact to the cap. |
| Alternative 6 - Capping, Pump-and-Treat, and MNA | Removed | Capping is already included in the current closure strategy. |
| Alternative 7 - Vertical Barrier/Hydraulic Control, Pump-and-Treat, and MNA | Retained/Modified | See comments for Alternatives 3 and 5. |
| Alternative 8 - ISS, Pump-and-Treat, and MNA | Removed | See comments for Alternative 4. |

# 3.0 IDENTIFICATION OF POTENTIAL CORRECTIVE MEASURES

## 3.1 Source Material

As discussed in the ACM Report (Golder 2019) and referenced above, NIPSCO plans to close the MCU in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. NIPSCO s approach combines CCR source removal/capping and groundwater remediation and monitoring to demonstrate achievement of the IDEM-approved Closure Application requirements and applicable GWPS. The multi-part corrective action approach will be integrated, but will be sequenced, to allow for monitoring of early-stage post-closure results and plume stability. This approach will facilitate optimization of subsequent steps following completion of the initial source removal and capping stages.

The first phase of the integrated corrective action approach is closure by removal/capping of the MCU. Following dewatering activities, the three impoundments will be excavated. In accordance with the Closure Application, excavations are being planned to remove CCR and non-CCR materials to the original design limits (sides and bottom) of the impoundments. Satisfactory excavation will be confirmed by a visual determination that the CCR materials have been removed (Wood 2021).

Following completion of CCR excavation and visual verification of the source removal activities, a final low permeability cap will be installed. As proposed to IDEM, the final cap will consist of the following components presented in descending order from top to bottom (Wood 2021):

- Topsoil (6-inch);
- Cover soil (18-inch);
- Geocomposite drainage layer (GDL);
- 40-mil linear low-density polyethylene (LLDPE) geomembrane; and
- Subgrade fill.

The low permeability cap (e.g., permeability less than or equal to 1 x 10-7 cm/sec) will reduce infiltration of rainwater into the closed CCR unit. In doing so it may further reduce the total volume of impacted groundwater requiring remediation.

During cap construction a hydraulically downgradient section of the slurry wall will be permanently removed down to the average elevation of the groundwater table to address the water buildup/overtopping possibility within the former impoundment. This action should reduce concerns regarding long-term cap performance and maintenance; however, it may result in periodic discharges from within the former impoundment of diluted groundwater that has previously been in contact with CCR.

Closure-by-removal construction activities including, but not limited to, dewatering and excavation of the CCR source material, removal of a portion of the existing slurry wall to the average elevation of the groundwater table, backfill of the closed impoundment, and placement of a low permeability cap are expected to affect the current groundwater flow regime within and in areas proximate to the MCU. Accordingly, NIPSCO will evaluate these impacts on groundwater remedy alternatives as a critical foundational component of the ongoing SOR process. IDEM requires NIPSCO to obtain their approval before closing the MCU; therefore, this stage of additional data collection will begin following IDEM s approval and during NIPSCO s implementation of the Closure Application. In addition to traditional long-term post-closure monitoring during closure implementation and in the early stages of post-closure, NIPSCO will perform remedy-focused groundwater monitoring activities. Beyond the Part 257 Appendix III and IV constituents, monitoring will include parameters specific to the applicability, appropriateness, and performance of MNA, continuing to build upon the results of the MNA Tier I-III evaluation previously completed. In short, NIPSCO will use the monitoring results to evaluate the impacts of source removal and associated closure construction activities and help inform and refine the groundwater remedy selection process as needed.

## 3.2 Ground ater Impacts

Following closure of the MCU by removal/capping, NIPSCO will address impacted groundwater below and downgradient of the MCU.

Because the existing slurry wall surrounding the MCU was installed to contact the underlying bedrock, installation of the low permeability cap will increase the possibility of creating a cell of isolated impacted groundwater beneath the MCU that will not be recharged through migration of un-impacted groundwater or infiltrating rainwater. Due to the history of CCR loading in the MCU, the capacity of the saturated zone within the slurry wall to naturally attenuate these isolated CCR impacts has likely been depleted relative to the aquifer outside the slurry wall. Therefore, there is also a potential for the isolated impacted groundwater within the MCU to be released downgradient if the slurry wall exceeds its operational lifetime or the water level inside the MCU rises and overtops the slurry wall. NIPSCO will also address these potential impacts if monitoring results do not indicate progress towards achievement of GWPS.

In the ACM Report (Golder 2019), Golder identified and preliminarily evaluated the following eight groundwater corrective measure alternatives for further consideration in accordance with the provisions of §257.96(c).

- Alternative 1 - Monitored Natural Attenuation (MNA)
- Alternative 2 - Capping and MNA
- Alternative 3 - Vertical Barrier and MNA

- Alternative 4 - In situ Stabilization/Solidification (ISS) and MNA
- Alternative 5 - Pump-and-Treat and MNA
- Alternative 6 - Capping, Pump-and-Treat, and MNA
- Alternative 7 - Vertical Barrier, Pump-and-Treat, and MNA
- Alternative 8 - ISS, Pump-and-Treat, and MNA

Golder s evaluation of the potential corrective measures and their key components were summarized in Table 5 of the ACM Report (Golder 2019). As noted above, previous Alternatives 2, 4, 6, and 8 have since been removed from future consideration due to a change in closure approach and previous Alternatives 1, 3, 5, and 7 have been modified for the same reason. For this Addendum 2, Golder is providing further supporting evaluation details with respect to each of the four remaining potential groundwater corrective measure alternatives. For clarification and to differentiate the ACM Addendum 2 alternatives from those presented and discussed in predecessor documents, the remaining alternatives are renumbered as follow:

- Alternative A MNA
- Alternative B Vertical Barrier/Hydraulic Controls and MNA
- Alternative C Pump-and-Treat and MNA
- Alternative D Vertical Barrier/Hydraulic Controls, Pump-and-Treat, and MNA

A summary of the retained groundwater corrective measure alternatives is shown in Table 5. The remedial components of the groundwater corrective measure alternatives following source removal and capping are described further in Section 4.

# 4.0 EVALUATION OF POTENTIAL GROUNDWATER CORRECTIVE MEASURES

## 4.1 Evaluation Criteria

In conformance with the applicable requirements of 40 CFR §257.96 and 40 CFR §257.97, Golder evaluated the effectiveness of each of the four remaining potential groundwater corrective measures originally identified in the ACM Report (Golder 2019) using the following criteria:

- **Performance** - Potential corrective measures were evaluated for their relative performance based on the magnitude of reduction of existing risks, ability to obtain the groundwater protection standard (GWPS) at the point of compliance (POC), the magnitude of residual risks in terms of likelihood of future releases due to remaining CCR following implementation of remedy, and the required type and degree of long-term management including monitoring, operation, and maintenance associated with the corrective measure.
- **Relia ilit** - Potential corrective measures were evaluated for their relative reliability based on the long-term reliability of engineering and institutional controls, potential need for the replacement of the remedy, extent to which containment practices will reduce further releases, and extent to which the treatment technologies may be used.

- **Ease of Implementation** - Potential corrective measures were evaluated based on their relative ease of implementation based on difficulty associated with construction of the technology, operational reliability of the technology(ies), coordination of regulatory approvals and permits from pertinent agencies, availability of necessary equipment and specialists, and availability capacity and location of needed treatment, storage, and disposal services.
- **Potential Impacts** - Potential corrective measures were evaluated based on their relative potential impacts based on safety impacts, cross-media impacts, and control of exposure. Exposure controls include short-term risks during implementation of a remedy and potential exposure to remaining wastes to the community or environment including potential threats associated with excavation, transportation, re-disposal of CCR, or contaminant.
- **Time Re uirements** - Potential corrective measures were evaluated based on the time required to initiate, construct, and complete the remedy.
- **Institutional Re uirements** - Potential corrective measures were evaluated based on their institutional requirements including local, state, and federal permit needs.

## 4.2 Evaluation Summaries

Relative to the above evaluation criteria, the following sections present brief summaries of the proposed groundwater corrective measure alternatives following source removal and capping. In addition, the summaries highlight areas where a particular remedy may perform well or poorly relative to other alternatives. A summary of Golder s evaluation of the four retained groundwater corrective measure alternatives is provided in Table 6.

### 4.2.1 Alternative A: Monitored Natural Attenuation

Golder evaluated MNA as a potential groundwater corrective measure for the Site COCs. The MNA Evaluation (Golder 2020) is presented in Appendix D. The results of the evaluation indicate that MNA is a technically feasible and appropriate corrective measure for groundwater at the Site based on the following factors:

- Attenuation is already occurring at the Site at a reasonable rate
- The dissolved plume is stable
- The aquifer has the long-term capacity to attenuate COCs

Based on the results of the Tier I, II, and III MNA evaluations for the Site, Golder concluded that MNA is expected to provide good long-term performance. MNA alone will not substantially affect groundwater concentrations in the short-term, however, it may show some progress within a few months of source material removal during closure of the MCU.

For the MNA evaluation, Golder conducted a point decay evaluation at monitoring wells downgradient of the MCU. Based on the results of the evaluation, maximum concentrations of boron and cobalt observed in downgradient wells over the period of monitoring would take approximately 41 and 39 years, respectively, to attenuate to concentrations below the GWPS (or health-based standard for boron) (Golder 2020).

For the evaluation, Golder also considered the following factors:

- The low groundwater flow velocities observed at the Site

- The distance from the MCU to the property boundary and lack of off-Site migration of groundwater impacts
- The lack of potable water supply wells at the Site in the vicinity of the MCU and the downgradient plume
- Planned institutional controls prohibiting use of groundwater from any impacted area at the Site for drinking water
- Lower observed boron concentrations at monitoring wells further downgradient from the MCU

Based on these other factors, MNA is expected to be protective of human health and reduce environmental degradation until the wells near the MCU achieve the cleanup criteria.

Because there is an existing monitoring well network downgradient of the MCU, implementation of an MNA program is unlikely to require any component construction/installation. In addition, it does not require disturbance of the complex subsurface utility network located hydraulically downgradient of the MCU. Therefore, MNA will be relatively easy to implement following regulatory approval and poses no short-term safety risks. Long-term operation and maintenance (O M) will include routine groundwater sampling and potentially periodic well redevelopment.

### 4.2.2 Alternative B: Vertical Barrier H draulic Controls and MNA

For the Vertical Barrier/Hydraulic Control and MNA Alternative, hydraulic controls within the existing slurry wall would be added to the MNA alternative. The Vertical Barrier/Hydraulic Control and MNA alternative would be implemented to reduce or eliminate downgradient migration of impacted groundwater. This alternative assumes that the existing slurry wall is intact, albeit slightly modified from the original design to address potential water buildup with the former impoundment cell, and that implementation of this alternative involves installation and operation of a pump-and-treat system within the former impoundment areas to prevent over-topping of the modified slurry wall due to groundwater recharge.

The Vertical Barrier/Hydraulic Control and MNA Alternative would have a similar effect as the MNA Alternative on groundwater downgradient of the closed MCU. It would reduce or eliminate the volume of impacted groundwater potentially overtopping the existing or modified slurry wall(s), thus removing a source of contamination, and allowing for more efficient natural attenuation. This remedy would also result in removal of contaminant mass through groundwater extraction and treatment with boron-specific ion exchange resin, which would reduce the potential for future releases of impacted groundwater if the slurry wall fails.

Because there is an existing and functional slurry wall around the MCU, corrective measure implementation would include design, well installation, enclosure construction, and treatment system assembly/construction. Some treatment system components may require lead times prior to delivery; however, most components should be readily available. An amendment to the Site s National Pollutant Discharge Elimination System (NPDES) permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review.

Resin regeneration requires concentrated sodium hydroxide and hydrochloric acid, which could be released and cause damage to the environment in the event of a containment breach. Likewise, in the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged in the treatment system effluent. However, both of these events are unlikely to occur as the reagents will be stored in secondary containment and resin regeneration will be completed automatically on a regular basis to maintain the resin at a high level of removal efficiency.

The hydraulic control system will require a higher level of periodic O M compared to the MNA Alternative as influent and effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, slurry dryer, pH adjustment system, etc.) that are needed to keep the system operational. Most or all of these components will also need replacement over the 30-year design lifetime of the system.

### 4.2.3 Alternative C: Pump-and-Treat and MNA

For the Pump-and-Treat and MNA Alternative, a groundwater pump-and-treat system would be designed and installed to capture contaminated groundwater present in the downgradient vicinity of the MCU and/or potentially leaking through/under the CCR slurry wall, to prevent downgradient off-Site migration. The captured groundwater would then be treated to reduce concentrations to an acceptable concentration and discharged to surface water or groundwater.

The Pump-and-Treat and MNA Alternative offers a higher level of short- and long-term protection than capping and ISS as it removes contaminant mass through treatment of extracted water using ion-exchange resin. This will help reduce contaminant concentrations and thereby enhance natural attenuation downgradient of the capture zone. The capture zone is extensive enough that continued operation of the pump-and-treat system will also contain any future groundwater releases if the slurry wall fails.

Some treatment system components may require lead times prior to delivery, but most components should be readily available. An amendment to the Site s NPDES permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review. Resin regeneration requires concentrated sodium hydroxide and hydrochloric acid, which could be released and cause damage to the environment in the event of a containment breach. Likewise, in the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged. However, both of these events are unlikely to occur as the any reagents will be stored in secondary containment and resin regeneration will be completed automatically on a regular basis to maintain the resin at a high level of removal efficiency. The system will require a higher level of periodic O M compared to capping and ISS as effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, slurry dryer, pH adjustment system, etc.) that are needed to keep the system operational. Most or all of these components will also need replacement over the 30-year design lifetime of the system.

### 4.2.4 Alternative D: Vertical Barrier H draulic Control, Pump-and-Treat, and MNA

The Vertical Barrier/Hydraulic Control, Pump-and-Treat, and MNA Alternative, which includes a pump-and-treat system pumping from wells both inside and downgradient of the slurry wall, would offer a high level of short- and long-term protection. The downgradient well field would remove impacted groundwater allowing for higher-efficiency natural attenuation downgradient of the capture zone while the well field inside the slurry wall would remove more highly-impacted material and reduce the potential for future releases if the slurry wall fails. This alternative would also result in the highest level of contaminant mass removal.

Construction/implementation of this corrective measure alternative would face similar construction/permitting hurdles as the Vertical Barrier/Hydraulic Control and Pump-and-Treat Alternatives in Sections 4.2.2 and 4.2.3, most significantly lead times on components and discharge permitting. Operation and maintenance for this remedy would also be similar to these alternatives with frequent influent/effluent sampling and component monitoring and maintenance, however, the treatment system could be contained in a single enclosure and have a

single set of components for treating extracted water from both capture areas. Because of the shared treatment system, the O M level of effort would likely not be significantly higher than that presented in Section 4.2.3 for the Pump-and-Treat Alternative (as opposed to an additive level of effort for the combined remedial alternatives).

# 5.0 SUMMARY AND NE T STEPS

This Addendum 2 supplements the ACM Report (Golder 2019) and replaces in full ACM Addendum 1 (Golder 2020). It reflects NIPSCO s enhanced closure strategy and ongoing discussions with IDEM in response to comments on the latest Closure Application, providing additional details regarding the remaining four potential groundwater corrective measures originally identified in those reports, and evaluating those corrective measures in accordance with the performance requirements identified in 40 CFR §257.96(c). As noted above, a summary of Golder s evaluation of the four retained groundwater corrective measure alternatives is provided in Table 6.

In addition to updating the ACM to reflect the most recent discussions with IDEM and the revision/submission of the Closure Application for IDEM for review and approval, NIPSCO continues to conduct activities in accordance with the expectations of the ACM and Selection of Remedy (SOR) processes, including the following:

- Preparation of bid documents (specifications and drawings) for closure of the MCU, which provide SOR-related information relative to cost and schedule for alternatives.
- Contractor procurement (including contractor pre-qualification, scheduling of site walks, scope of work question-and-answer, request for alternative approach(es), and establishment of a bid due date) to perform the source removal/capping phase of the corrective measures. This activity informs and refines cost and schedule aspects of the SOR alternatives evaluation process.
- Communications with vendors regarding water treatment technologies, equipment availability, and media costs/handling. This activity also informs and helps refine cost and schedule aspects of the SOR evaluation.

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# Tables

**Table 1: Applicable Groundwater Cleanup Standards**
**CCR Unit Schahfer MSRB, MCWB, and DA**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL (mg/L) | GWPS (mg/L) | IDEM RCG (mg/L) |
|---|---|---|---|
| **Appendix III Constituents** | | | |
| Boron | - | NA | 4 |
| Calcium | - | NA | - |
| Chloride | - | NA | - |
| Fluoride | 4 | 4 | 0.8 |
| pH | - | NA | - |
| Sulfate | - | NA | - |
| Total Dissolved Solids | - | NA | - |
| **Appendix IV Constituents** | | | |
| Antimony | 0.006 | 0.006 | 0.006 |
| Arsenic | 0.01 | 0.078 | 0.01 |
| Barium | 2 | 2 | 2 |
| Beryllium | 0.004 | 0.004 | 0.004 |
| Cadmium | 0.005 | 0.005 | 0.005 |
| Chromium | 0.1 | 0.1 | 0.1 |
| Cobalt[1] | 0.006[2] | 0.01 | 0.006 |
| Fluoride | 4 | 4 | 0.8 |
| Lead[1] | 0.015[2] | 0.0007 | 0.015 |
| Lithium[1] | 0.04[2] | 0.0082 | 0.04 |
| Mercury | 0.002 | 0.002 | 0.002 |
| Molybdenum[1] | 0.1[2] | 0.036 | 0.1 |
| Radium 226+228 | 5 | 5 | - |
| Selenium | 0.05 | 0.05 | 0.05 |
| Thallium | 0.002 | 0.002 | 0.002 |

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

**Notes:**
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard calculated August 23, 2018. Revision
mg/L= milligrams per liter
NA= not applicable; GWPS are calculated for Appendix IV constituents only
1) These four constituents do not have an established MCL. Prior to the Phase 1 Part 1 amendment, effective August 29, 2018, the GWPS was calculated based on background concentrations according to the CCR Final Rule.
2) The Phase 1 Part 1 amended health-based standard, effective August 29, 2018 pursuant to 40 CFR §257.95(h)(2)

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | CAMW04 | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-12 | 2016-09-08 | 2018-11-05 | 2017-01-30 | | 2017-03-31 | 2017-04-25 | 2017-06-28 | 2017-08-22 | 2017-10-04 | 2018-03-13 | 2018-03-24 | 2018-04-20 | | 2018-10-25 | 2019-04-23 | 2019-11-07 | 2020-05-13 | |
| | | | | N | N | N | FD | N | N | N | N | N | N | FD | N | FD | N | N | N | N | FD | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 0.48 | 1.4 | 2.4 Q | 1.1 | 1 | 1.2 | 0.74 | 0.82 | 1.2 | 0.59 | | | 0.74 | 0.72 | 0.78 | 0.74 | 1.3 | 0.69 | 0.84 |
| Calcium | | | mg/L | 110 | 230 | 300 Q | 270 | 240 | 230 | 220 | 200 | 200 | 140 | | | 140 | 140 | 210 | 130 | 290 | 115 | 112 |
| Chloride | | | mg/L | 8.8 | 27 | 69 Q | 18 | 14 | 14 | 5.4 | 12 | 13 | 4.5 | | | 7.7 J | 9.4 | 20 | 3.7 | 9.5 | 2 | 2 |
| Fluoride | 4 | 4 | mg/L | 0.92 J- | 0.82 | 10 UQ | 0.19 J | 0.14 J | 5 U | 5 U | 0.19 J | 0.21 J | 0.24 J | 0.19 J | 5 U | 5 U | 0.17 J- | 0.26 | 0.19 J+ | 0.25 | 0.25 | 0.15 |
| pH | | | SU | 7.22 | 6.83 | 6.75 | | 6.83 | 7.01 | 6.76 | 6.88 | 7.21 | 7.23 | | 6.95 | | 7.2 | 6.39 | 7 | 7.14 | | 7.42 |
| Sulfate | | | mg/l | 140 J | 460 | 188 Q | 460 | 470 | 480 | 470 | 370 | 440 | 360 | | | 220 | 210 | 530 | 260 | 490 | 136 | 130 |
| Total Dissolved Solids | | | mg/L | 420 | 950 | 1400 Q | 1000 | 1000 | 990 | 820 | 680 | 920 | 610 | | | 580 J | 580 | 980 | 600 | 900 | 411 | 413 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.00027 JQ | 0.002 U | 0.00057 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | | | 0.002 U | 0.00095 J | 0.00092 J | 0.001 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0059 | 0.013 | 0.0052 Q | 0.0059 | 0.0072 | 0.005 J | 0.0059 | 0.012 | 0.012 | | 0.004 J | 0.005+ | | | 0.014 | 0.0025 J | 0.0018 J | 0.002 | 0.002 |
| Barium | 2 | 2 | mg/L | 0.051 | 0.077 | 0.11 Q | 0.095 | 0.079 | 0.089 | 0.068 | 0.084 | 0.09 | | 0.11 | 0.077 | | | 0.074 | 0.068 | 0.069 | 0.076 | 0.077 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.00027 J | 0.002 U | 0.001 UQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.00048 J | 0.00059 J | 0.001 U | 0.0002 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.00036 JQ | 0.00058 J | 0.0057 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.0011 J | 0.0017 J | | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.00031 J | 0.00064 JQ | 0.0061 | 0.0058 | 0.0035 | 0.0049 | 0.003 | 0.0023 | | 0.0028 | 0.0031 | | | 0.0026 | 0.0011 | 0.00043 J | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.92 J | 0.82 | 10 UQ | 0.19 J | 0.17 J | 5 U | 5 U | 0.19 J | 0.21 J | 0.24 J | 0.19 J | 5 U | 5 U | 0.17 J | 0.26 | 0.19 J+ | 0.25 | 0.25 | 0.15 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 L | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0018 J | 0.006 U | 0.003 UQ | 0.0021 J | 0.0022 J | 0.0033 J | 0.0035 J | 0.0062 J | 0.0052 J | | 0.009 U | 0.008 U | | | 0.0023 J | 0.0045 J | 0.0028 J | 0.008 U | 0.008 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 UQ | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 J | 0.0002 UJ | | 0.0002 U | 0.0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.006 J | 0.023 | 0.003 Q | 0.007 | 0.008 | 0.008 | 0.010 | 0.02 | 0.004 | | 0.0049 J | 0.004 | | | 0.009 | 0.024 | 0.026 | 0.022 | 0.022 |
| Radium 226 + 228 | 5 | | pCi/L | 5 U | 0.583 | 0.697 Q | 0.804 | 0.515 U | 0.362 U | 0.376 U | 0.364 U | 0.352 U | | 1.35 J- | 0.778 J+ | | | 0.473 | 0.591 | | 1.7 U | 1.52 U |
| Radium 226 | | | pCi/L | 1 U | 0.198 U | 0.316 UQ | 0.301 U | 0.242 U | 0.129 U | 0.117 U | 0.119 U | 0.118 | | 0.177 | 0.0881 | | | 0.208 | 0.311 U | | 0.78 U | 0.613 U |
| Radium-228 | | | pCi/L | 1 U | 0.498 U | 0.495 UQ | 0.677 J+ | 0.515 U | 0.362 U | 0.376 U | 0.364 U | 0.352 U | | 1.17 J- | 0.69 J+ | | | 0.462 U | 0.425 | | 0.924 U | 1.31 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.00084 JQ | 0.00077 J | 0.0021 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.001 U | 0.001 U | | | 0.005 U | 0.0013 J | 0.0059 | 0.001 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.09 | 0.58 | 0.37 | | 1.82 | 1.47 | 0.12 | 0.3 | 0.52 | 0.09 | | 0.66 | | 2.3 | 0.15 | 7.03 | 2.05 | | 1.32 |
| Oxidation Reduction Potential | | | millivolts | 59.6 | -24 | -6.9 | | -91.7 | 14 | -56.8 | -46 | -27 | -105.8 | | -181.8 | | -81.2 | -66.1 | 19 | -10.7 | | -28.6 |
| pH | | | SU | 7.22 | 6.83 | 6.75 | | 6.83 | 7.01 | 6.76 | 6.88 | 7.21 | 7.23 | | 6.95 | | 7.2 | 6.39 | 7 | 7.14 | | 7.42 |
| Specific Conductivity | | | uS/cm | 695 | 1345 | 1681 | | 1109 | 919 | 1137 | 911 | 1153 | 813 | | 962 | | 770 | 1311 | 549 | 866 | | 681 |
| Temperature | | | deg C | 13 | 17.3 | 16.3 | | 10.5 | 8.05 | 13.2 | 13.1 | 15.9 | 16.1 | | 7.55 | | 3.5 | 15.5 | 4.2 | 13.3 | | 9.3 |
| Turbidity | | | NTU | 1.01 | 1.48 | 2.91 | | 9.26 | 1.06 | 4.04 | 1.88 | 1.85 | 0.51 | | 4.02 | | 3.12 | 1.69 | 8.48 | 1.38 | | 3.57 |

Notes
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-8 Screening Levels - 2021
Revision
MCL= Maximum Contaminant Leve
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uSiem = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
"U" = indicates the result was not detected above the method criterion, Limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J+" = indicates the result is estimated and may be biased low.
"J-" = Indicates the result is estimated and may be biased high.
"UJ" = indicates the result was not detected above the MDL, the estimated RL is provided.
"Q" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | CRMW07 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-12 | 2016-09-08 | 2016-11-06 | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-06-29 | 2017-08-23 | 2017-10-03 | | 2018-03-15 | 2018-04-23 | 2018-06-26 | 2019-05-02 | 2019-11-08 | 2020-04-28 | |
| | | | | N | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | FD | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 1.2 | 1 | 0.81 | 0.91 | 1 | 0.68 | 0.67 | 0.98 | 0.71 | 0.72 | | 1.2 | 1.4 | 0.85 | 0.85 | 0.87 | 0.87 |
| Calcium | | | mg/L | 170 | 180 | 200 | 170 | 170 | 190 | 220 | 190 | 220 | 220 | | 210 | 230 | 220 | 180 | 230 | 211 |
| Chloride | | | mg/L | 4.8 | 6.6 | 6.3 | 6 | 5.6 | 6.8 | 8.1 | 8.2 J | 8.1 | 8.0 J | | 4.7 J | 6.3 | 6.5 | 4.8 | 6.5 | 6.3 |
| Fluoride | 4 | 4 | mg/L | 0.72 J+ | 0.91 J | 0.8 J | 0.86 J | 0.66 J | 0.76 J | 0.79 J | 0.56 J | 1.1 J | 0.93 J | 0.58 J | 0.57 J | 0.73 | 0.97 | 0.89 | 0.69 | 0.64 |
| pH | | | SU | 7.03 | 7.27 | 7.04 | 7.15 | 7.2 | 7.17 | 6.57 | 7.2 | | 7.1 | 7.28 | 7.35 | 6.71 | 7.2 | 7.44 | | 7.3 |
| Sulfate | | | mg/l | 310 | 330 | 390 | 320 | 290 | 310 | 360 | 380 | 460 | 450 | | 450 | 520 | 500 | 480 | 493 | 390 |
| Total Dissolved Solids | | | mg/L | 720 | 830 | 840 | 750 | 750 | 810 | 970 | 910 | 970 | 1000 | | 900 | 920 | 1100 | 940 | 840 | 846 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.00035 J | 0.00035 J | 0.00035 J | 0.00029 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0013 J | 0.0016 J | 0.0019 J | 0.0028 J | 0.002 U | 0.0026 J | 0.0015 J | 0.0016 J | | | 0.005 U | | 0.0012 J | 0.0019 J | 0.0011 J | 0.001 U | 0.001 U |
| Barium | 2 | 2 | mg/L | 0.052 | 0.055 | 0.059 | 0.042 | 0.05 | 0.05 | 0.059 | 0.059 | | | 0.056 | | 0.054 | 0.053 | 0.043 | 0.041 | 0.04 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.00011 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0013 J | 0.00022 J | | | 0.001 U | | 0.00047 J | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.00017 J | 0.00016 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0021 J |
| Cobalt | | 0.006 | mg/L | 0.0056 | 0.0077 | 0.0055 | 0.0038 | 0.0044 | 0.0065 | 0.01 | 0.0095 | | | 0.006 | | 0.01 | 0.0074 | 0.0045 | 0.0053 | 0.0064 |
| Fluoride | 4 | 4 | mg/l | 0.72 J | 0.91 J | 0.8 J | 0.86 J | 0.66 J | 0.76 J | 0.79 J | 0.56 J | 1.1 J | 0.93 J | 0.58 J | 0.57 J | 0.73 | 0.97 | 0.89 | 0.69 | 0.64 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0007 J | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0034 J | 0.036 U | 0.036 U | 0.0025 J | 0.0031 J | 0.0041 J | 0.0027 J | 0.0036 J | | | 0.0024 J | | 0.0054 J | 0.0041 J | 0.0031 J | 0.008 U | 0.008 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.0084 J | 0.0098 J | 0.0095 J | 0.01 J | 0.01 U | 0.0085 J | 0.0081 J | 0.007 J | | | 0.0066 J | | 0.009 J | 0.0057 J | 0.0087 J | 0.0073 | 0.0073 |
| Radium 226 + 228 | 5 | | pCi/L | 1.59 | 0.696 | 0.543 | 0.412 U | 0.42 U | 0.371 U | 0.45 | 0.588 | | | 0.749 J+ | | 0.823 J+ | 0.37 J | | 1.82 | 2.01 U |
| Radium 226 | | | pCi/l | 0.667 U | 0.289 | 0.371 | 0.237 U | 0.186 | 0.155 | 0.232 U | 0.3 | | | 0.163 | | 0.183 U | 0.305 U | | 0.653 U | 1.16 U |
| Radium-228 | | | pCi/L | 0.923 | 0.408 | 0.462 U | 0.413 U | 0.42 U | 0.371 U | 0.262 U | 0.453 U | | | 0.585 J+ | | 0.365 U | 0.37 U | | 1.07 | 0.864 |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.003 T | 0.0041 T | 0.005 U | 0.008 | 0.0054 | 0.005 | | | 0.0028 T | | 0.0016 T | 0.0045 T | 0.0016 T | 0.0017 | 0.0018 |
| Thallium | 0.002 | 0.002 | mg/L | 0.0001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.0024 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.6 | 1.31 | 0.59 | 0.52 | 0.51 | 1.96 | 1.02 | 0.84 | | 0.49 | 0.6 | 0.52 | 2.64 | 0.81 | 0.38 | | 0.34 |
| Oxidation Reduction Potential | | | millivolts | 111.2 | 64.2 | -6.9 | -71.3 | 66.3 | 76.9 | 291.1 | 8.5 | | 99.4 | -55 | -98.7 | -233.8 | 195.1 | -191.8 | | 116.2 |
| pH | | | SU | 7.03 | 7.27 | 7.04 | 7.15 | 7.2 | 7.17 | 6.57 | 7.2 | | 7.1 | 7.28 | 7.35 | 6.71 | 7.2 | 7.44 | | 7.3 |
| Specific Conductivity | | | uS/cm | 986 | 1072 | 1106 | 928 | 832 | 1121 | 1151 | 1157 | | 1273 | 760 | 1060 | 1240 | 975 | 829 | | 1223 |
| Temperature | | | deg C | 14.4 | 15.2 | 16.7 | 12.8 | 10.65 | 11.8 | 14.6 | 16.5 | | 18 | 10 | 10 | 16.95 | 18.3 | 15.3 | | 10.5 |
| Turbidity | | | NTU | 1.6 | 4.53 | 1.06 | 3.2 | 1.76 | 2.17 | 3.87 | 6.9 | | 0.49 | 1.3 | 1.75 | 1.08 | 2.72 | 1.58 | | 2.2 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set.

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW07B | | | | | GAMW08 | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-06 | 2018-10-26 | 2019-05-02 | 2019-11-12 | 2020-04-28 | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-06-27 | 2017-06-29 | 2017-08-23 | 2017-10-04 | 2018-03-14 | 2018-04-23 | 2018-10-26 | 2019-05-02 | 2019-11-07 | 2020-04-28 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 20 | 22 | 28 | 15 | 11.1 | 5.5 | 3.9 | 2.2 | 3.4 | 1.8 | 3.2 | 2.9 | 2.2 | 3.7 | | 3.4 | 1.8 | 1.4 | 2.5 | 3 |
| Calcium | | | mg/L | 370 | 430 | 380 | 400 | 370 | 310 | 290 | 300 | 260 | 270 | 310 | 340 | 270 | 290 | | 380 | 220 | 250 | 280 | 309 |
| Chloride | | | mg/L | 10 UD | 250 | 5.0 | 250 | 11.3 | 88 | 71 | 89 | 95 | 110 | 86 | 83 | 99 | 87 | | 64 | 56 | 49 | 66 | 67 |
| Fluoride | 4 | 4 | mg/L | 10 UD | 1.9 | 1.3 | 1.2 | 1.2 | 1.2 J- | 1.2 J | 0.73 J | 0.67 J | 0.94 J | 0.52 J | 1.3 J | 2 J | 0.68 J | 1.2 J | 1.3 J- | 1.0 | 2.2 | 1.8 | 1.1 J- |
| pH | | | SU | 8.39 | 6.78 | 7.58 | 7.13 | 7.73 | 6.92 | 7.03 | 6.85 | 7.02 | 7.09 | 6.83 | 7 | 7.27 | 6.89 | 7.41 | 7.42 | 6.99 | 7.37 | 7.5 | 7.35 |
| Sulfate | | | mg/l | 10 UD | 1600 | 1500 | 1400 | 1260 | 770 J | 690 | 680 | 610 | 630 | 770 | 800 | 690 | 670 | | 800 | 460 | 640 | 670 | 710 |
| Total Dissolved Solids | | | mg/L | 2200 | 2600 | 920 | 2300 | 2_40 | 1500 | 1500 | 1800 | 1700 | 1400 | 1700 | 2000 | 1400 | 1500 | | 1700 | 1100 | 1300 | 1300 | 1550 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.00078 J | 0.00065 J | 0.0014 J | 0.00041 J | 0.00043 J | 0.002 U | 0.00052 J | 0.00075 J | | 0.002 U | | 0.00082 J | 0.00076 J | 0.00077 J | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0028 J | 0.0015 J | 0.0019 J | 0.0017 J | 0.0023 | 0.0018 J | 0.0019 J | 0.0016 J | 0.0027 J | 0.0026 J | 0.0021 J | 0.0017 J | 0.0023 J | | 0.005 U | | 0.0011 J | 0.0015 J | 0.0016 J | 0.0012 |
| Barium | 2 | 2 | mg/L | 0.072 | 0.058 | 0.053 | 0.048 | 0.044 | 0.068 | 0.065 | 0.068 | 0.09 | 0.056 | 0.064 | 0.074 | 0.077 | | 0.060 | 0.069 | 0.052 | 0.058 | 0.060 | 0.061 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.00017 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.0004 J | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 7.4E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.00037 J | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.00029 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.00074 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.006 | 0.004 | 0.008 | 0.047 | 0.05 | 0.037 | 0.047 | 0.02 | | 0.022 | 0.027 | 0.011 | 0.0078 | 0.011 | 0.022 |
| Fluoride | 4 | 4 | mg/l | 10 U | 1.9 | 1.3 | 1.2 | 1.2 | 1.2 | 1.2 J | 0.73 J | 0.67 J | 0.94 J | 0.52 J | 1.3 J | 2 J | 0.68 J | 1.2 J | 1.3 J | 1.0 | 2.2 | 1.8 | 1.1 J |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0043 J | 0.0045 J | 0.004 J | 0.0035 J | 0.003 U | 0.0086 | 0.011 | 0.009 | 0.0088 | 0.0063 | 0.012 | 0.011 | 0.012 | | 0.0098 | 0.009 | 0.011 | 0.015 | 0.0095 | 0.0057 |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.015 | 0.017 | 0.029 | 0.026 | 0.026 | 0.094 | 0.036 | 0.024 | 0.02 | 0.019 | 0.029 | 0.049 | 0.083 | | 0.056 | 0.058 | 0.059 | 0.09 | 0.069 | 0.048 |
| Radium 226 + 228 | 5 | | pCi/L | 3.63 | 2.62 J- | 2.31 | | 1.92 U | 1.07 | 1.08 | 1.09 | 0.531 | 0.777 | 0.632 | 1.11 | 0.762 | | 1.13 J+ | 0.99 | 1.1+ | 0.473 | | 1.25 U |
| Radium 226 | | | pCi/L | 1.86 | 1.58 U | 2.17 | | 0.889 U | 0.501 U | 0.486 | 0.557 | 0.375 | 0.588 | 0.383 | 0.613 U | 0.501 | | 0.267 | 0.197 | 0.582 U | 0.312 U | | 0.569 U |
| Radium 228 | | | pCi/L | 1.47 | 1.04 | 1.14 | | 1.07 | 1 U | 0.605 | 0.533 | 0.43 U | 0.423 U | 0.365 U | 0.469 | 0.341 U | | 0.865 J+ | 0.552 | 0.423 | 0.456 U | | 0.689 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.0012 J | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0.005 U | 0.0045 | 0.0033 J | 0.0014 J | 0.0032 J | 0.01 | 0.0058 | 0.0081 | | 0.004 | 0.022 | 0.0021 J | 0.016 | 0.0036 J | 0.0062 |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.00045 J | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.83 | 0.67 | 0.19 | 0.2 | 0.1 | 1.9 | 0.38 | 1.52 | 1.27 | 0.95 | 0.63 | 1.96 | 3.93 | 0.21 | 3.97 | 5.09 | 0.21 | 0.44 | 4.2 | 0.34 |
| Oxidation Reduction Potential | | | millivolts | -147.6 | -230.2 | 34.9 | -196.7 | -128.6 | 159.4 | 94.6 | -8 | 98.4 | 49.9 | 60.4 | 242.6 | 61.8 | -25.9 | 110.1 | -106.4 | 22.7 | 62.2 | 44.1 | 92.5 |
| pH | | | SU | 8.39 | 6.78 | 7.58 | 7.13 | 7.73 | 6.92 | 7.03 | 6.85 | 7.02 | 7.09 | 6.83 | 7 | 7.27 | 6.89 | 7.41 | 7.42 | 6.99 | 7.37 | 7.5 | 7.35 |
| Specific Conductivity | | | uS/cm | 3178 | 3237 | 2357 | 1696 | 2722 | 1905 | 1807 | 1694 | 1517 | 1494 | 2088 | 1824 | 1713 | 1840 | 1121 | 1732 | 1443 | 1102 | 1322 | 2008 |
| Temperature | | | deg C | 15.03 | 13.86 | 12.4 | 12.9 | 12.7 | 15.5 | 18.78 | 17.75 | 12.2 | 10.06 | 11.1 | 15.8 | 18.5 | 18.3 | 9.6 | 10.2 | 17.2 | 11 | 10.34 | 10.5 |
| Turbidity | | | NTU | 1.48 | 3.01 | 0.86 | 1.11 | 3.48 | 2.3 | 3.22 | 0.58 | 1.26 | 1.58 | 5.1 | 2.41 | 0.68 | 1.38 | 1.11 | 1.54 | 1.4 | 0.81 | 0.31 | 2.5 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 Screening Levels - 2021
Revision
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
"U" = indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J-" = indicates the result is estimated and may be biased low.
"J+" = indicates the result is estimated and may be biased high.
"UJ" = indicates the result was not detected above the MDL; the estimated RL is provided.
"D" = Indicates a result was identified as an outlier and removed from the data set.

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | CAMW05S | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-07 | | 2018-10-26 | | 2019-05-03 | 2019-11-07 | 2020-04-2 | |
| | | | | FD | N | FD | N | N | N | FD | N |
| **Appendix III Parameters** | | | | | | | | | | | |
| Boron | | 4 | mg/L | | 18 | | 15 | 14 | 13 | | 20.4 |
| Calcium | | | mg/L | | 330 | | 320 | 320 | 340 | | 325 |
| Chloride | | | mg/L | | 240 | | 180 | 100 | 180 | | 220 |
| Fluoride | 4 | 4 | mg/L | | 1.6 J | | 1.5 | 1.8 | 1.7 | | 2.5 J+ |
| pH | | | SU | | 7.7 | | 7.45 | 7.57 | 7.85 | | 7.89 |
| Sulfate | | | mg/l | | 1500 | | 1500 | 1400 | 1300 | | 1280 |
| Total Dissolved Solids | | | mg/L | | 1900 J+ | | 2300 | 2300 | 2200 | | 2560 |
| **Appendix IV Parameters** | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | | 0.001 U |
| Barium | 2 | 2 | mg/L | | 0.042 | | 0.03 | 0.026 | 0.023 | | 0.028 |
| Beryllium | 0.004 | 0.004 | mg/L | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | | 0.007 U | | 0.007 U | 0.007 U | 0.007 U | | 0.007 U |
| Cobalt | | 0.006 | mg/L | | 0.00665 J | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U |
| Fluoride | 4 | 4 | mg/l | | 1.6 J | | 1.5 | 1.8 | 1.7 | | 1.5 J |
| Lead | 0.015 | 0.015 | mg/L | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U |
| Lithium | | 0.04 | mg/L | | 0.0059 J | | 0.0073 J | 0.0063 J | 0.0059 J | | 0.003 U |
| Mercury | 0.002 | 0.002 | mg/L | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | | 0.037 | | 0.039 | 0.057 | 0.046 | | 0.05 |
| Radium-226 + 228 | 5 | | pCi/L | | 1.67 J+ | | 1.02 J+ | 0.784 | | | 1.67 U |
| Radium-226 | | | pCi/l | | 1.09 J+ | | 0.596 J+ | 0.498 | | | 0.709 U |
| Radium-228 | | | pCi/L | | 0.579 | | 0.454 U | 0.518 U | | | 0.857 U |
| Selenium | 0.05 | 0.05 | mg/L | | 0.001 U | | 0.005 U | 0.005 U | 0.005 U | | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U |
| **Field Parameters** | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | | 0.42 | | 0.12 | 0.33 | 2.81 | | 0.12 |
| Oxidation Reduction Potential | | | millivolts | | -185.5 | | -97 | 79 | -67 | | -142.2 |
| pH | | | SU | | 7.7 | | 7.45 | 7.57 | 7.85 | | 7.89 |
| Specific Conductivity | | | uS/cm | | 2538 | | 2375 | 2290 | 1896 | | 3391 |
| Temperature | | | deg C | | 14.6 | | 14.5 | 12.8 | 8.05 | | 13 |
| Turbidity | | | NTU | | 3.4 | | 1.63 | 1.72 | 0.86 | | 9.51 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-3 Screening Levels - 2021
Revision

MCL – Maximum Contaminant Level
mg/L = milligrams per liter
SU – standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided

"J" = indicates the result is estimated.

"J+" = indicates the result is estimated and may be biased low.

"J-" = indicates the result is estimated and may be biased high.

"UJ" = indicates the result was not detected above the MDL; the estimated RL is provided.

"R" = indicates a result was identified as an outlier and removed from the data set.

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW05 | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-05 | 2017-01-10 | 2017-03-01 | | 2017-04-25 | | 2017-06-28 | 2017-08-23 | 2017-10-03 | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-05-02 | | 2019-11-07 | 2020-04-29 |
| | | | | N | N | N | N | FD | N | FD | N | N | N | N | N | N | N | FD | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 5.7 | 4.7 | 7.3 | 5.2 | 5.7 | 6.0 | 5.8 | 6.1 | 4.8 | 7.9 | 7.3 | | 4.8 | 6.3 | 6 | 6 | 2.7 | 3.3 |
| Calcium | | | mg/L | 220 | 240 | 210 | 210 | 200 | 200 | 220 | 240 | 270 | 280 | 220 | | 220 | 220 | 200 | 200 | 150 | 170 |
| Chloride | | | mg/L | 63 | 55 | 58 | 58 | 58 | 75 | 73 | 71 | 67 | 63 | 59 | 54 | | 56 | 52 | 49 | 46 | 38 | 54.3 |
| Fluoride | 4 | 4 | mg/L | 0.15 J+ | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0.10 J | 0.13 J | 0.18 J | 0.10 | 0.21 J | 5 U | 0.20 J+ | 0.28 | 0.27 | 0.27 | 0.23 | 0.3 J+ |
| pH | | | SU | 7.27 | 7.25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7.31 | 7.3 | 7.28 | 6.87 | 6.88 | | 7.1 | 7.05 | 7.15 |
| Sulfate | | | mg/l | 610 J | 570 | 560 | 500 | 510 | 490 | 460 | 460 | 600 | 740 | 540 | | 510 | 510 J | 530 | 530 | 380 | 390 |
| Total Dissolved Solids | | | mg/L | 1500 | 1100 | 880 | 980 | 1000 | 950 | 1000 | 960 | 1300 | 1400 | 1,100 | | 950 | 1100 | 970 | 980 | 770 | 772 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 J | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0015 J | 0.0013 J | 0.00976 J | 0.0031 J | 0.005 U | 0.005 U | 0.0029 J | 0.0029 J | 0.003 J | 0.0027 J | | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U |
| Barium | 2 | 2 | mg/L | 0.059 | 0.048 | 0.039 | 0.039 | 0.035 | 0.037 | 0.039 | 0.042 | 0.047 | 0.054 | | | 0.041 | 0.039 | 0.039 | 0.041 | 0.041 | 0.036 | 0.032 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.00052 J | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.00036 J | 0.002 U | 0.001 U | 0.001 U | | | 0.001 UJ | | 0.00052 J | 0.00058 J | 0.00052 J | 0.00049 J | 0.00039 |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.00033 J | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.0036 | 0.002 U | 0.00069 J | 0.0015 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0011 J | 0.0015 J | | | 0.0016 J | | 0.002 U | 0.0012 J | 0.0013 J | 0.002 U | 0.001 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.00018 J | 0.0002 J | 0.0002 J | 0.001 U | 0.001 U | 0.00029 J | 0.00025 J | 0.001 U | 0.001 U | | | 0.001 U | | 0.00038 J | 0.00049 J | 0.00055 J | 0.00035 J | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.15 J | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0.10 J | 0.13 J | 0.18 J | 0.10 | 0.21 J | 5 U | 0.20 J | | 0.28 | 0.27 | 0.27 | 0.23 | 0.3 J |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0019 J | 0.036 U | 0.003 U | 0.0016 J | 0.0011 J | 0.0022 J | 0.003 U | 0.036 U | 0.0047 J | 0.0013 J | | | 0.008 U | | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.003 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.004 | 0.012 | 0.0024 | 0.0023 | 0.002 | 0.0027 | 0.021 | 0.042 | 0.028 | 0.032 | | | 0.025 | 0.036 | 0.14 | 0.053 | 0.043 | 0.035 | 0.012 |
| Radium 226 + 228 | 5 | | pCi/L | 1.5 | 0.588 | 0.477 U | 0.467 U | 0.55 | 0.459 | 0.593 | 0.414 | 0.707 | 0.803 | | | 1.45 J+ | 0.986 | 0.679 | 0.505 | 0.427 U | | 1.47 U |
| Radium 226 | | | pCi/L | 0.906 U | 0.291 | 0.307 U | 0.247 | 0.134 | 0.156 | 0.104 | 0.285 | 0.255 U | 0.357 | | | 0.188 | 0.291 | 0.416 | 0.33 | 0.355 U | | 0.606 U |
| Radium-228 | | | pCi/L | 0.594 | 0.349 U | 0.472 U | 0.467 U | 0.427 U | 0.432 U | 0.393 | 0.36 U | 0.452 | 0.446 | | | 1.26 J+ | -0.108 | 0.361 U | 0.428 U | 0.427 U | | 0.277 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.011 | 0.0091 | 0.0049 J | 0.011 | 0.014 | 0.014 | 0.017 | 0.03 | 0.013 | 0.027 | | | 0.0082 | 0.01 | 0.0098 | 0.012 | 0.012 | 0.0077 | 0.0026 |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 2.09 | 6.69 | 1.98 | 6.1 | | 3.41 | | 3.92 | 5.27 | 3.24 | 5.98 | 6.71 | 5.43 | 0.22 | | 5.02 | 5.04 | 3.14 |
| Oxidation Reduction Potential | | | millivolts | -1.4 | 75.7 | 270 | 230 | | 98.5 | | 154.6 | 280.8 | 58.9 | 138.5 | -110.3 | -90.8 | -48.8 | | 53.6 | -25.7 | 44 |
| pH | | | SU | 7.27 | 7.25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7.31 | 7.3 | 7.28 | 6.87 | 6.88 | | 7.1 | 7.05 | 7.15 |
| Specific Conductivity | | | uS/cm | 1671 | 736 | 1110 | 822 | | 1041 | | 1209 | 202 | 1542 | 1331 | 600 | 1155 | 1274 | | 988 | 685 | 774 |
| Temperature | | | deg C | 14.4 | 18.4 | 16.9 | 11.8 | | 10.75 | | 11.9 | 14.7 | 17.2 | 18.2 | 13.2 | 10.9 | 17.9 | | 11.4 | 15.9 | 10.3 |
| Turbidity | | | NTU | 1.93 | 3.03 | 7.15 | 1.84 | | 3.12 | | 1.88 | 5.01 | 0.91 | 0.36 | 0.82 | 2.94 | 2.47 | | 1.41 | 1.55 | 2.37 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 Screening Levels - 2021
Revision
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
"U" = indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J+" = indicates the result is estimated and may be biased low.
"J-" = indicates the result is estimated and may be biased high.
"UJ" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | CAMW03B | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | | 2016-05-26 | 2016-12-09 | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-08-28 | | 2017-08-23 | 2017-10-05 | 2018-03-14 | 2018-04-23 | 2018-09-06 | 2018-10-26 | 2019-05-08 | | 2019-11-07 | 2020-04-27 |
| | | | | FD | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | N | FD | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 24 | 25 | 25 | 19 | 11 | 11 | 11 | 12 | 16 | 19 | 19 | | 14 | 12 | 12 | 14 | 14 | 8 | 6.1 |
| Calcium | | | mg/L | 280 | 280 | 270 | 190 | 200 | 170 | 170 | 180 | 160 | 190 | 150 | | 160 | 150 | 160 | 150 | 150 | 150 | 140 |
| Chloride | | | mg/L | 210 | 180 | 190 | 130 | 110 | 120 | 130 | 150 | 170 | 160 | 140 | | 150 | 130 | 150 | 240 | 140 | 110 | 110 |
| Fluoride | 4 | 4 | mg/L | 0.68 J+ | 0.62 J+ | 0.67 J | 0.68 J | 0.1 U | 1.8 J | 1.2 J | 1.4 J | 1.2 J | 0.87 J | 1.5 J | 1.4 J | 1.6 J | 1.8 J | 1.6 | 1.6 | 1.6 | 1.5 | 1.3 |
| pH | | | SU | | 7.08 | 7.15 | 5.96 | 7.36 | 7.44 | 7.29 | 7.36 | | 7.46 | 7.36 | 7.56 | 7.43 | 7.32 | 7.46 | | 7.46 | 7.56 | 7.65 |
| Sulfate | | | mg/l | 670 T | 1000 T | 980 | 740 | 620 T | 550 | 570 | 610 | 630 | 650 | 550 | | 430 | 570 | 580 | 610 | 570 | 440 | 387 |
| Total Dissolved Solids | | | mg/L | 2100 | 2000 | 2100 | 1700 | 1330 | 1200 | 1200 | 1500 | 1500 | 1500 | 1300 | | 990 | 1300 | 1200 | 1200 | 1200 | 990 | 906 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0011 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0024 J | 0.0026 J | 0.003 J | 0.0014 J | 0.0027 J | 0.005 U | 0.004 J | 0.004 J | 0.0031 J | 0.0031 J | | 0.005+ | 0.0054 | 0.0044 J | 0.004 J | 0.0052 | 0.0057 | 0.0042 J | 0.0049 |
| Barium | 2 | 2 | mg/L | 0.069 | 0.071 | 0.076 | 0.062 | 0.048 | 0.04 | 0.046 | 0.065 | 0.062 | 0.068 | | 0.04+ | 0.04 | 0.049 | 0.047 | 0.042 | 0.041 | 0.028 | 0.034 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.00012 J | 9.1E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.00027 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/l | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.001 U | 0.00069 J | 0.00026 J | 0.00045 J | 0.001 U | 0.00028 J | 0.00045 J | 0.00041 J | 0.00041 J | | 0.001 U | | 0.00058 J | 0.00028 J | 0.00022 J | 0.00025 J | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.67 T | 0.55 T | 0.67 J | 0.68 J | 0.1 J | 1.5 T | 1.2 T | 1.4 T | 1.3 J | 0.87 J | 1.5 T | 1.4 J | 1.6 J | 1.8 T | 1.6 | 1.6 | 1.6 | 1.5 | 1.3 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.00017 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0055 J | 0.0065 J | 0.006 J | 0.006 U | 0.0046 J | 0.0045 J | 0.0058 J | 0.0054 J | 0.0047 J | 0.0042 J | | 0.0051 J | | 0.0037 J | 0.0052 J | 0.0053 J | 0.0052 J | 0.0033 J | 0.0016 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 J | 0.0002 U | 0.0002 U | 0.0002 J | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 J | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.00097 J | 0.003 | 0.015 | 0.015 | 0.012 | 0.0094 J | 0.01 | | 0.014 | 0.022 | 0.01 | 0.012 | 0.012 | 0.012 | 0.0096 J | 0.013 |
| Radium 226 + 228 | 5 | | pCi/L | 1.42 | 1.86 | 1.65 | 1.14 | 0.453 | 1.09 | 0.774 | 1.85 | 1.01 | 1.27 | | 1.18 J+ | 0.868 | 1.04 | 1.24 J+ | 1.03 | 1.01 | | 1.25 U |
| Radium 226 | | | pCi/L | 0.809 U | 0.972 U | 0.902 | 0.579 | 0.176 | 0.585 | 0.316 | 0.781 U | 0.585 | 0.706 | | 0.482 | 0.301 | 0.653 | 0.69 U | 0.585 | 0.449 | | 0.556 U |
| Radium-228 | | | pCi/L | 1 U | 0.813 | 0.743 | 0.559 | 0.42 U | 0.508 | 0.458 | 1.07 | 0.421 | 0.563 | | 0.699 J+ | 0.567 | 0.386 | 0.546 | 0.491 U | 0.564 | | 0.838 |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.002 U | 0.005 U | 0.0014 J | 0.001 U | 0.0015 J | 0.0016 J | | 0.005 U | | 0.002 U | 0.0019 J | 0.005 U | 0.005 U | 0.001+ U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.0035 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.0012 J | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | | 0.44 | 1.06 | 0.43 | 0.38 | 0.44 | 0.51 | 0.71 | | 0.57 | 0.45 | 0.1 | 0.04 | 0.61 | 0.28 | | 0.04 | 0.35 | 0.17 |
| Oxidation Reduction Potential | | | millivolts | | -67.7 | 97.3 | -76.4 | -100.1 | -80.6 | -102.6 | 68.2 | | 19.7 | -46.8 | -121.6 | -136.6 | -209.5 | -101.1 | | -16.8 | -141.8 | -130 |
| pH | | | SU | | 7.08 | 7.15 | 5.96 | 7.36 | 7.44 | 7.29 | 7.36 | | 7.46 | 7.36 | 7.56 | 7.43 | 7.32 | 7.46 | | 7.46 | 7.56 | 7.65 |
| Specific Conductivity | | | uS/cm | | 2356 | 2435 | 2088 | 1559 | 1352 | 1592 | 1561 | | 1922 | 1722 | 1053 | 1391 | 1553 | 1693 | | 1.65 | 0.24 | 1418 |
| Temperature | | | deg C | | 14.1 | 14.7 | 15.1 | 13.6 | 13.45 | 14.5 | 14.8 | | 15.5 | 15 | 14 | 14.4 | 15.1 | 16 | | 14.2 | 14.4 | 13.3 |
| Turbidity | | | NTU | | 3.48 | 4.29 | 2.17 | 0.99 | 0.58 | 1.88 | 1.80 | | 2.91 | 1.96 | 4.18 | 0.17 | 2.05 | 1.39 | | 1.7 | 3.36 | 4.8 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method criterion limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = indicates the result is estimated.
"J+" = indicates the result is estimated and may be biased low.
"J-" = indicates the result is estimated and may be biased high.

"UJ" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = indicates a result was identified as an outlier and removed from the data set.

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | CAMW15 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | | 2016-11-05 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-13 | 2018-03-15 | 2018-04-24 | 2018-10-26 | 2019-05-06 | 2019-11-08 | 2020-04-27 |
| | | | | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 0.76 | 0.45 J | 1 | 1.1 | 0.6 | 0.44 | 0.45 | 0.87 | 0.91 | 0.66 | | 0.72 | 0.79 | 0.71 | 0.75 | 0.68 |
| Calcium | | | mg/L | 130 | 130 | 120 | 100 | 82 | 91 | 95 | 150 | 150 | 77 | | 170 | 120 | 140 | 100 | 120 |
| Chloride | | | mg/L | 28 | 31 | 31 | 27 | 28 | 27 | 27 | 27 | 25 | 14 | | 24 | 21 | 22 | 28 | 25.2 |
| Fluoride | 4 | 4 | mg/L | 1.2 J+ | 0.85 J | 0.89 J | 0.74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.88 J | 0.67 J | 0.76 J | 0.69 | 0.92 | 0.75 | 0.9 |
| pH | | | SU | 6.83 | | 6.98 | 6.83 | 6.86 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7.34 | 7.34 |
| Sulfate | | | mg/l | 160 | 260 | 250 | 150 | 140 | 140 | 160 | 330 | 330 | 260 | | 110 | 210 | 380 | 260 | 227 |
| Total Dissolved Solids | | | mg/L | 570 | 660 | 630 | 520 | 400 | 400 | 420 | 730 | 750 | 650 | | 790 | 5800 D | 740 | 640 | 572 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.00041 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.055 | 0.072 | 0.069 | 0.078 | 0.075 | 0.054 | 0.062 | 0.059 | 0.066 | | 0.058 | | 0.091 | 0.001 | 0.075 | 0.061 |
| Barium | 2 | 2 | mg/L | 0.044 | 0.053 | 0.053 | 0.039 | 0.032 | 0.031 | 0.034 | 0.054 | 0.048 | | 0.047 | | 0.049 | 0.047 | 0.037 | 0.038 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.002 J | 0.00027 J | 0.00038 J | 0.00059 J | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.0019 | 0.0022 | 0.0022 | 0.0021 | 0.0019 | 0.0018 | 0.0022 | 0.0029 | 0.0027 | | 0.0025 | | 0.0023 | 0.0035 | 0.0017 | 0.0018 |
| Fluoride | 4 | 4 | mg/l | 1.2 J | 0.85 J | 0.89 J | 0.74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.88 J | 0.67 J | 0.76 J | 0.69 | 0.92 | 0.75 | 0.9 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 L | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0053 J | 0.036 U | 0.008 U | 0.009 U | 0.004 J | 0.0054 J | 0.004 J | 0.0058 J | 0.005 J | | 0.0023 J | | 0.0054 J | 0.0023 J | 0.0027 J | 0.005 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0003 JB | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.027 | 0.027 | 0.026 | 0.023 | 0.022 | 0.022 | 0.026 | 0.017 | 0.019 | | 0.029 | | 0.019 | 0.017 | 0.029 | 0.021 |
| Radium 226 + 228 | 5 | | pCi/L | 1 U | 0.479 | 0.513 | 0.546 U | 0.555 J+ | 0.339 U | 0.463 U | 0.335 | 0.342 U | | 0.657 J+ | | 0.858 J+ | 0.476 U | | 1.72 U |
| Radium 226 | | | pCi/l | 1 U | 0.282 | 0.145 | 0.337 U | 0.38 | 0.177 U | 0.1 | 0.0965 U | 0.101 | | 0.681 J | | 0.592 U | 0.38 U | | 1.02 U |
| Radium-228 | | | pCi/L | 1 U | 0.397 U | 0.382 U | 0.546 U | 0.401 U | 0.339 U | 0.463 U | 0.278 U | 0.342 U | | 0.376 J+ | | 0.407 U | 0.476 U | | 0.695 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.43 | | 0.48 | 0.14 | 0.22 | 0.18 | 0.19 | 1 | 0.32 | 0.39 | 0.05 | 0.02 | 1.67 | 0.15 | 0.12 | 0.09 |
| Oxidation Reduction Potential | | | millivolts | -79.2 | | -60.1 | -111 | -114.3 | -124.5 | -108.4 | -46.9 | -43.7 | -358 | -568 | -99.1 | -254.7 | -27.6 | -103 | -103.9 |
| pH | | | SU | 6.83 | | 6.98 | 6.83 | 6.86 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7.34 | 7.34 |
| Specific Conductivity | | | uS/cm | 779 | | 909 | 733 | 594 | 584 | 674 | 9.32 | 1004 | 901 | 581 | 933 | 855 | 790 | 598 | 950 |
| Temperature | | | deg C | 15.3 | | 23.3 | 19.9 | 14.6 | 12.1 | 11.6 | 14.6 | 16.6 | 13.5 | 10.3 | 10.6 | 17.1 | 9.3 | 15.8 | 11.5 |
| Turbidity | | | NTU | 4.48 | | 8.06 | 3.91 | 3.98 | 4.4 | 4.92 | 5.2 | 3.1 | 1.07 | 3.08 | 1.29 | 3.1 | 4.9 | 6.9 | 0.51 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased low.
"J-" = Indicates the result is estimated and may be biased high.

"FD" = Indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set.

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW15B | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-06 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-03 | 2018-03-15 | 2018-04-24 | 2018-09-06 | | 2018-10-26 | 2019-05-08 | | 2019-11-08 | | 2020-04-27 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | N | FD | V | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 1.1 | 1.2 | 2 | 3.7 | 4.3 | 5.6 | 3.5 | 2.1 | 2.1 | | 4.4 | 4.1 | | 4.9 | 10 | | 9.2 | 7.9 |
| Calcium | | | mg/L | 160 | 160 | 160 | 180 | 160 | 170 | 190 | 170 | 73 | | 230 | 200 | | 210 | 260 | | 200 | 270 |
| Chloride | | | mg/L | 52 | 55 | 62 | 81 | 64 | 65 | 72 | 64 | 64 | | 87 | 89 | | 90 | 120 | | 80 | 104 |
| Fluoride | 4 | 4 | mg/L | 0.69 J+ | 0.62 J | 0.76 J | 0.74 J | 0.77 J | 0.78 J | 0.72 J | 0.82 J | 0.65 J | 0.68 J | 0.79 J | 0.8 J | | 0.8 | 0.84 J+ | | 0.89 | 0.84 |
| pH | | | SU | 7.81 | 7.49 | 7.04 | 7.52 | 7.48 | 7.11 | 7.26 | 7.37 | 7.42 | 7.45 | 7.36 | 7.3 | | 6.74 | 7.43 | | 7.57 | 7.56 |
| Sulfate | | | mg/l | 380 J | 360 | 340 | 500 | 390 | 430 | 530 | 520 | 500 | | 700 | 720 | | 770 | 1300 | | 910 | 912 |
| Total Dissolved Solids | | | mg/L | 830 | 800 | 840 | 1000 | 890 | 980 | 1200 | 1100 | 1100 | | 1400 | 1400 | | 1400 | 2100 | | 1600 | 1720 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.003 J | 0.0051 J | 0.0014 J | 0.0022 J | 0.0011 J | 0.00093 J | 0.00084 J | 0.00081 J | | 0.005 U | | 0.005 U | | 0.005 U | 0.00098 J | | 0.005 U | 0.001 U |
| Barium | 2 | 2 | mg/L | 0.054 | 0.053 | 0.059 | 0.056 | 0.051 | 0.062 | 0.064 | 0.069 | | 0.068 | | 0.07 | | 0.064 | 0.081 | | 0.064 | 0.054 |
| Beryllium | 0.004 | 0.004 | mg/L | 7.6E-05 J | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.002 U | | 0.001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.002 U | | 0.001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.00065 J | 0.002 U | 0.002 U | 0.00053 J | 0.00054 J | 0.002 U | 0.002 U | 0.002 U | | 0.005 U | | 0.002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.002 U | 0.001 U | 0.001 U | 0.00016 J | 0.001 U | 0.001 U | 0.001 U | | 0.00025 J | | 0.001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.69 J | 0.62 J | 0.76 J | 0.74 J | 0.77 J | 0.78 J | 0.72 J | 0.82 J | 0.65 J | | 0.79 J | 0.8 J | | 0.8 | 0.84 J+ | | 0.89 | 0.84 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.002 U | 0.00023 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.002 U | | 0.001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0038 J | 0.036 U | 0.003 U | 0.0077 J | 0.0023 J | 0.0062 | 0.0063 | 0.0077 J | | 0.027 J | | 0.006 | | 0.0066 | 0.012 | | 0.0062 | 0.0036 |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.011 | 0.013 | 0.01 | 0.012 | 0.013 | 0.014 | 0.014 | 0.022 | | 0.012 | | 0.01 | | 0.011 | 0.012 | | 0.01 | 0.012 |
| Radium 226 + 228 | 5 | | pCi/L | 1.25 | 0.594 | 0.81 | 1.14 J+ | 0.876 | 0.687 | 0.789 | 0.872 | | 1.69 J+ | | 1.31 | | 1.51 J+ | 1.61 | | | 1.63 U |
| Radium 226 | | | pCi/L | 0.807 U | 0.412 | 0.361 U | 0.785 | 0.491 | 0.442 | 0.537 U | 0.517 | | 0.752 | | 0.711 | | 0.837 U | 1.03 | | | 0.668 U |
| Radium-228 | | | pCi/L | 1 U | 0.389 U | 0.469 U | 0.363 U | 0.435 | 0.378 U | 0.329 U | 0.363 U | | 0.94 J+ | | 0.803 | | 0.678 | 0.544 | | | 0.975 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.0017 J | | 0.005 U | 0.005 U | | 0.005 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.002 U | | 0.001 U | | 0.001 U | 0.00083 J | | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.22 | 0.91 | 0.56 | 0.22 | 0.48 | 0.3 | 0.43 | 0.54 | 0.23 | 0.09 | 0.04 | 0.29 | | 2.66 | 0.23 | | 0.16 | 0.16 |
| Oxidation Reduction Potential | | | millivolts | -129.2 | -21.6 | -94.6 | -152.6 | -81.7 | -49.6 | -21.9 | -36.5 | -42.6 | -64 | -103.4 | -92.2 | | -26.1 | 46.7 | | -189.2 | -98.1 |
| pH | | | SU | 7.81 | 7.49 | 7.04 | 7.52 | 7.48 | 7.11 | 7.26 | 7.37 | 7.42 | 7.45 | 7.36 | 7.3 | | 6.74 | 7.43 | | 7.57 | 7.56 |
| Specific Conductivity | | | uS/cm | 834 | 1049 | 1060 | 1237 | 940 | 1096 | 1099 | 1110 | 1295 | 1255 | 1612 | 2757 | | 1889 | 1798 | | 1384 | 2359 |
| Temperature | | | deg C | 12.71 | 15.9 | 16.1 | 13.8 | 13.6 | 13 | 13.8 | 14.2 | 14.5 | 13.3 | 13 | 14.13 | | 13.6 | 9.1 | | 13.8 | 13.9 |
| Turbidity | | | NTU | 1.93 | 1.58 | 1.46 | 3.6 | 2.23 | 8.65 | 3.16 | 1.78 | 0.4 | 4.59 | 4.85 | 3.59 | | 1.35 | 3.56 | | 1.49 | 4.3 |

Notes
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision
MCL= Maximum Contaminant Leve
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uSiem = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units.
"U" = Indicates the result was not detected above the method criterion limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.
"FD" = Indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | CANW16 | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-06 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-15 | 2018-04-24 | 2018-10-29 | | 2019-05-08 | 2019-11-08 | | 2020-04-13 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | FD | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 1.1 | 1.8 | 1.6 | 1.2 | 0.85 | 1.3 | 1 | 1.4 | 1.1 | | 1.3 | 1.4 | 1.4 | 1.6 | | 1.8 | 1.1 | |
| Calcium | | | mg/L | 230 | 160 | 230 | 120 | 160 | 210 | 220 | 240 | 57 | | 220 | 160 | 160 | 210 | | 210 | 202 | |
| Chloride | | | mg/L | 53 | 37 | 50 | 28 | 24 | 25 | 29 | 31 | 42 | | 58 | 36 | 36 | 26 | | 59 | 25.9 | |
| Fluoride | 4 | 4 | mg/L | 1.4 J+ | 1.6 J | 1.3 J | 1.5 | 1.3 J | 1.3 J | 1.2 J | 1.3 J | 1.5 J | 1 J | 1.2 J | 1.1 | 1.1 | 0.99 | | 1.1 | 0.88 | |
| pH | | | SU | 7.92 | 7.13 | 7.48 | 7.5 | 7.58 | 7.17 | 7.36 | 7.36 | 7.62 | 7.41 | 7.67 | | | 7.28 | 7.46 | | 7.8 | 7.79 |
| Sulfate | | | mg/l | 530 | 400 | 500 | 470 | 300 | 530 | 580 | 680 | 520 | | 530 | 340 | 350 | 570 | | 530 | 757 | |
| Total Dissolved Solids | | | mg/L | 1100 | 810 | 790 | 570 | 570 | 930 | 1000 | 1100 | 950 | | 1100 | 740 | 730 | 1100 | | 1100 | 1290 | |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.000928 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.001 U | |
| Arsenic | 0.01 | 0.01 | mg/L | 0.011 | 0.0077 | 0.012 | 0.0064 | 0.0078 | 0.006 | 0.006 | 0.0096 | | 0.0021 J | 0.0095 | 0.01 | 0.0069 | 0.005 | | 0.0092 | 0.009 | |
| Barium | 2 | 2 | mg/L | 0.049 | 0.042 | 0.035 | 0.024 | 0.029 | 0.043 | 0.044 | 0.054 | | 0.057 | 0.045 | 0.035 | 0.035 | 0.044 | | 0.054 | 0.046 | |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.0002 U | |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.0002 U | |
| Chromium | 0.1 | 0.1 | mg/L | 0.00065 J | 0.002 U | 0.002 U | 0.0031 | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.00068 J | 0.00051 J | 0.00046 J | 0.00055 J | 0.00052 J | 0.00094 J | 0.001 U | | 0.001 U | | 0.00053 J | 0.00061 J | 0.00066 J | | 0.00061 J | 0.0012 | |
| Fluoride | 4 | 4 | mg/l | 1.4 J | 1.6 J | 1.3 J | 1.5 | 1.3 J | 1.3 J | 1.2 J | 1.3 J | 1.5 J | 1 J | 1.2 J | 1.1 | 1.1 | 0.99 | | 1.1 | 0.88 | |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | |
| Lithium | | 0.04 | mg/L | 0.00043 J | 0.036 U | 0.003 U | 0.00623 J | 0.003 U | 0.008 U | 0.008 U | 0.008 U | | 0.008 U | | 0.006 U | 0.006 U | 0.006 U | | 0.008 U | 0.006 U | |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | |
| Molybdenum | | 0.1 | mg/L | 0.024 | 0.036 | 0.043 | 0.044 | 0.03 | 0.027 | 0.023 | 0.024 | | 0.027 | 0.021 | 0.035 | 0.031 | 0.027 | | 0.028 | 0.022 | |
| Radium 226 + 228 | 5 | | pCi/L | 1.68 | 0.543 | 0.527 U | 0.626 U | 0.648 | 0.392 U | 0.339 U | 0.429 | | 0.852 J+ | 0.29 | 0.863 J+ | 1.32 J+ | 0.685 U | | | 1.69 J | |
| Radium 226 | | | pCi/L | 0.532 U | 0.249 | 0.363 U | 0.256 U | 0.120 U | 0.091 | 0.106 U | 0.216 | | 0.1 | 0.0822 | 0.214 U | 0.238 U | 0.227 U | | | 0.649 U | |
| Radium-228 | | | pCi/L | 1.14 | 0.335 U | 0.527 U | 0.626 U | 0.528 | 0.392 U | 0.339 U | 0.322 U | | 0.752 J+ | 0.208 | 0.648 J+ | 1.04 J+ | 0.685 U | | | 1.05 J | |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.0005 J | 0.00053 J | 0.003 U | 0.0012 J | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | | 0.0015 J | 0.001 U | |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.16 | 0.27 | 0.46 | 0.31 | 0.36 | 0.14 | 0.5 | 0.14 | 0.05 | 0.22 | 0.22 | | 1.27 | 0.29 | | 4.02 | 0.19 | |
| Oxidation Reduction Potential | | | millivolts | -13.06 | 71.6 | -124.8 | -78.8 | -126.9 | -68.6 | -114.2 | 9.5 | -138.4 | -55.8 | -106.5 | | -216.8 | 8 | | -2 | -124.8 | |
| pH | | | SU | 7.92 | 7.13 | 7.48 | 7.5 | 7.58 | 7.17 | 7.36 | 7.36 | 7.62 | 7.41 | 7.67 | | 7.28 | 7.46 | | 7.8 | 7.79 | |
| Specific Conductivity | | | uS/cm | 1331 | 1112 | 807 | 751 | 921 | 1257 | 1123 | 1406 | 1254 | 1029 | 1239 | | 1046 | 1001 | | 2014 | 1880 | |
| Temperature | | | deg C | 15.02 | 16.8 | 18.15 | 12.1 | 9.72 | 13.6 | 15.41 | 18 | 17.8 | 8.71 | 9.3 | | 17.81 | 10.5 | | 27.52 | 10.3 | |
| Turbidity | | | NTU | 8.80 | 2.16 | 1.68 | 3.16 | 1.14 | 8.05 | 4.83 | 2.45 | 4.05 | 4.62 | 12.51 | | 3.64 | 1.65 | | 4.68 | 8.11 | |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 Screening Levels - 2021
Revision
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
"U" = indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J+" = indicates the result is estimated and may be biased low.
"J-" = Indicates the result is estimated and may be biased high.
"FD" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GMW183 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-15 | 2018-04-24 | 2018-08-07 | 2018-10-29 | 2019-05-06 | 2019-11-08 | 2020-04-14 |
| | | | | N | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 1.6 | 1.6 | 1.4 | 1.4 | 1.4 | 1.4 | 1.1 | 1.4 | 1.5 | 1.9 | | 1.1 | 1.0 | 0.7 | 1.2 | 1.1 | 1.0 | 0.7 |
| Calcium | | | mg/L | 230 | 190 | 190 | 180 | 210 | 210 | 270 | 220 | 260 | 190 | | 250 | 310 | 350 | 350 | 280 | 200 | 230 |
| Chloride | | | mg/L | 93 | 96 | 97 | 99 | 97 | 97 | 71 | 71 | 120 | 78 | | 140 | 160 | 150 | 190 | 220 | 210 | 122 |
| Fluoride | 4 | 4 | mg/L | 1.1 J+ | 1.1 J | 0.84 J | 0.83 J | 0.99 J | 0.87 J | 0.83 J | 0.76 J | 0.78 J | 1 J | 0.8 J | 0.76 J | 0.73 J | 0.64 | 0.76 | 1 | 1 | 0.78 J+ |
| pH | | | SU | 7.75 | 7.47 | | 7.41 | 7.57 | 7.55 | 7.3 | 7.51 | 7.28 | 7.54 | 7.6 | 7.55 | 7.67 | 7.02 | 7.49 | | 7.85 | 7.73 |
| Sulfate | | | mg/l | 580 T | 480 | 500 | 440 | 58 C | 470 | 730 | 770 | 940 | 580 | | 690 | 760 | 890 | 940 | 1500 | 1500 | 884 |
| Total Dissolved Solids | | | mg/L | 1100 | 1000 | 1000 | 1000 | 1000 | 1000 | 1300 | 1200 | 1400 | 1200 | | 1400 | 20 JD | 1600 | 1800 | 2400 | 2400 | 1860 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.00957 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.00095 J | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0058 | 0.0064 | 0.011 | 0.011 | 0.012 | 0.0097 | 0.012 | 0.0056 | 0.0081 | | 0.0099 | 0.0097 | 0.011 | 0.0093 | 0.0071 | 0.0079 | 0.0078 | 0.009 |
| Barium | 2 | 2 | mg/L | 0.072 | 0.04 | 0.039 | 0.035 | 0.038 | 0.039 | 0.056 | 0.043 | 0.046 | | 0.053 | 0.088 | 0.068 | 0.043 | 0.079 | 0.055 | 0.064 | 0.043 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.00022 J | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.00199 J | 0.002 U | 0.00026 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.00016 J | 0.00019 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.00063 J | | 0.00054 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 1.1 J | 1.1 T | 0.84 T | 0.83 T | 0.99 T | 0.87 T | 0.83 T | 0.76 T | 0.78 T | 1 T | 0.8 T | 0.76 T | 0.73 J | 0.64 | 0.76 | 1 | 1 | 0.78 T |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0055 J | 0.036 U | 0.0032 J | 0.0022 J | 0.0058 J | 0.0035 J | 0.0072 J | 0.006 J | 0.0051 J | | 0.017 J | | 0.0059 J | 0.0038 J | 0.007 J | 0.0054 J | 0.0055 J | 0.003 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0003 JD | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.013 | 0.012 | 0.012 | 0.012 | 0.012 | 0.013 | 0.028 | 0.016 | 0.013 | | 0.016 | 0.015 | 0.012 | 0.011 | 0.014 | 0.02 | 0.029 | 0.017 |
| Radium 226 + 228 | 5 | | pCi/L | 1.31 | 1.05 | 0.866 | 0.794 | 0.993 J+ | 0.577 | 1.23 | 0.795 | 1.21 | | 1.11 J+ | 0.99 | 1.17 J- | 1.64 J+ | 0.584 | | | 1.5 U |
| Radium 226 | | | pCi/L | 0.651 TI | 0.758 | 0.427 | 0.413 TI | 0.507 | 0.348 | 0.835 | 0.54 TI | 0.559 | | 0.448 | 0.535 | 0.391 TI | 0.719 T | 0.283 | | | 0.673 U |
| Radium-228 | | | pCi/L | 0.68 | 0.39 | 0.467 U | 0.435 U | 0.491 J+ | 0.369 U | 0.597 | 0.287 U | 0.647 | | 0.671 J+ | 0.455 | 0.822 U | 0.919 J- | 0.459 U | | | 0.855 |
| Selenium | 0.05 | 0.05 | mg/L | 0.005 U | 0.005 U | 0.00061 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 1.23 | 1.63 | | 0.39 | 0.3 | 0.21 | 0.12 | 0.32 | 0.16 | 0.15 | 0.23 | 0.25 | 1.02 | 4.21 | 0.33 | | 3.42 | 0.14 |
| Oxidation Reduction Potential | | | millivolts | -122.6 | -89 | | -126.3 | -148.5 | -132.2 | -139.2 | -123.1 | -32.7 | -136.8 | -75.5 | -127.6 | -101.5 | -104.8 | 61.2 | | -99.5 | -129.6 |
| pH | | | SU | 7.75 | 7.47 | | 7.41 | 7.57 | 7.55 | 7.3 | 7.51 | 7.28 | 7.54 | 7.6 | 7.55 | 7.67 | 7.02 | 7.49 | | 7.85 | 7.73 |
| Specific Conductivity | | | uS/cm | 1147 | 1297 | | 1158 | 1230 | 1192 | 1645 | 1353 | 1665 | 1485 | 1142 | 1653 | 3104 | 2098 | 1692 | | 2540 | 2595 |
| Temperature | | | deg C | 13.04 | 14.44 | | 15.27 | 14.3 | 13.37 | 12.3 | 13.48 | 14.3 | 15 | 12.5 | 12.3 | 15 | 13.7 | 11.2 | | 14.65 | 13 |
| Turbidity | | | NTU | 0.1 | 3.09 | | 1.8 | 2.76 | 4.21 | 4.58 | 3.22 | 3.48 | 3.9 | 4.08 | 4.2 | 4.69 | 3.48 | 3.22 | | 0.8 | 6.61 |

Notes
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J-" = indicates the result is estimated and may be biased low.
"J+" = indicates the result is estimated and may be biased high.

"UJ" = indicates the result was not detected above the MDL; the estimated RL is provided.
"D" = indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW17 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-02-14 | 2016-09-08 | 2016-11-05 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-14 | | 2018-04-23 | | 2018-10-29 | 2019-05-09 | 2019-11-06 | 2020-04-24 |
| | | | | N | N | N | N | N | N | N | N | N | FD | N | FD | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 12 | 12 | 11 | 11 | 11 | 8.9 | 7.6 | 12 | 12 | | | 5.8 | 5.8 | 16 | 7.7 | 4.9 | 7.6 |
| Calcium | | | mg/L | 150 | 160 | 170 | 180 | 200 | 130 | 120 | 150 | 64 | | | 110 | 110 | 200 | 130 | 120 | 160 |
| Chloride | | | mg/L | 110 | 100 | 130 | 150 | 140 | 81 | 100 | 130 | 100 | | | 60 | 58 | 150 | 90 | 92 | 100 |
| Fluoride | 4 | 4 | mg/L | 1.8 J+ | 2.0 J | 2.0 | 1.9 J | 1.6 J | 1.6 J | 0.79 J | 1.8 J | 2.4 J | 5.0 | 1.7 J | 1.9 J | 1.9 J+ | 1.7 | 1.6 | 1.7 | 1.8 J+ |
| pH | | | SU | 7.56 | 7.27 | 7.21 | 7.33 | 7.54 | 7.23 | 7.4 | 7.16 | 7.12 | | 7.62 | | 7.82 | 6.85 | 7.53 | 7.75 | 7.54 |
| Sulfate | | | mg/l | 230 J | 330 | 360 | 380 | 390 | 390 | 520 | 250 | 350 | | | 240 | 220 | 210 | 300 | 290 | 260 |
| Total Dissolved Solids | | | mg/L | 940 | 920 | 940 | 1000 | 1100 | 950 | 1400 | 890 | 1000 | | | 630 | 620 | 1100 | 800 | 880 | 1120 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.00054 J | 0.00032 J | 0.00032 J | 0.002 U | 0.00028 J | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | | | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0054 | 0.0056 | 0.0042 J | 0.0069 | 0.0059 | 0.0054 | 0.0015 J | 0.0026 J | | 0.005 U | 0.0027 J | | | 0.0041 J | 0.0021 J | 0.0029 J | 0.0023 |
| Barium | 2 | 2 | mg/L | 0.057 | 0.056 | 0.054 | 0.05 | 0.054 | 0.048 | 0.044 | 0.06 | | 0.042 | 0.058 | | 0.029 | 0.073 | 0.041 | 0.052 | 0.067 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.00076 J | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.0015 J | 0.002 U | 0.0017 J | 0.0011 J | 0.0017 J | 0.0012 J | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | | | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 6.3E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 1.8 J | 2.0 J | 2.1 | 1.9 J | 1.6 J | 1.6 J | 0.79 J | 1.9 J | 2.4 J | 5.0 | 1.7 J | 1.9 J | 1.9 J | 1.7 | 1.6 | 1.7 | 1.8 J |
| Lead | 0.015 | 0.015 | mg/L | 0.00038 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0047 J | 0.006 U | 0.0038 J | 0.0047 J | 0.0014 J | 0.0045 J | 0.0058 J | 0.0076 J | | 0.006 U | 0.0035 J | | | 0.0086 J | 0.0035 J | 0.0052 J | 0.006 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.015 | 0.012 | 0.011 | 0.01 J | 0.01 | 0.011 | 0.016 | 0.024 | | 0.024 | 0.024 | | 0.02 | 0.017 | 0.017 | 0.02 | 0.03 |
| Radium 226 + 228 | 5 | | pCi/L | 0.559 | 0.451 U | 0.447 U | 0.553 U | 0.428 | 0.477 | 0.403 U | 0.72 | | 0.816 J+ | 0.384 U | | 0.205 | 1.1 J+ | 0.518 U | | 1.53 U |
| Radium 226 | | | pCi/l | 0.17 | 0.331 | 0.415 U | 0.246 U | 0.202 | 0.23 | 0.191 U | 0.515 | | 0.282 | 0.112 | | 0.0399 | 0.315 U | 0.26 U | | 0.783 U |
| Radium-228 | | | pCi/L | 1 U | 0.451 U | 0.447 U | 0.553 U | 0.402 U | 0.408 U | 0.403 U | 0.495 | | 0.614 J+ | 0.384 U | | 0.166 | 0.783 J+ | 0.518 U | | 0.797 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.019 | 0.03 | 0.018 | 0.023 | 0.026 | 0.026 | 0.0081 | 0.0032 J | | 0.0074 | 0.031 | | 0.015 | 0.022 | 0.0041 J | 0.011 | 0.0011 |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.00083 J | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 2.79 | 1.7 | 1.8 | 1.01 | 2.35 | 7.33 | 0.18 | 4.33 | 3.2 | | 4.96 | | 9 | 1.78 | 5.75 | 6.47 | 3.15 |
| Oxidation Reduction Potential | | | millivolts | 45.8 | 826.9 | 6.1 | 82.3 | 6.6 | 67.9 | 23.3 | 8 | 56.9 | | -90.2 | | -98.2 | -23 | 53.1 | 65 | 25.2 |
| pH | | | SU | 7.56 | 7.27 | 7.21 | 7.33 | 7.54 | 7.23 | 7.4 | 7.16 | 7.12 | | 7.62 | | 7.82 | 6.85 | 7.53 | 7.75 | 7.54 |
| Specific Conductivity | | | uS/cm | 1059 | 1237 | 1141 | 1272 | 1541 | 1290 | 902 | 1152 | 1357 | | 832 | | 675 | 1523 | 894 | 798 | 1017 |
| Temperature | | | deg C | 17.23 | 20.6 | 13.63 | 13.6 | 10.55 | 11.8 | 17.71 | 14.4 | 22.3 | | 10.5 | | 11.4 | 20 | 12.1 | 12.23 | 9.31 |
| Turbidity | | | NTU | 1.56 | 1.09 | 0.58 | 2.58 | 2.41 | 2.21 | 1.02 | 1.5 | 2.51 | | 0.51 | | 1.19 | 0.45 | 0.11 | 0.86 | 0.73 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 Screening Levels - 2021
Revision
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased low.
"J-" = Indicates the result is estimated and may be biased high.
"FD" = Indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMWL7E | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-04 | 2018-03-14 | 2018-04-23 | 2018-09-06 | 2018-10-29 | 2019-05-05 | 2019-11-08 | 2020-04-24 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 18 | 19 | 19 | 21 | 22 | 20 | 16 | 13 | 11 | | 13 | 10 | 12 | 12 | 9.4 | 8.7 |
| Calcium | | | mg/L | 230 | 250 | 240 | 250 | 270 | 250 | 240 | 160 | 57 | | 160 | 150 | 150 | 160 | 150 | 141 |
| Chloride | | | mg/L | 180 | 170 | 180 | 190 | 200 | 200 | 71 | 99 | 140 | | 140 | 120 | 110 | 130 | 110 | 111 |
| Fluoride | 4 | 4 | mg/L | 0.9 J+ | 0.88 J | 0.98 J | 0.98 J | 0.9 J | 0.8 J | 2.1 J | 1.8 J | 1.1 J | 0.55 J | 0.58 J | 0.84 J | 0.71 | 0.82 | 0.67 | 0.68 J+ |
| pH | | | SU | 7.43 | 7.37 | 7.1 | 7.24 | 7.44 | 7.03 | 7.25 | 7.19 | 7.38 | 7.48 | 7.39 | 7.53 | 7.4 | 7.15 | 7.66 | 7.22 |
| Sulfate | | | mg/l | 710 J | 680 | 710 | 740 | 710 | 680 | 800 | 380 | 120 | | 570 | 850 | 850 | 770 | 850 | 811 |
| Total Dissolved Solids | | | mg/L | 1500 | 1400 | 1400 | 1600 | 1700 | 1500 | 660 | 1000 | 950 | | 1100 | 940 | 950 | 980 | 990 | 835 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0024 J | 0.0021 J | 0.0024 J | 0.0035 J | 0.0033 J | 0.0022 J | 0.0023 J | 0.0026 J | | 0.0011 J | | 0.0017 J | 0.0023 J | 0.0022 J | 0.0019 J | 0.0015 |
| Barium | 2 | 2 | mg/L | 0.078 | 0.078 | 0.086 | 0.092 | 0.1 | 0.089 | 0.065 | 0.06 | | 0.085 | 0.069 | 0.069 | 0.073 | 0.11 | 0.074 | 0.065 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.000333 J | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.0033 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.9 J | 0.88 J | 0.98 J | 0.98 J | 0.9 J | 0.8 J | 2.1 J | 1.8 J | 1.1 J | 0.55 J | 0.58 J | 0.84 J | 0.71 | 0.82 | 0.67 | 0.68 J |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0017 J | 0.008 J | 0.008 U | 0.0019 J | 0.00845 J | 0.0021 J | 0.0019 J | 0.008 U | | 0.008 U | | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.004 | 0.021 | 0.013 | 0.011 | 0.012 | 0.011 | 0.017 | 0.021 | | 0.017 | 0.016 | 0.01 | 0.011 | 0.0073 J | 0.01 | 0.014 |
| Radium 226 + 228 | 5 | | pCi/L | 1.79 | 1.84 | 2.53 | 2.58 | 1.35 | 1.94 | 1.08 | 2.4 | | 1.64 J+ | 1.21 | 1.47 | 2.43 J+ | 1.71 | | 1.74 |
| Radium 226 | | | pCi/l | 0.882 U | 0.861 | 1.28 | 1.3 | 1.01 | 1.06 | 0.839 U | 1.867 | | 0.799 | 0.518 | 0.975 | 1.45 J+ | 0.966 | | 0.671 U |
| Radium-228 | | | pCi/L | 0.913 | 0.98 | 1.25 | 1.17 | 0.423 U | 0.846 | 0.395 | 1.53 | | 0.845 J+ | 0.696 | 0.524 | 1.53 J+ | 0.748 | | 1.12 |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 J | 0.005 U | 0.00053 J | 0.00051 J | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.00022 J | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.33 | 0.24 | 0.67 | 0.36 | 0.13 | 0.13 | 0.18 | 3.14 | 0.09 | 0.16 | 0.11 | 0.2 | 0.83 | 0.22 | 4.2 | 0.2 |
| Oxidation Reduction Potential | | | millivolts | -115 | 054 | -100.8 | -119.6 | -91.8 | 102.8 | -93.6 | -51.1 | -129.4 | -95.2 | -191.9 | -83.9 | -244.5 | 11.8 | -5.9 | -95.1 |
| pH | | | SU | 7.43 | 7.37 | 7.1 | 7.24 | 7.44 | 7.03 | 7.25 | 7.19 | 7.38 | 7.48 | 7.39 | 7.53 | 7.4 | 7.15 | 7.66 | 7.22 |
| Specific Conductivity | | | uS/cm | 1525 | 1734 | 1568 | 171.9 | 2251 | 1950 | 488 | 1244 | 1537 | 1235 | 1453 | 2072 | 1380 | 1060 | 890 | 920 |
| Temperature | | | deg C | 15.23 | 15.16 | 15.77 | 15 | 14.3 | 14.4 | 15.62 | 16.5 | 16.6 | 15.2 | 15.2 | 16.55 | 16.1 | 13.6 | 15.05 | 13.12 |
| Turbidity | | | NTU | 1.00 | 2.18 | 6.62 | 0.92 | 0.58 | 2.11 | 2.35 | 1.86 | 3.15 | 3.76 | 3.88 | 8.55 | 4.85 | 3.81 | 2.68 | 4.58 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J-" = indicates the result is estimated and may be biased low.
"J+" = indicates the result is estimated and may be biased high.

"N" = indicates the result was not detected above the MDL; the estimated RL is provided.
"O" = indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW18 | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-07-12 | | 2017-08-23 | 2017-10-03 | | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-04-29 | 2019-11-07 | 2020-04-23 |
| | | | | N | N | FD | N | N | N | N | FD | N | N | FD | N | N | N | N | N | N | N | N |
| **Appendix I I I Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 1.8 | 3.5 | 1.9 | 1.8 | 1.3 | 1 | 0.77 | 1.2 | 1.2 | 1.5 | 1.9 | 1.9 | | 1.2 | 1.7 | 0.95 | 1.7 | 1.2 |
| Calcium | | | mg/L | 320 | 610 O | 370 | 360 | 330 | 280 | 210 | 280 | 290 | 300 | 380 J | 64 J | | 320 | 230 | 320 | 360 | 294 |
| Chloride | | | mg/L | 17 | 39 | 17 | 17 | 9.3 | 5 | 4.3 | 10 | 10 | 11 | 23 | 23 | | 7.3 | 22 | 12 | 27 | 16.7 |
| Fluoride | 4 | 4 | mg/L | 0.047 J+ | 0.036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0.057 | 0.074 | 0.15 | 0.17 |
| pH | | | SU | 6.95 | 6.83 | | 6.7 | 6.88 | 7.11 | 6.6 | | 6.96 | 7.02 | | 6.91 | 7.2 | 7.21 | 6.54 | 6.71 | 7.18 | 6.96 |
| Sulfate | | | mg/L | 760 J- | 1400 | 850 | 830 | 640 | 540 | 370 | 600 | 610 | 690 | 960 | 950 | | 670 | 550 | 780 | 920 | 679 |
| Total Dissolved Solids | | | mg/L | 1300 | 2200 | 1500 | 1500 | 1200 | 1000 | 730 | 1100 | 1100 | 1300 | 1600 | 1500 | | 2400 | 1100 | 1400 | 1500 | 1130 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.00096 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0014 J | 0.0023 J | 0.0014 J | 0.00091 J | 0.0014 J | 0.005 U | 0.0015 J | 0.0021 J | 0.0021 J | 0.0011 J | | | 0.005 U | | 0.005 U | 0.00079 J | 0.005 U | 0.001 U |
| Bar um | 2 | 2 | mg/L | 0.038 | 0.047 | 0.041 | 0.039 | 0.037 | 0.024 | 0.021 | 0.051 | 0.052 | 0.055 | | | 0.048 | 0.035 | 0.037 | 0.039 | 0.05 | 0.033 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Cadm um | 0.005 | 0.005 | mg/L | 8.1E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.00067 J | 0.00046 J | 0.0005 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.00023 J | 0.00047 J | 0.0002 J | 0.00024 J | 0.001 U | 0.00023 J | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.00028 J | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/L | 0.047 J+ | 0.036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0.057 | 0.074 | 0.15 | 0.17 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.00051 J | 0.00025 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.00067 J | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.00096 J | 0.008 U | 0.008 U | 0.008 U | 0.00042 J | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | | | 0.008 U | | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.11 | 0.18 O | 0.14 O | 0.13 O | 0.094 | 0.1 | 0.1 | 0.1 | 0.11 | 0.1 | | | 0.097 | 0.085 | 0.057 | 0.062 | 0.076 | 0.071 |
| Radium 226 + 228 | 5 | | pCi/L | 5 U | 0.803 | 0.474 | 0.449 | 0.581 U | 0.398 U | 0.384 U | 0.493 | 0.337 U | 0.629 | | | 0.373 U | 0.259 | 0.477 | 0.365 U | | 1.74 U |
| Radium-226 | | | pCi/L | 1 U | 0.348 | 0.334 U | 0.33 U | 0.325 | 0.13 | 0.131 U | 0.166 J+ | 0.179 J+ | 0.332 | | | 0.111 | 0.0715 | 0.291 | 0.325 U | | 0.789 U |
| Radium-228 | | | pCi/L | 1 U | 0.49 U | 0.455 U | 0.413 U | 0.581 U | 0.398 U | 0.384 U | 0.381 U | 0.337 U | 0.369 U | | | 0.373 U | 0.187 | 0.357 U | 0.365 U | | 0.947 U |
| Selenium | 0.05 | 0.05 | mg/L | 0.01 | 0.018 | 0.0065 | 0.0052 | 0.0099 | 0.011 | 0.0053 | 0.012 | 0.012 | 0.006 | | | 0.009 | 0.0084 | 0.015 | 0.015 | 0.012 | 0.018 |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 4.83 | 4.77 | | 5.93 | 7.52 | 8.86 | 7.79 | | 6.04 | 4.52 | | 5.32 | 6.5 | 8.49 | 3.78 | 7.01 | 2.95 | 5.6 |
| Oxidation Reduction Potential | | | millivolts | 98.9 | 76.8 | | 28.7 | 106.8 | 97.9 | 209.2 | | 203.2 | 24.7 | | 121.9 | -129.6 | -51.6 | -36.6 | 129.2 | -41.1 | 241.3 |
| pH | | | SU | 6.95 | 6.83 | | 6.7 | 6.88 | 7.11 | 6.6 | | 6.96 | 7.02 | | 6.91 | 7.2 | 7.21 | 6.54 | 6.71 | 7.18 | 6.96 |
| Specific Conductivity | | | uS/cm | 1474 | 2362 | | 1740 | 1255 | 986 | 970 | | 1299 | 1414 | | 1760 | 905 | 1170 | 1230 | 1060 | 1338 | 995 |
| Temperature | | | deg C | 16.3 | 20.1 | | 16.6 | 9.65 | 8.47 | 11.2 | | 17.9 | 19.8 | | 19.3 | 8.1 | 8.9 | 17.4 | 8.8 | 14.2 | 9.18 |
| Turbidity | | | NTU | 3.32 | 1.63 | | 2.38 | 3.05 | 4.44 | 2.48 | | 1.71 | 1.03 | | 4.16 | 4.59 | 0.71 | 1.29 | 4.55 | 2.04 | 1.33 |

Notes:
IDEM RCG Indiana Department of Environmental Management Remediation Closure Guidance Table A-6 Screening Levels - 2021 Revision

MCL Maximum Contaminant Level
mg/L milligrams per liter
SU standard units
pCi/L picoCuries per liter
uS/cm microSiemens per centimeter
deg C degrees Celsius
NTU Nepholometic Turbidity Un ts

"U" Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" Indicates the result is estimated.
"J-" Indicates the result is estimated and may be biased low.
"J+" Indicates the resu t is estimated and may be biased high.

"UJ" Indicates the result was not detected above the MDL, the estimated RL is provided.

"O" Indicates te result was identified as an outlier and removed from the data set.

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | CAMW13B | | | | | | CAMW45 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-10 | 2018-12-05 | | 2019-04-25 | 2019-11-07 | 2020-04-23 | 2018-06-13 | 2018-09-12 | 2018-12-07 | 2019-06-06 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2020-04-21 |
| | | | | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 13 | 12 | 13 | 14 | 11 | 10.8 | 0.065 JQ | 0.1 U | 0.033 J | 0.1 U | 0.032 J | 0.053 J | 0.043 J | 0.049 J | 0.1 U |
| Calcium | | | mg/L | 260 | 200 | 220 | 240 | 190 | 299 | 56 Q | 14 | 28 | 15 J- | 35 | 35 | 23 | 27 | 24.5 |
| Chloride | | | mg/L | 150 | 140 | 140 | 170 | 140 | 217 | 8.4 Q | 2.4 | 1.9 | | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Fluoride | 4 | 4 | mg/L | 0.77 J | 0.74 | 0.73 | 0.89 | 0.89 | 0.91 | 0.052 JQ | 0.008 | 0.063 | | 0.095 | 0.09 | 0.079 J+ | 0.082 | 0.082 |
| pH | | | SU | 7.73 | | 6.86 | 7.15 | 7.68 | 7.21 | 7.93 | 8.17 | 8.23 | 7.52 | 8.15 | 7.9 | 7.81 | 7.77 | 8.64 |
| Sulfate | | | mg/l | 1100 | 1000 | 1100 | 1100 | 840 | 1230 | 65 Q | 31 | 50 | | 28 | 26 | 30 | 27 | 24.7 |
| Total Dissolved Solids | | | mg/L | 2100 | 2000 | 2200 | 2100 | 1500 | 2060 | 280 Q | 160 | 150 | | 130 | 150 | 140 J+ | 140 | 101 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 J | 0.002 U | 0.002 U | 0.001 U | 0.002 UQ | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0018 J | 0.0028 J | 0.0026 J | 0.0037 J | 0.0041 J | 0.0029 | 0.0014 JQ | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.00086 J | 0.002 U | 0.001 U |
| Barium | 2 | 2 | mg/L | 0.048 | 0.035 | 0.038 | 0.049 | 0.024 | 0.041 | 0.027 Q | 0.0028 J | 0.0059 | 0.0066 | 0.0064 | 0.0064 | 0.0049 J | 0.0059 | 0.0063 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.001 UQ | 0.005 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.00084 J | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 J | 0.001 U | 0.001 U | 0.0002 U | 0.001 UQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/l | 0.002 U | 0.002 U | 0.002 J | 0.002 U | 0.002 U | 0.002 U | 0.002 UQ | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.00027 J | 0.00026 J | 0.00018 J | 0.00024 J | 0.00024 J | 0.001 U | 0.0002 JQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.77 J | 0.74 | 0.73 | 0.89 | 0.89 | 0.91 | 0.052 JQ | 0.008 | 0.063 | | 0.095 | 0.09 | 0.079 J+ | 0.082 | 0.082 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.025 | 0.015 | 0.016 | 0.023 | 0.015 | 0.026 | 0.009 UQ | 0.04 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UQ | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.014 | 0.014 | 0.015 | 0.016 | 0.011 | 0.019 | 0.0051 JQ | 0.01 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0.0015 J | 0.01 U | 0.001 U |
| Radium 226 + 228 | 5 | | pCi/L | 1.7 | 1.28 | 1.46 | | | 1.7 U | 0.384 UQ | 0.488 U | 0.33 U | | 0.427 U | 0.535 U | 0.568 | | 1.7 J |
| Radium 226 | | | pCi/L | 0.773 U | 0.717 | 0.748 | 0.41 | | 0.882 U | 0.244 UQ | 0.103 U | 0.0708 U | | 0.214 U | 0.0925 U | 0.179 U | | 0.741 U |
| Radium-228 | | | pCi/L | 0.928 | 0.562 | 0.708 | 0.945 | | 0.821 U | 0.384 UQ | 0.488 U | 0.33 U | | 0.427 U | 0.535 U | 0.481 U | | 0.95 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0.001 UQ | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 UQ | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.00059 J | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.24 | | 0.29 | 0.92 | 0.36 | 0.18 | 2.12 | 1.85 | 4.18 | 6.44 | 6.59 | 4.03 | 2.44 | 3.36 | 3.42 |
| Oxidation Reduction Potential | | | millivolts | -148.2 | | -103.4 | 109.2 | -144.8 | -77.7 | -171.4 | 1.9 | 67 | 169.6 | 256 | 406 | 9.10 | -141.1 | 125.6 |
| pH | | | SU | 7.73 | | 6.86 | 7.15 | 7.68 | 7.21 | 7.93 | 8.17 | 8.23 | 7.52 | 8.15 | 7.9 | 7.81 | 7.77 | 8.64 |
| Specific Conductivity | | | uS/cm | 3311 | | 2147 | 1902 | 2475 | 2897 | 367 | 155 | 161 | 179 | 153 | 153 | 152 | 132 | 208 |
| Temperature | | | deg C | 15.39 | | 14.9 | 11.8 | 13.7 | 12.1 | 11.4 | 8 | 9.1 | 11.5 | 13.2 | 14.2 | 14.8 | 11.7 | 8.3 |
| Turbidity | | | NTU | 3.78 | | 8.58 | 3.21 | 8.14 | 2.35 | 3.96 | 1.91 | 1.33 | 0.5 | 0.82 | 0.69 | 0.89 | 0.66 | 2.18 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 Screening Levels - 2021
Revision
MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uSiem = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
"U" = Indicates the result was not detected above the method criterion limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the result was not detected above the MDL; the estimated RL is provided.
"Q" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW66 | | | | | | | | | | GAMW51 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-05-15 | 2019-03-04 | 2019-04-17 | 2019-06-07 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2020-04-21 | 2018-10-10 | 2018-10-31 | 2019-05-09 | 2019-11-14 | | 2020-04-30 |
| | | | | N | N | N | N | N | N | N | N | N | N | FD | N | N | FD | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 0.05 JO | 0.05 J | 0.027 J | 0.047 J | 0.03 J | 0.05 J | 0.047 J | 0.046 J | 0.1 U | 0.39 | | 0.14 | 0.077 J | | 0.15 | 0.1 U |
| Calcium | | | mg/L | 55 D | 58 | 59 | 56 | 52 | 59 | 48 | 56 | 53 D | 25 | | 59 | 52 | | 72 | 48.3 |
| Chloride | | | mg/L | 8 D | 7.9 | 7.8 | | 7.2 | 8 | 7.1 | 6.8 | 8.6 | 34 | | 9.2 | 9.8 | | 37 | 32 |
| Fluoride | 4 | 4 | mg/L | 0.048 JD | 0.06 | 0.06 | | 0.062 | 0.069 | 0.073 J+ | 0.072 | 0.084 | 0.39 J | | 0.3 | 0.29 J+ | | 0.3 | 0.25 |
| pH | | | SU | 8.3 | 7.11 | 7.59 | 7.58 | 8.16 | 7.62 | 7.44 | 7.47 | 8.03 | 7.5 | | 7.06 | 7.17 | | 7.59 | 7.98 |
| Sulfate | | | mg/l | 59 D | 61 | 61 | | 61 | 68 | 65 | 67 | 58.8 | 86 | | 89 | 74 | | 87 | 71.8 |
| Total Dissolved Solids | | | mg/L | 150 D | 280 | 290 | | 240 | 220 J | 250 | 240 | 209 | 400 | | 250 | 240 | | 350 | 295 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 UD | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0015 JO | 0.0012 J | 0.00976 J | 0.005 U | 0.00091 J | 0.00095 J | 0.0013 J | 0.001 J | 0.001 U | 0.005 U | | 0.005 U | 0.005 U | | 0.005 U | 0.001 U |
| Barium | 2 | 2 | mg/L | 0.0096 O | 0.027 | 0.029 | 0.025 | 0.025 | 0.024 | 0.021 | 0.025 | 0.026 | 0.039 | | 0.015 | 0.015 | | 0.02 | 0.015 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 UD | 0.0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0011 | 0.00052 U | 0.002 U | | 0.001 U | 0.002 U | | 0.001 U | 0.00052 J |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 UD | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.001 U | | 0.00024 J | 0.001 U | | 0.001 U | 0.0002 J |
| Chromium | 0.1 | 0.1 | mg/L | 0.007 D | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.00034 JO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.00058 J | | 0.00031 J | 0.001 U | | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.048 JD | 0.066 | 0.075 | | 0.069 | 0.069 | 0.073 J+ | 0.072 | 0.084 | 0.38 J | | 0.3 | 0.25 J+ | | 0.3 | 0.25 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 UD | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.009 UD | 0.0017 J | 0.003 U | 0.008 U | 0.002 J | 0.008 U | 0.008 U | 0.003 J | 0.008 U | 0.0027 J | | 0.008 U | 0.008 U | | 0.0025 J | 0.008 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 UD | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 J |
| Molybdenum | | 0.1 | mg/L | 0.0018 JO | 0.0024 J | 0.0022 J | 0.0025 J | 0.00228 J | 0.0026 J | 0.0025 J | 0.003 J | 0.0021 | 0.005 J | | 0.0035 J | 0.0026 J | | 0.0017 J | 0.0012 |
| Radium 226 + 228 | 5 | | pCi/L | 0.392 UD | 0.492 U | 0.308 U | | 0.427 U | 0.609 U | 0.408 U | | 1.68 U | 0.796 | | 1 J- | 0.53 U | | | 1.64 J |
| Radium 226 | | | pCi/l | 0.279 UD | 0.286 | 0.108 | | 0.327 U | 0.205 UI | 0.192 U | | 0.881 U | 0.796 U | | 0.296 U | 0.056 | | | 0.736 U |
| Radium-228 | | | pCi/L | 0.392 UD | 0.492 U | 0.308 U | | 0.427 U | 0.609 UI | 0.408 U | | 1.15 | 0.392 U | | 0.706 J+ | 0.53 U | | | 0.904 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.0017 JO | 0.005 U | 0.005 U | 0.005 U | 0.003 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0.005 U | | 0.0017 J | 0.0014 J | | 0.0011 J | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 UD | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.00068 J | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 2.09 | 0.09 | 1.8 | 0.2 | 1.4 | 1.25 | 0.31 | 0.3 | 0.17 | 0.49 | | 0.21 | 6.42 | | 2.2 | 5.9 |
| Oxidation Reduction Potential | | | millivolts | -29.4 | 111.9 | -111.1 | -135.1 | -93.9 | -119.9 | 33.7 | -229.6 | -137.4 | -30.3 | | 35.1 | 108.2 | | -43.8 | 166.6 |
| pH | | | SU | 8.3 | 7.11 | 7.59 | 7.58 | 8.16 | 7.62 | 7.44 | 7.47 | 8.03 | 7.5 | | 7.06 | 7.17 | | 7.59 | 7.98 |
| Specific Conductivity | | | uS/cm | 211 | 268 | 294 | 282 | 274 | 284 | 260 | 242 | 405 | 0.396 | | 448 | 368 | | 320 | 389 |
| Temperature | | | deg C | 11.3 | 8.6 | 10.8 | 11 | 11.5 | 12.3 | 12.3 | 11.3 | 10 | 19.37 | | 17.6 | 14.2 | | 15.5 | 10.8 |
| Turbidity | | | NTU | 8.45 | 3.26 | 4.9 | 3.25 | 3.11 | 1.75 | 1.16 | 2.84 | 8.02 | 0.45 | | 0.83 | 0.42 | | 0.74 | 1.57 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method criterion limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J-" = indicates the result is estimated and may be biased low.
"J+" = indicates the result is estimated and may be biased high.

"UJ" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW52B | | | | | GAMW53 | | | | | GAMW53B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-11 | 2018-10-31 | 2019-05-06 | 2019-11-14 | 2020-04-30 | 2018-09-12 | 2018-10-30 | 2019-04-30 | 2019-11-14 | 2020-05-01 | 2018-09-11 | 2018-10-30 | 2019-04-30 | 2019-11-14 | 2020-05-01 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 0.76 | 0.8 | 1 | 1.5 | 0.77 | 0.19 | 0.25 | 0.056 J | 0.13 | 0.1 U | 2.5 | | 3.1 | 2.2 | 0.73 | 3.4 |
| Calcium | | | mg/L | 160 | 160 | 140 | 130 | 129 | 45 | 53 | 47 | 25 | 32 | 300 | | 290 | 150 | 140 | 160 |
| Chloride | | | mg/L | 530 | 470 | 380 | 370 | 390 | 6.9 | 6.6 | 6.9 | 3.6 | 4.8 | 88 | | 86 | 81 | 74 | 107 |
| Fluoride | 4 | 4 | mg/L | 0.18 U | 0.18 | 0.21 J+ | 0.23 | 0.26 | 0.27 J | 0.17 | 0.05 U | 0.06 U | 0.05 U | 0.52 J | | 0.49 | 0.52 | 0.7 | 0.48 |
| pH | | | SU | 8.3 | 7.1 | 7.42 | 7.34 | 7.6 | 8 | 6.47 | 5.93 | 6.21 | 6.42 | 7.3 | | 7.35 | 7.45 | 7.52 | 7.48 |
| Sulfate | | | mg/l | 210 | 160 | 220 | 280 | 216 | 51 | 56 | 32 | 38 | 32.5 | 430 | | 510 | 340 | 390 | 488 |
| Total Dissolved Solids | | | mg/L | 1500 | 1200 | 1100 | 1100 | 1260 | 240 | 250 | 130 | 160 | 161 | 1100 | | 1100 | 900 | 770 | 1050 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.002 U | 0.002 U | 0.002 U | 0.00061 J | 0.001 U | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0013 J | 0.0016 J | 0.00083 J | 0.0012 J | 0.0011 | 0.013 | 0.012 | 0.00097 J | 0.0018 J | 0.0015 | 0.00379 J | | 0.00083 J | 0.001 J | 0.0016 J | 0.0028 |
| Barium | 2 | 2 | mg/L | 0.32 | 0.31 | 0.26 | 0.28 | 0.29 | 0.027 | 0.028 | 0.029 | 0.026 | 0.023 | 0.052 | | 0.054 | 0.044 | 0.072 | 0.099 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.00042 J | 0.001 U | 0.001 U | 0.0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.001 U | | 0.001 U | 0.00059 J | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.00029 J | 0.001 U | 0.001 U | 0.0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.001 U | | 0.001 U | 0.001 J | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.00167 | 0.0018 J | 0.0015 J | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 J | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.00032 J | 0.001 U | 0.001 U | 0.0011 | 0.00084 J | 0.00098 J | 0.0005 J | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 J | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.18 U | 0.18 | 0.21 J+ | 0.23 | 0.26 | 0.27 J | 0.17 | 0.05 U | 0.06 U | 0.05 U | 0.52 J | | 0.49 | 0.52 | 0.7 | 0.48 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0014 | 0.00085 J | 0.00057 J | 0.00063 J | 0.001 U | 0.001 U | | 0.001 U | 0.001 J | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0042 J | 0.0031 J | 0.0033 J | 0.0071 J | 0.0035 | 0.008 U | 0.008 U | 0.008 U | 0.0021 J | 0.008 U | 0.0042 J | | 0.0052 J | 0.005 J | 0.0056 J | 0.011 |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.014 | 0.015 | 0.0095 J | 0.0086 J | 0.019 | 0.014 | 0.015 | 0.0051 J | 0.012 | 0.0068 | 0.0089 J | | 0.0075 J | 0.0098 J | 0.02 | 0.016 |
| Radium 226 + 228 | 5 | | pCi/L | 5.52 | 5.35 J+ | 2.83 | | 2.44 | 0.547 U | 1.45 J+ | 0.344 U | | 1.9 U | 2.69 | | 0.48 J+ | 1.26 | | 1.73 |
| Radium 226 | | | pCi/L | 2.11 | 2.78 J+ | 2.0 | | 1.76 | 0.257 | 0.795 J+ | 0.316 U | | 1.08 U | 0.789 | | 0.338 J+ | 0.514 | | 0.845 |
| Radium-228 | | | pCi/L | 1.41 | 2.78 J+ | 1.44 | | 0.885 U | 0.547 U | 0.658 J+ | 0.344 U | | 0.832 U | 0.897 | | 0.342 U | 0.75 | | 0.886 J+ |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0.005 U | | 0.005 U | 0.005 J | 0.005 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.00049 J | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.44 | 0.1 | 0.15 | 0.19 | 2.09 | 0.53 | 0.98 | 2.12 | 0.04 | 1.39 | 0.26 | | 0.8 | 0.36 | 0.09 | 0.12 |
| Oxidation Reduction Potential | | | millivolts | -214.9 | -198.6 | 6.31 | -102.9 | -104.2 | -24.6 | -199.5 | 43.7 | -24.8 | 168 | -183.2 | | -198 | 27.7 | -76.5 | -128.9 |
| pH | | | SU | 8.3 | 7.1 | 7.42 | 7.34 | 7.6 | 8 | 6.47 | 5.93 | 6.21 | 6.42 | 7.3 | | 7.35 | 7.45 | 7.52 | 7.48 |
| Specific Conductivity | | | uS/cm | 1934 | 2005 | 1662 | 1353 | 2424 | 307 | 400 | 125 | 155 | 260 | 1354 | | 1620 | 1160 | 870 | 1634 |
| Temperature | | | deg C | 17.25 | 16.6 | 15.2 | 16.1 | 15.3 | 21.3 | 20.1 | 11.4 | 17.5 | 13.3 | 20.89 | | 20.4 | 18.7 | 19.7 | 20.2 |
| Turbidity | | | NTU | 1.6 | 0.88 | 0.35 | 1.01 | 1.42 | 0.93 | 5.17 | 1.26 | 4.6 | 4.8 | 2.43 | | 3 | 3.45 | 2.5 | 7.86 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-8 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method criterion, limit (MDL) for the sample; the quantitation limit (RL) is provided
"J" = indicates the result is estimated.
"J-" = indicates the result is estimated and may be biased low.
"J+" = indicates the result is estimated and may be biased high.

"FD" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = indicates a result was identified as an outlier and removed from the data set

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW5R | | | | | GAMW54S | | | | | | | GAMW55 | | | | GAMW55I | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-10 | 2018-10-31 | 2019-04-30 | 2019-11-14 | 2020-05-04 | 2018-09-10 | | 2018-10-31 | 2019-05-01 | 2019-11-15 | 2020-05-04 | | 2018-09-10 | | 2018-10-29 | | 2019-11-15 | 2020-05-05 |
| | | | | N | N | N | N | N | N | FD | N | N | N | FD | N | FD | N | FD | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 0.85 | 0.77 | 0.39 | 0.57 | 0.42 | 5.6 | | 6.5 | 5.9 | 6 | | 2.7 | 1.9 | 1.9 | 1.8 | 1.8 | 1.1 | 0.96 |
| Calcium | | | mg/L | 91 | 86 | 93 | 81 | 131 | 210 | | 220 | 200 | 240 | | 214 | 260 | 250 | 270 | 260 | 160 | 168 |
| Chloride | | | mg/L | 15 | 10 | 10 | 4 | 12.3 | 100 | | 95 | 110 | 120 | | 68.3 | 59 | 59 | 65 | 70 | 41 | 40.3 |
| Fluoride | 4 | 4 | mg/L | 0.18 J | 0.17 | 0.14 | 0.28 | 0.18 | 0.41 J | | 0.52 | 0.59 | 0.58 | | 0.54 | 0.51 J | 0.52 J | 0.47 | 0.47 | 0.62 | 0.52 |
| pH | | | SU | 6.24 | 7.92 | 6.82 | 7.08 | 5.74 | 6.95 | | 8.72 | 7.27 | 7.2 | | 7.43 | | 8.77 | | 7.04 | 7.81 | 7.52 |
| Sulfate | | | mg/l | 190 | 150 | 190 | 78 | 284 | 750 | | 730 | 710 | 770 | | 176 | 690 | 600 | 690 | 620 | 480 | 375 |
| Total Dissolved Solids | | | mg/L | 500 | 400 | 470 | 350 | 648 | 1900 | | 1400 | 1500 | 1400 | | 1000 | 1200 | 1000 | 1300 | 1300 | 859 | 845 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.0011 J | 0.000074 J | 0.00078 J | 0.001 J | 0.001 U | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | | 0.001 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0024 J | 0.0028 J | 0.0022 J | 0.0045 J | 0.0045 | 0.0025 J | | 0.0031 J | 0.0045 J | 0.005 | | 0.0042 | 0.00083 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U |
| Barium | 2 | 2 | mg/L | 0.049 | 0.039 | 0.021 | 0.031 | 0.052 | 0.098 | | 0.083 | 0.08 | 0.089 | | 0.06 | 0.099 | 0.087 | 0.068 | 0.069 | 0.035 | 0.046 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.007 U | | 0.007 U | 0.002 U | 0.007 U | | 0.005 U | 0.007 U | 0.007 U | 0.002 U | 0.005 U | 0.002 U | 0.005 U |
| Cobalt | | 0.006 | mg/L | 0.00053 J | 0.00052 J | 0.00062 J | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.0065 | 0.0058 | 0.0044 | 0.0044 | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.18 J | 0.17 | 0.14 | 0.28 | 0.18 | 0.41 J | | 0.52 | 0.59 | 0.58 | | 0.54 | 0.51 J | 0.52 J | 0.47 | 0.47 | 0.62 | 0.52 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 J | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.009 U | 0.036 U | 0.009 U | 0.0023 J | 0.003 U | 0.0046 J | | 0.0036 J | 0.0049 J | 0.0074 J | | 0.003 U | 0.0021 J | 0.0027 J | 0.002 U | 0.002 U | 0.0035 J | 0.003 U |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.005 | 0.004 | 0.025 | 0.03 | 0.014 | 0.018 | | 0.059 | 0.0085 J | 0.012 | | 0.018 | 0.03 | 0.028 | 0.026 | 0.026 | 0.024 | 0.02 |
| Radium 226 + 228 | 5 | | pCi/L | 0.5 | 1.08 J+ | 0.393 U | | 1.51 U | 2.03 | | 2.7 J+ | 1.82 | | | 2.41 U | 1.4 | 0.832 | 0.922 J+ | 1.24 J+ | | 1.58 U |
| Radium 226 | | | pCi/L | 0.386 U | 0.737 U | 0.337 U | | 0.73 U | 1.18 J+ | | 1.35 J+ | 0.956 | | | 0.854 U | 0.574 U | 0.471 U | 0.383 U | 0.447 U | | 0.387 U |
| Radium-228 | | | pCi/L | 0.385 U | 0.343 J+ | 0.393 U | | 0.783 U | 0.849 | | 1.35 J+ | 0.865 | | | 0.754 U | 0.824 | 0.433 U | 0.559 J+ | 0.796 J+ | | 1.34 |
| Selenium | 0.05 | 0.05 | mg/l | 0.0017 U | 0.0022 U | 0.0033 U | 0.00357 | 0.0073 | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | | 0.001 U | 0.0037 U | 0.0031 U | 0.0022 U | 0.0022 U | 0.0046 U | 0.0046 |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.00021 J | 0.001 U | 0.00023 J | 0.00022 J | 0.00022 J | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.61 | 1.41 | 0.72 | 0.26 | 2.65 | 0.42 | | 2.12 | 0.42 | 0.31 | | 0.1 | | 1.73 | | 0.33 | 0.72 | 1.35 |
| Oxidation Reduction Potential | | | millivolts | 107.8 | -294.7 | 48.4 | -69.5 | 24.5 | -323.4 | | -315.7 | -23.1 | -43.3 | | -114.5 | | 21.6 | | -68.4 | -28.8 | 148.6 |
| pH | | | SU | 6.24 | 7.92 | 6.82 | 7.08 | 5.74 | 6.95 | | 8.72 | 7.27 | 7.2 | | 7.43 | | 8.77 | | 7.04 | 7.81 | 7.52 |
| Specific Conductivity | | | uS/cm | 675 | 630 | 493 | 374 | 960 | 1816 | | 1983 | 1635 | 2010 | | 0.63 | | 1493 | | 1574 | 1017 | 1270 |
| Temperature | | | deg C | 21.2 | 16.53 | 10.5 | 15.3 | 11.4 | 17.6 | | 17.29 | 15.5 | 15.8 | | 15.6 | | 21.1 | | 19.4 | 16.7 | 12.8 |
| Turbidity | | | NTU | 3.09 | 1 | 9.91 | 2.31 | 1.9 | 1.2 | | 1.61 | 4.29 | 5.67 | | 1.31 | | 1.71 | | 3.66 | 0.26 | 0.1 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table 4-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = indicates the result is estimated.
"J+" = indicates the result is estimated and may be biased low.
"J-" = indicates the result is estimated and may be biased high.

"Un" = indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = indicates a result was identified as an outlier and removed from the data set.

GOLDER

**Table 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW55B | | | | | | | GAMW55 | | | | | | GAMW56B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-11 | | 2018-10-29 | 2019-05-01 | 2019-11-15 | 2020-05-05 | | 2013-09-11 | 2018-10-26 | 2019-04-29 | 2019-11-15 | 2020-05-05 | | 2018-09-11 | 2018-10-29 | 2019-04-29 | 2019-11-15 | 2020-05-05 |
| | | | | FD | N | N | N | N | FD | N | N | N | N | N | FD | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 7.1 | 7.4 | 8.2 | 9.1 | 11 | 9.21 J | 10.9 J | 0.26 | 0.28 | 0.21 | 0.2 | | 0.22 | 1.2 | 1.2 | 1.3 | 1.2 | 1.1 |
| Calcium | | | mg/L | 250 | 253 | 260 | 210 | 210 | 116 J | 219 J | 130 | 110 | 95 | 123 | | 115 | 140 | 140 | 150 | 150 | 141 |
| Chloride | | | mg/L | 220 | 220 | 190 | 170 | 150 | 119 | 135 | 3.1 | 2.4 | 3.2 | 2.1 | | 2.8 | 50 | 50 | 55 | 64 | 50.8 |
| Fluoride | 4 | 4 | mg/L | 0.29 J | 0.3 U | 0.25 | 0.32 | 0.31 | 0.32 | 0.32 | 1.4 J | 0.59 | 0.53 | 0.67 | | 0.66 | 0.41 J | 0.33 | 0.4 | 0.44 | 0.55 |
| pH | | | SU | | 7.37 | 7.19 | 7.31 | 7.45 | | 7.48 | 5.83 | 7.17 | 5.83 | 7.06 | | 7.05 | 6.95 | 6.91 | 7.08 | 7.21 | 7.52 |
| Sulfate | | | mg/l | 820 | 830 | 810 | 790 | 760 | 678 | 674 | 57 | 63 | 54 | 56 | | 56.3 | 170 | 190 | 260 | 280 | 280 |
| Total Dissolved Solids | | | mg/L | 1800 | 1930 | 1830 | 1700 | 1403 | 1400 | 1420 | 470 | 480 | 420 | 440 | | 456 | 740 | 690 | 830 | 860 | 753 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.001 U | 0.002 U | 0.002 U | 0.002 | 0.002 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0014 J | 0.0011 J | 0.005 U | 0.005 U | 0.005 U | 0.0079 J | 0.001 UJ | 0.019 | 0.022 | 0.011 | 0.0097 | | 0.0076 | 0.005 U | 0.005 U | 0.005 | 0.005 U | 0.001 U |
| Barium | 2 | 2 | mg/L | 0.14 | 0.14 | 0.12 | 0.074 | 0.067 | 0.045 J | 0.057 J | 0.068 | 0.049 | 0.044 | 0.04 | | 0.047 | 0.076 | 0.072 | 0.082 | 0.079 | 0.071 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.0002 U | 0.001 U | 0.001 U | 0.001 | 0.001 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.0002 U | 0.001 U | 0.001 U | 0.001 | 0.001 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | 0.007 U | 0.007 U | 0.007 U | 0.007 U | 0.007 U | 0.007 U | 0.007 U | 0.007 U | 0.007 U | 0.007 U | 0.007 U | | 0.007 U | 0.007 U | 0.007 U | 0.007 | 0.007 U | 0.007 U |
| Cobalt | | 0.006 | mg/L | 0.00934 J | 0.00828 J | 0.001 U | 0.001 U | 0.001 U | 0.0087 J | 0.001 UJ | 0.0017 | 0.0053 | 0.0064 | 0.0081 | | 0.0092 | 0.001 U | 0.001 U | 0.001 | 0.001 U | 0.001 U |
| Fluoride | 4 | 4 | mg/l | 0.29 J | 0.3 U | 0.25 | 0.32 | 0.31 | 0.32 | 0.32 | 1.4 J | 0.59 | 0.53 | 0.67 | | 0.66 | 0.41 J | 0.33 | 0.4 | 0.44 | 0.55 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.0084 J | 0.0064 J | 0.0054 J | 0.0055 J | 0.0078 J | 0.003 U | 0.013 | 0.0024 J | 0.0029 J | 0.0023 J | 0.0053 J | | 0.002 U | 0.0051 J | 0.0035 J | 0.0044 | 0.0062 J | 0.0032 |
| Mercury | 0.002 | 0.002 | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | 0.0057 J | 0.0055 J | 0.0055 J | 0.0046 J | 0.005 J | 0.0049 J | 0.0053 J | 0.0019 | 0.0044 J | 0.00472 J | 0.00459 J | | 0.0068 | 0.0094 J | 0.009 J | 0.0092 | 0.0084 J | 0.0065 |
| Radium 226 + 228 | 5 | | pCi/L | 5.35 | 3.18 | 3.55 J+ | 3.08 | | 3.06 | 3.02 | 0.738 | 0.693 J+ | | | | 1.24 U | 1.26 | 1.23 J+ | | | 2.11 |
| Radium 226 | | | pCi/L | 1.77 | 1.25 | 1.85 U | 1.15 | | 1.29 | 1.66 | 0.505 | 0.357 U | 0.331 U | | | 0.509 U | 0.763 | 0.678 U | 0.506 | | 0.966 |
| Radium-228 | | | pCi/L | 1.63 | 1.43 | 1.79 J+ | 0.926 | | 1.83 | 1.68 | 0.371 U | 0.429 U | 0.373 U | | | 0.735 U | 0.493 | 0.598 J+ | 0.571 | | 1.23 U |
| Selenium | 0.05 | 0.05 | mg/l | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.002 | 0.001 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.0022 | 0.005 U | 0.005 U | 0.005 | 0.005 U | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | | 0.17 | 0.17 | 0.12 | 0.17 | | 0.1 | 0.96 | 0.28 | 1.3 | 0.34 | | 0.21 | 0.29 | 0.25 | 0.79 | 0.19 | 0.09 |
| Oxidation Reduction Potential | | | millivolts | | -129.6 | -126.9 | -57.6 | -137.8 | | -101.9 | -97.4 | -95.4 | 34 | -86.6 | | -42.1 | -107.8 | -44.4 | 91.9 | -105.7 | -106.5 |
| pH | | | SU | | 7.37 | 7.19 | 7.31 | 7.45 | | 7.45 | 6.83 | 7.17 | 5.83 | 7.06 | | 7.05 | 6.95 | 6.91 | 7.08 | 7.21 | 7.52 |
| Specific Conductivity | | | uS/cm | | 2199 | 2231 | 1967 | 1491 | | 2016 | 749 | 835 | 460 | 465 | | 782 | 928 | 1036 | 855 | 741 | 1179 |
| Temperature | | | deg C | | 19.2 | 18.5 | 18.1 | 17.9 | | 17.1 | 17 | 15.7 | 8.7 | 14 | | 9.6 | 13.8 | 13.8 | 11.6 | 12.9 | 11.8 |
| Turbidity | | | NTU | | 4.38 | 1.24 | 4.77 | 3.92 | | 4.11 | 2.81 | 2.99 | 2.31 | 2.05 | | 2.4 | 2.86 | 1.45 | 4.27 | 1.1 | 4.56 |

Notes:
IDEM RCGs= Indiana Department of Environmental Management
Remediation Closure Guidance Table A-6 Screening Levels - 2021
Revision

MCL= Maximum Contaminant Level
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pCi/L = picoCuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample; the quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.

"UJ" = Indicates the result was not detected above the MDL; the estimated RL is provided.
"R" = Indicates a result was identified as an outlier and removed from the data set.

Prepared by: KMC
Checked by:
Reviewed by:

GOLDER

**Table 3: General Groundwater Response Actions**
**CCR Unit Schahfer MSRB, MCWB, and DA**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| General Response Action | Comments | Corrective Measure Area | |
|---|---|---|---|
| | | Below CCR Unit | Downgradient of CCR Unit |
| Limited Action | Access Restrictions<br>Institutional Controls<br>Use Restrictions<br>Environmental Monitoring<br>Monitored Natural Attenuation | X | X |
| Containment | Physical | X | |
| Removal | Extraction | X | X |
| Treatment | In-Situ<br>Ex-Situ | X | X |
| On-Site Disposal | Surface Water Discharge<br>Groundwater Discharge<br>POTW Discharge | X | X |
| Off-Site Disposal | Permitted Disposal Facility | X | X |

Notes
X- General Response Action selected for further screening at the indicated Corrective Measure Area

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

**Table 4: Initial Screening of Corrective Measure Alternatives / Process Options for Groundwate**
**CCR Unit Schahfer MSRB, MCWB, and DA**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| General Response Action | Remedial Technology | Process Option | Description | Screening Comments | Retained for Further Evaluation | |
|---|---|---|---|---|---|---|
| | | | | | Below CCR Unit | Downgradient of CCR Unit |
| Limited Ac ion | Institutional Controls | Permitting and Notices | Administra ive controls to restrict groundwater use. | Potentially implementable. | Yes | Yes |
| | | Access Restrictions | Physical restrictions or structures that prevent access by unauthorized persons. | Potentially implementable. | Yes | Yes |
| | Monitoring | Groundwater Monitoring | Periodic sampling and analyses of groundwater as a means of detecting unacceptable changes in constituent concentrations. | Potentially implementable. | Yes | Yes |
| | Use Restriction | Deed Restrictions | Administrative controls to provide future land use restrictions | Potentially implementable. | Yes | Yes |
| | Monitored Natural Attenuation | Monitored Natural Attenuation | Long-term monitoring of natural attenuation, including advection/dispersion/adsorption and biotic and abiotic degrada ion/transformation, of the inorganic constituents dissolved in groundwater; advection/dispersion/adsorption of inorganics. | Potentially implementable. | Yes | Yes |
| Containment | Physical Containment | Capping | Low-permeable cap covering the source area. | Potentially implementable, minimizes stormwater infiltration reducing the potential for plume migration. | Yes | NA |
| | | Vertical Barriers | Vertical barriers including slurry walls and sheet piling placed around the area of contamination to contain groundwater. | Potentially implementable, reduces poten ial for plume migration. | Yes | NA |
| Removal | Extraction | Extraction Wells | Use of extraction wells to extract contaminated groundwater and control groundwater movement within capture zone. | Poten ially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration. | Yes | Yes |
| | | Extraction Trench | Removal of groundwater by pumping from extraction trenches. | Poten ially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration. | Yes | Yes |
| *In Situ* Treatment | Stabilization/ Solidification | Solidification | Blending soil with grout to contain and immobilize contaminated groundwater. | Potentially implementable for the corrective measure area below he CCR Unit. Reduces potential for plume migration. | Yes | No |
| | Permeable Reactive Barrier | Vertical Reactive Barrier | Construction of vertical reactive barrier (e.g., carbon wall) to treat groundwater as it flows through the treatment zone. | Not effective on all Site COCs, limited effectiveness on Sites with high groundwater velocity. | No | No |
| *In Situ* Treatment | Chemical Addition/ Treatment | Chemical Precipitation | Increasing inorganic precipitation through chemical injection, either by changing site geochemical conditions (i.e., pH, Eh, or ionic strength) or the addition of a co-precipitate that reacts with or acts as an adsorbent for the COC. | Not effective on all Site COCs. | No | No |
| | | Chemical Reduction | Injection of a reducing agent such as nanoscale or microscale zero valent iron into groundwater. Reduction reactions chemically convert constituents to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. | Not effective on all Site COCs. | No | No |
| | Biological Treatment | Bioremediation | Use of microorganisms to oxidize/reduce metal contaminants directly or by the production of chemical oxidizing/reducing agents. | Not effective on all Site COCs. | No | No |

**Table 4: Initial Screening of Corrective Measure Alternatives / Process Options for Groundwate**
**CCR Unit Schahfer MSRB, MCWB, and DA**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| General Response Action | Remedial Technology | Process Option | Description | Screening Comments | Retained for Further Evaluation | |
|---|---|---|---|---|---|---|
| | | | | | Below CCR Unit | Downgradient of CCR Unit |
| *Ex Situ* Treatment | On-Site Treatment Facility | On-Site, Various Physical/chemical Process Options | Extracted groundwater is pumped to the on-Site treatment facility (physical/chemical treatment). | Potentially implementable to treat extracted contaminated groundwater. Treatment processes that could remediate the Site COCs include chemical/physical precipitation, activated carbon, and reverse osmosis. | Yes | Yes |
| Disposal | On-Site Discharge | On-Site Discharge to Surface Water | Treated groundwater discharged to local water body pursuant to updated NPDES permit. | Potentially implementable. Treated landfill leachate is currently discharged to a local water body pursuant to a NPDES permit. | Yes | Yes |
| | | On-Site Discharge to Groundwater | Treated groundwater discharged to groundwater within the Station Area. | Potentially implementable. | Yes | Yes |
| | | POTW Discharge | Discharge of treated groundwater to POTW under a discharge authorization. | No access to POTW. | No | No |
| | Off-Site Treatment | Off-Site Disposal/Treatment of Collected Groundwater | Transport and treatment of extracted groundwater at off-Site treatment facility. | Not retained due to higher safety concerns and much higher disposal costs. | No | No |

Notes
COC- constituent of concern
NPDES- National Pollutant Discharge Elimination System
POTW- publicly owned treatment works
NA- not applicable

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

**Table 5: Summary of Groundwater Corrective Measure Alternatives**
**For Multi-Cell Unit (MSRB, MCWB, and DA)**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Alternative | | Key Components |
|---|---|---|
| A | Monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Environmental monitoring |
| B | Vertical barrier/hydraulic controls and monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Installation of hydraulic controls within existing vertical barrier wall<br>*x situ* treatment of pumped groundwater by an on-Site treatment facility<br>Disposal of treated groundwater to on-Site surface water or groundwater<br>NPDES permit or installation of injection wells and UIC permit<br>Long-term maintenance<br>Environmental monitoring |
| C | Pump-and-treat and monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Installation of monitoring wells or extraction trench immediately downgradient of the slurry wall<br>*x situ* treatment of pumped groundwater by an on-Site treatment facility<br>Disposal of treated groundwater to on-Site surface water or groundwater<br>NPDES permit or of injection wells and UIC permit<br>Long-term maintenance<br>Environmental monitoring |
| D | Vertical barrier/hydraulic controls, pump-and-treat, and monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Installation of hydraulic controls within existing vertical barrier wall<br>Installation of monitoring wells or extraction trench outside the vertical barrier wall<br>*x situ* treatment of pumped groundwater by an on-Site treatment facility<br>Disposal of treated groundwater to on-Site surface water or groundwater<br>NPDES permit or of injection wells and UIC permit<br>Long-term maintenance<br>Environmental monitoring |

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG

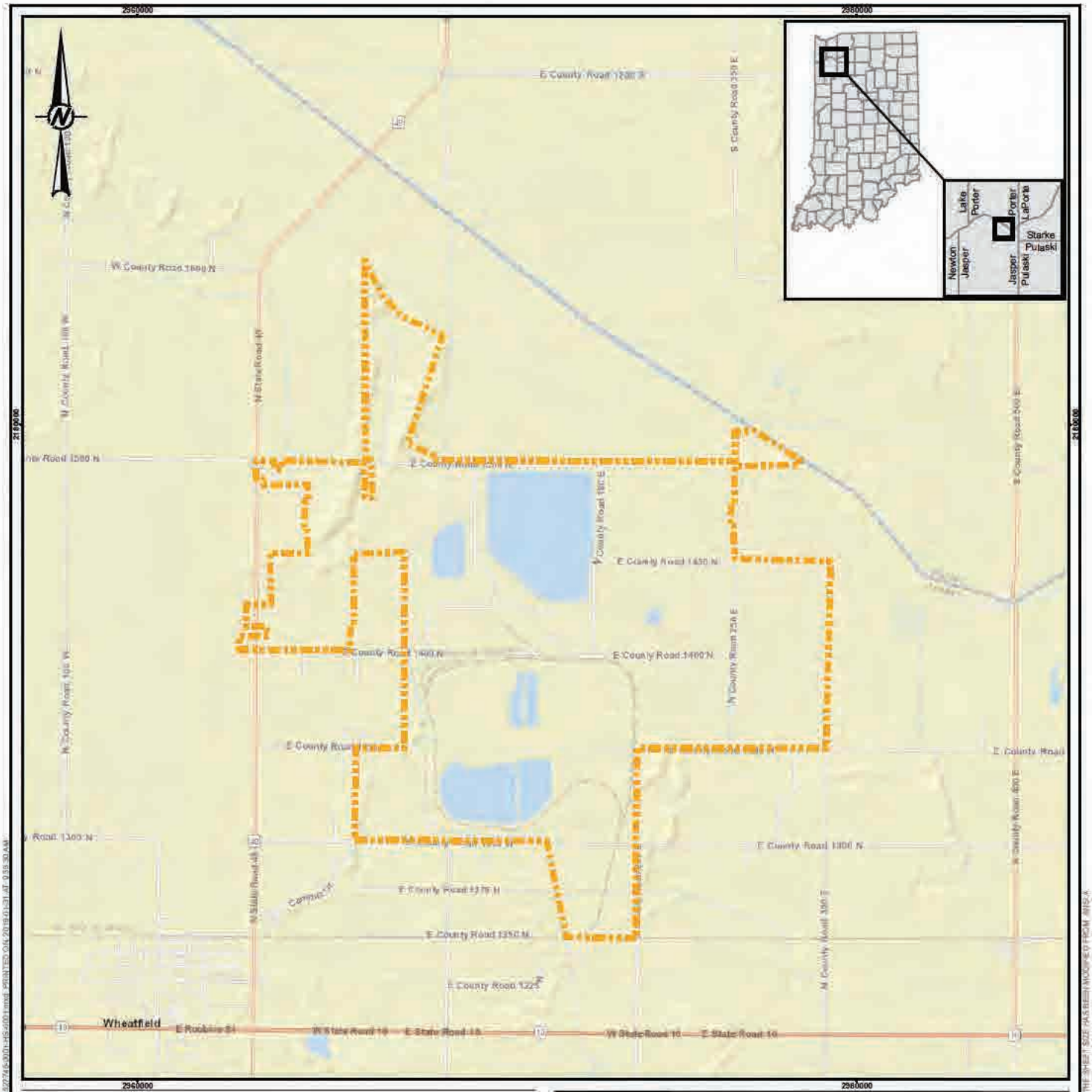
**Table : valuation of Groundwater Corrective Measure Alternatives**
**For Multi-Cell Unit (MSRB, MCWB, and DA)**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Corrective Measure Alternatives | | | |
|---|---|---|---|---|
| | **Alternative A** | **Alternative B** | **Alternative C** | **Alternative D** |
| **valuation Criteria** | **Monitored natural attenuation** | **ertical barrier hydraulic controls and monitored natural attenuation** | **Pump-and-treat and monitored natural attenuation** | **ertical barrier hydraulic controls, pump-and- treat, and monitored natural attenuation** |
| **Performance** | Initial review of site conditions indicates plume stability and confirmation of attenuation and immobili ation, therefore, monitored natural attenuation could be effective in reducing the C C concentrations and mobility.<br><br>Relative short-term effectiveness varies depending on success of excavation to remove the source material and the low-permeability cap to reduce the mobility of residual C Cs and potential for plume migration. Minimally effective short-term. | ydraulic controls within an existing vertical barrier slurry wall are an effective means of containing the source area.<br><br>Relatively effective both short-term and long-term. | Groundwater extraction of contaminated groundwater could be potentially effective in reducing volume and mobility of dissolved C Cs in groundwater.<br><br>Relatively effective both short-term and long-term. | ydraulic controls within an existing vertical barrier slurry wall are an effective means of containing the source area and groundwater extraction of contaminated groundwater downgradient of the barrier could be potentially effective in reducing volume and mobility of dissolved C Cs in groundwater.<br><br>Relatively effective both short-term and long-term. |
| **Reliability** | Moderate to igh. No M re uired, but long-term changes to geochemistry may impact attenuation. | Moderate. Some M re uired and potential treatment replacement. | Moderate, some M re uired and potential treatment replacement. | Moderate, some M re uired and potential treatment replacement. |
| **ase of Implementation** | Already occurring. | echnology is common some installation challenges expected based on existing slurry walls and proposed cap. | echnology is common, some installation and drilling challenges expected. | echnology is common some installation challenges expected based on existing slurry walls and proposed cap. |
| **Potential Impacts** | Minimal potential for impacts to surface water and off-site groundwater. | ydraulic controls within an existing vertical barrier control cross media impacts outside of the wall. Some safety concerns related to drilling wells and operating treatment plant e.g., regenerating resin . | Groundwater collection and treatment will reduce long-term downgradient cross media impacts. Some safety concerns related to drilling wells and operating treatment plant e.g., regenerating resin . | ydraulic controls within an existing vertical barrier and groundwater collection and treatment have very good control of cross media impacts. Some safety concerns related to drilling wells and operating treatment plant e.g., regenerating resin . |
| **Time Re uirements** | Relatively long, no active remediation. | Moderate, should be shorter than MNA alone | Moderate, should be shorter than MNA alone | Moderate, should be shorter than MNA or pump-and-treat alone. |
| **Institutional Re uirements** | Low permitting re uirements | May re uire NPDES permit modifications or UIC permit, overall low permitting re uirements | May re uire NPDES permit modifications or UIC permit, overall low permitting re uirements | May re uire NPDES permit modifications or UIC permit, overall low permitting re uirements |
| **Relative Costs** | Low Capital, Low M and Replacement | Moderate Capital, Moderate M and Replacement | Moderate Capital, Moderate M and Replacement | Moderate Capital, igh M and Replacement |

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG

GOLDER
MEMBER OF WSP

# Figures




**LEGEND**

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

**REFERENCE(S)**

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTR BUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

**SITE LOCATION MAP**

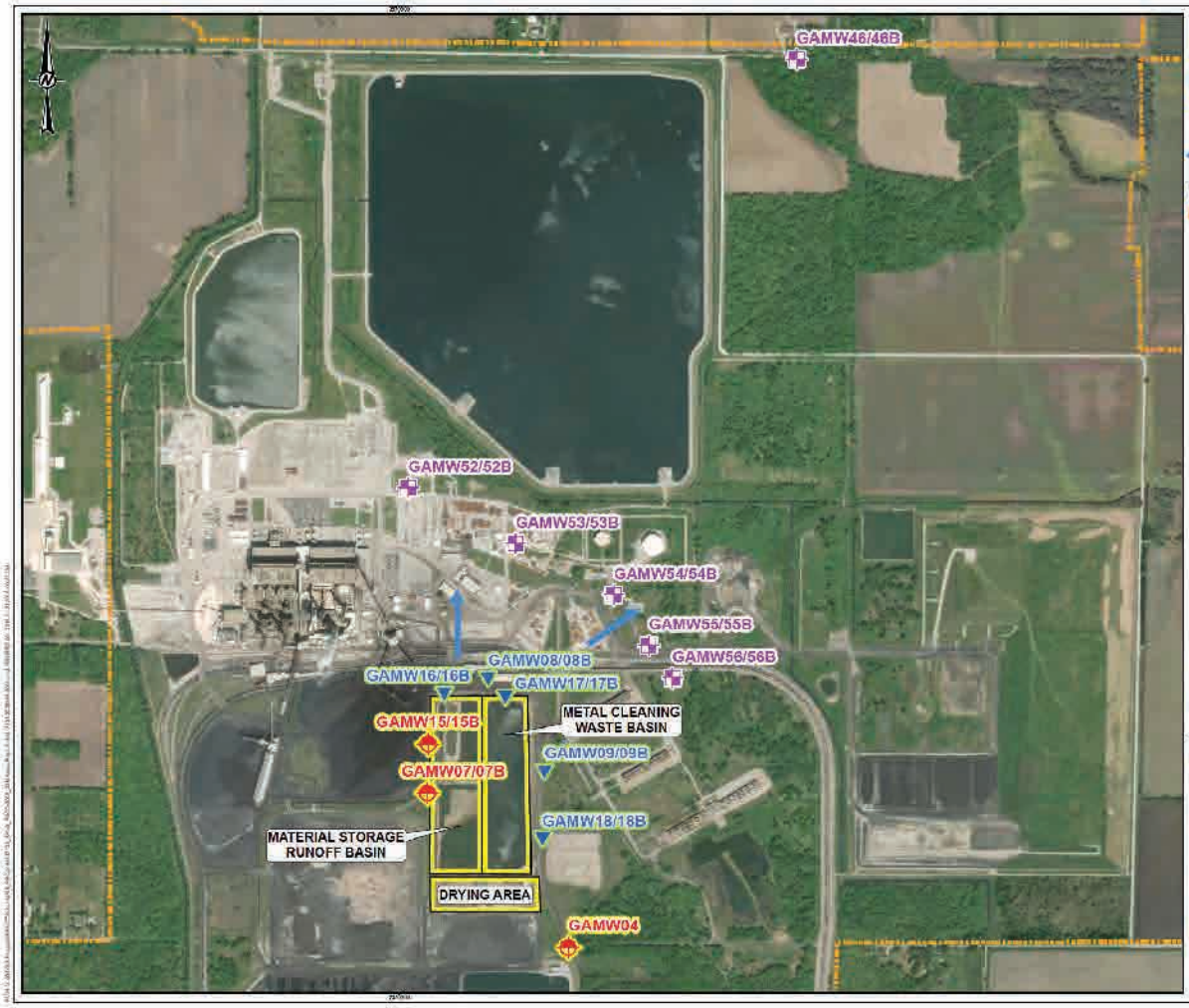
CONSULTANT

GOLDER

| | |
|---|---|
| YYYY-MM-DD | 1/31/2019 |
| DESIGNED | DFS |
| PREPARED | SHL |
| REV EWED | JSP |
| APPROVED | MAH |

| PROJECT NO | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 164817101 | A | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A




Legend

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1 " = 850 feet

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

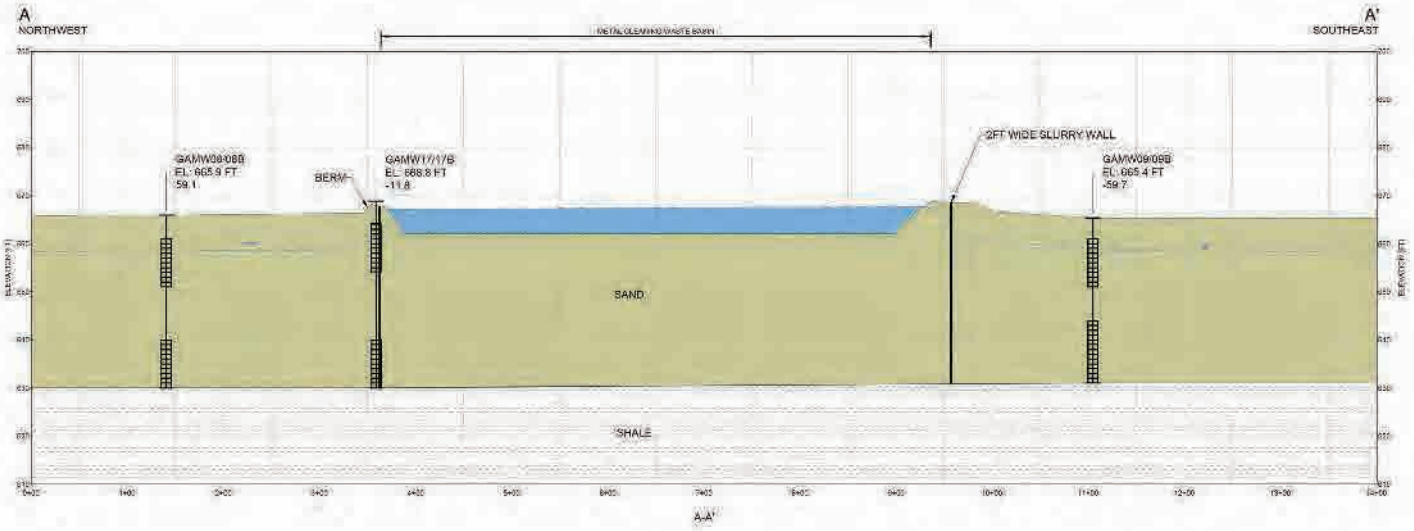
MONITORING WELL LOCATIONS
DRYING AREA, MSRB, AND MCWB

CONSULTANT

GOLDER

| | |
|---|---|
| DESIGNED | DPS |
| PREPARED | SR |
| REVIEWED | MKH |
| APPROVED | MWT |

PROJECT NO. 164017101 | CONTROL A | REV. 0 | FIGURE 2







VERTICAL SCALE: 1" = 10' (FEET)

HORIZONTAL SCALE: 1" = 50' (FEET)

LEGEND

GAMW-25-03B
EL. 663.8
09.1

- WELL ID
- GROUND SURFACE ELEVATION
- OFFSET DISTANCE
- C/L = CENTERLINE
- GROUNDWATER ELEVATION
- WELL SCREEN
- END OF BORING LOCATION
- IMPOUNDMENT WATER
- SAND
- SHALE

NOTE(S):

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

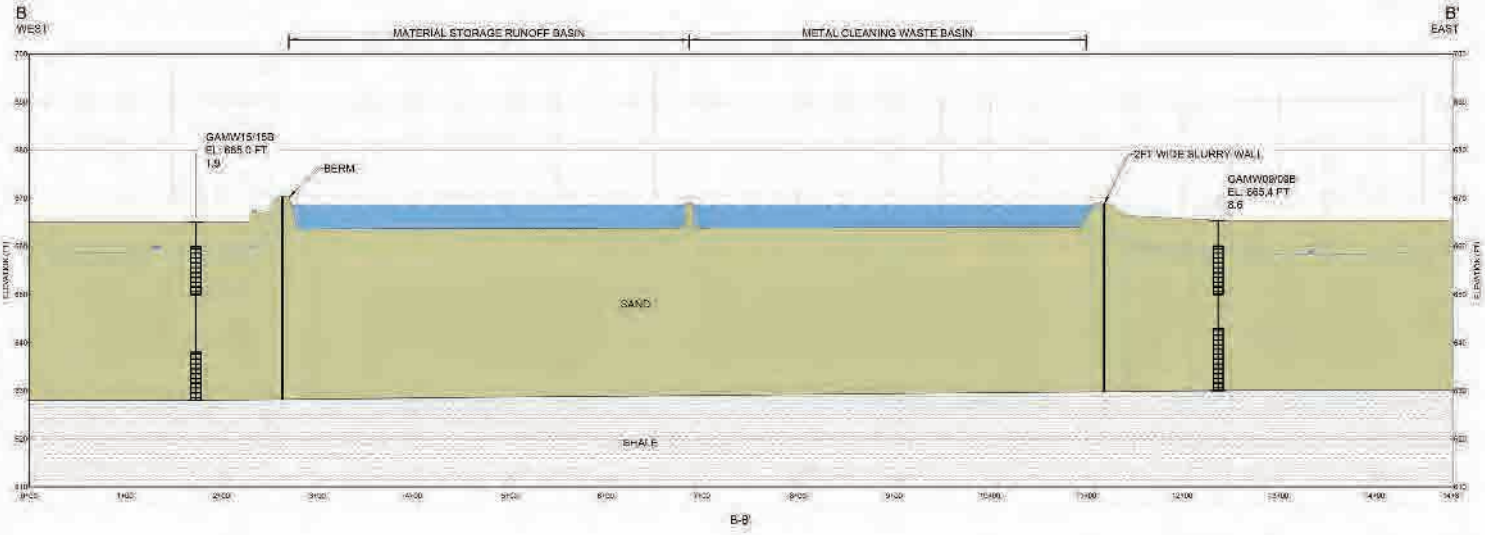
CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2019-03-26 |
| DESIGNED | RWC |
| PREPARED | RWC |
| REVIEWED | JBG |
| APPROVED | MAR |

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
**GEOLOGIC INTERPRETATION**
**CROSS SECTION A-A'**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1648171 | 03 | 0 | 3 |







VERTICAL SCALE: 1 INCH = 20 FEET

HORIZONTAL SCALE: 1 INCH = 200 FEET

LEGEND

GAMW 15/15D
EL. 665.14
1.9

- WELL ID
- GROUND SURFACE ELEVATION
- OFFSET DISTANCE (N = NORTH/E = EAST/W = WEST/S = SOUTH)
- GROUNDWATER ELEVATION
- WELL SCREEN
- END OF BORING LOCATION

IMPOUNDMENT WATER

SAND

SHALE

NOTE(S):
1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2019-03-26 |
| PREPARED | RWC |
| REVIEWED | JBC |
| APPROVED | MKH |

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
**GEOLOGIC INTERPRETATION**
**CROSS SECTION B-B'**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1648171 | 03 | 0 | 4 |




LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Non-CCR Well
- Surface Water Location
- April 2021 Groundwater Elevation Contour (0.5 ft interval)
- Slurry Wall
- Approximate Property Line
- CCR Units
- Inactive Retired Waste Disposal Basin
- Phase VII

0 850 1,700

1 in. = 850 feet

Feet

NOTE(S)

1. NS INDICATES LOCATION WAS NOT SAMPLED.
2. ft INDICATES NOT USED IN CONTOURING.

REFERENCE(S)

1. SURFACE WATER FEATURES SOURCE: ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHITE HALL, INDIANA

TITLE

**MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATION CONTOURS (APRIL 2021)**

CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| TYPE/MANAGER | 2021-07-26 |
| DESIGNED | DPS |
| DRAWN BY | TRH |
| CHECKED | DPS |
| APPROVED | MAH |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 19431567 | A | 0 | 5 |




0.17 April - May 2020 Boron Concentration (mg/L)

Assessment Monitoring Well

Background Monitoring Well

Downgradient Monitoring Well

April - May 2020 Shallow Boron Contour (mg/L)

Inferred April - May 2020 Shallow Boron Contour (mg/L)

Generalized Groundwater Flow Direction

Slurry Wall

CCR Units

Approximate Property Line

FIGURE NARRATIVE

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

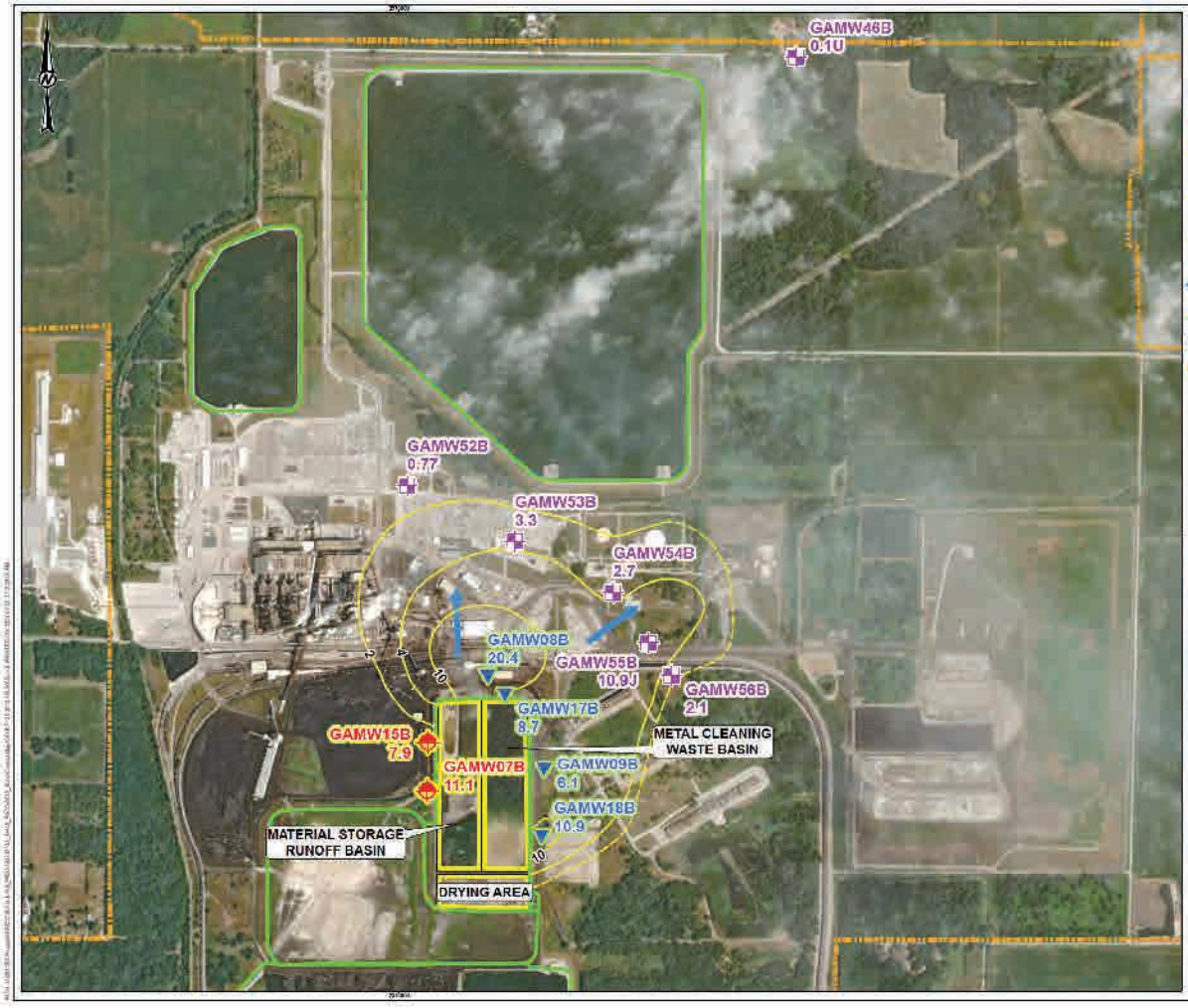
CLIENT:
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT:
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE:
**ASSESSMENT OF CORRECTIVE MEASURES**
**BORON ISOCONCENTRATION CONTOUR MAP**
**APRIL - MAY 2020 (SHALLOW)**

CONSULTANT:
GOLDER

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20447130 | A | 0 | 6 |




LEGEND

- 3.1 April - May 2020 Boron Concentration (mg/L)
- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- April - May 2020 Deep Boron Contour (mg/L)
- Inferred April - May 2020 Deep Boron Contour (mg/L)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units
- Approximate Property Line

FIGURE NARRATIVE

NOTE(S)

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

**ASSESSMENT OF CORRECTIVE MEASURES**
**BORON ISOCONCENTRATION CONTOUR MAP**
**APRIL - MAY 2020 (DEEP)**

GOLDER

DESIGNED: KC
PREPARED: TBH
REVIEWED: BKH
APPROVED: MW

PROJECT NO. 20447130 | CONTROL A | REV. 0 | FIGURE 7

**APPENDIX A**

# Volume Calculations

VOLUME CALCULATIONS

**Volume of impacted material below the CCR Unit**

Assumptions:

Entire remaining volume of water within the slurry walls after excavation is impacting.
Area is estimated by the combined area of the three impoundments (Figure 6).
Depth is estimated by the approximate saturated thickness outside the slurry walls (Figure 3).

| | | | | |
|---|---|---|---|---|
| Area | 36.2 | acre | (A) | (Wood 2019) |
| Saturated depth | 32 | feet | (D) | (Golder 2017) |

Estimated volume of impacted material was calculated using the following formula:

$Volume = A*D = V_1$ 1 acre= 43560 $ft^2$

| | | |
|---|---|---|
| $V_1$ | 1158 | acre-ft |
| $V_1$ | 5.0E+07 | $ft^3$ |

**Volume of impacted material downgradient of the CCR Unit**

Assumptions:

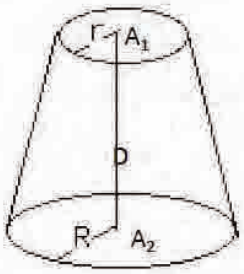
The volume is estimated by the volume with boron concentrations greater than 4 mg/L.
Plume areas are calculated based on the 4 mg/L contours displayed on Figure 6 and Figure 7.

| | | | | |
|---|---|---|---|---|
| Shallow plume area | 21.75 | acre | | |
| | 9.474E+05 | $ft^2$ | (A1) | |
| Deep plume area | 87.40 | acre | | |
| | 3.807E+06 | $ft^2$ | (A2) | |
| Saturated depth | 32 | feet | (D) | (Golder 2017) |
| Assumed effective porosity | 0.3 | | (n) | (Golder 2017) |

The plume area were approximated as circles, and the volume of impacted material was estimated as a frustrum using the following formula:

$Volume = \pi*D/3*(R^2 + Rr + r^2) = V_2$

$r = (A_1/\pi)^{1/2}$, $R = (A_2/\pi)^{1/2}$




| | | |
|---|---|---|
| r | 549.2 | ft |
| R | 1101 | ft |
| $V_2$ | 7.10E+07 | $ft^3$ |
| $V_2$ | 1629 | acre-ft |

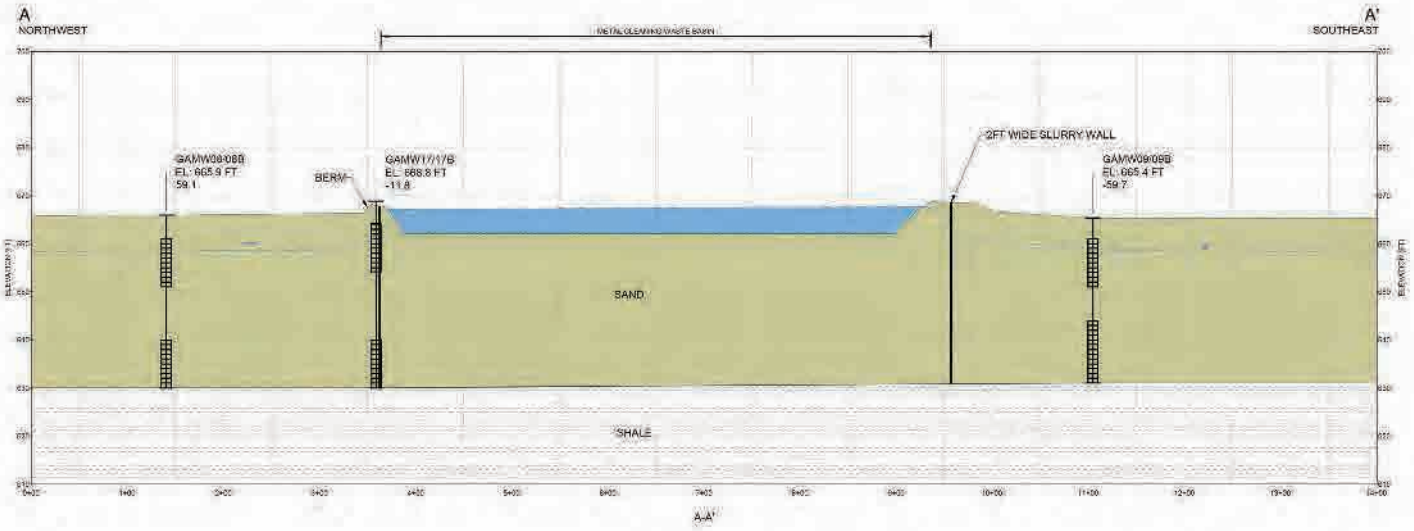
Estimated volume of impacted groundwater was calculated using the following forumula:

$Volume = V_2*n = V_{water}$

| | | |
|---|---|---|
| $V_{water}$ | 2.13E+07 | $ft^3$ |
| $V_{water}$ | 1.59E+08 | gallons |

Prepared by: DFS
Checked by: BPC
Reviewed by: JBG

Golder Associates, Groundwater Monitoring Program Implementation Manual, October 2017
Wood, 2019. Multi-Cell Unit Surface Impoundments (CCR Final Rule) Draft Closure Application. March 8, 2019.







VERTICAL SCALE: 1" = 10' (FEET)

HORIZONTAL SCALE: 1" = 50' (FEET)

LEGEND

GAMW-25/25B
EL. 663.8
09.1

- WELL ID
- GROUND SURFACE ELEVATION
- OFFSET DISTANCE
- C/L = CENTERLINE
- GROUNDWATER ELEVATION
- WELL SCREEN
- END OF BORING LOCATION
- IMPOUNDMENT WATER
- SAND
- SHALE

NOTE(S):

1. GEOLOGIC CONTACTS ILLUSTRATED/OBTAINED BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2019-02-26 |
| DESIGNED | RWO |
| PREPARED | RWO |
| REVIEWED | |
| APPROVED | |

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
**GEOLOGIC INTERPRETATION**
**CROSS SECTION A-A'**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1648171 | 03 | 0 | 3 |




0.17 October 2018 Boron Concentration (mg/L)

Assessment Monitoring Well

Background Monitoring Well

Downgradient Monitoring Well

October 2018 Shallow Boron Contour (mg/L)

Generalized Groundwater Flow Direction

Slurry Wall

CCR Units

Approximate Property Line

FIGURE NARRATIVE

NOTES:

NORTHERN INDIANA PUBLIC SERVICE COMPANY

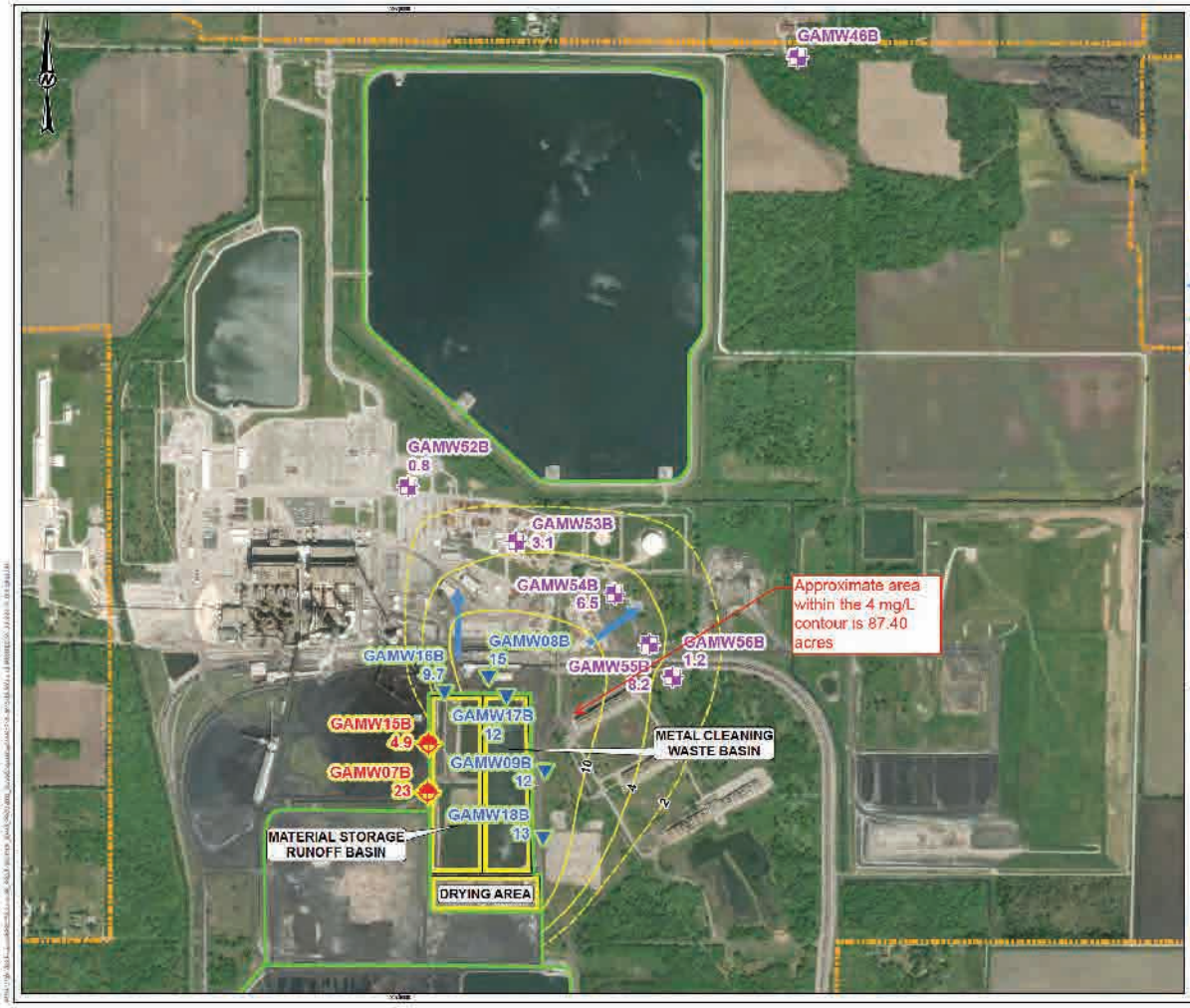
NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

**ASSESSMENT OF CORRECTIVE MEASURES**
**BORON ISOCONCENTRATION CONTOUR MAP**
**OCTOBER 2018 (SHALLOW)**

GOLDER

DESIGNED DFS
PREPARED SHL
REVIEWED MAH
APPROVED MAH

PROJECT NO. 1648(1710) | CONTROL A | REV. 0 | FIGURE 6




LEGEND

- 3.1 October 2018 Boron Concentration (mg/L)
- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- October 2018 Deep Boron Contour (mg/L)
- Inferred October 2018 Deep Boron Contour (mg/L)
- Generalized Groundwater Flow Direction
- Slurry Wall
- CCR Units
- Approximate Property Line

FIGURE NARRATIVE

THE PURPOSE OF THIS FIGURE IS TO SHOW THE INTERPRETED BORON ISOCONCENTRATION CONTOURS BASED ON GROUNDWATER ANALYTICAL DATA FROM THE DEEPER WATER-BEARING UNIT FOR SITE WITH A DOWNGRADIENT PUBLIC SURFACE WATER BODY. THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INTERPRETED DISTRIBUTION OF BORON IN GROUNDWATER ON THE BASIS OF THE DATA ILLUSTRATED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY OTHER INTERPRETATIONS ARE POSSIBLE. BORON DISTRIBUTION IN GROUNDWATER IS KNOWN TO VARY WITH TIME.

THE VARIATIONS DETECTED IN GAMW 07B AND GAMW 15B ARE NOT CONTOURED IN THIS MAP BECAUSE INTERPRETATION IS THAT THESE CONCENTRATIONS ARE DUE TO UPGRADIENT INFLUENCE.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE DEEPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES ARE REPORTED IN MILLIGRAMS PER LITER (MG/L).

REFERENCE(S)

1. DERIVED FROM SOURCES SUCH AS ESRI, USGS, NOAA

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

ASSESSMENT OF CORRECTIVE MEASURES
BORON ISOCONCENTRATION CONTOUR MAP
OCTOBER 2018 (DEEP)

CONSULTANT

GOLDER

| | |
|---|---|
| DESIGNED | DFS |
| PREPARED | SHL |
| REVIEWED | MAH |
| APPROVED | MAH |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 1648(1710) | A | 0 | 7 |

**APPENDIX B**

# Slug Test Data and Calculations

**Appendix B**
**HYDRAULIC CONDUCTIVITY TESTING RESULTS**



| Well | Date | Screened Interval | Type | Test Duration | Test Number | Hvorslev Method | | Bouwer and Rice Method | | van der Kamp Method | | Hvorslev/Bouwer and Rice Arithmetic Mean | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | cm/sec | ft/day | cm/sec | ft/day | cm/sec | ft/day | cm/sec | ft/day |
| GAMW03 | 7/7/2016 | 5-15 | Transducer (Rising) | <2 min | 1 | 7.44E-03 | 2.11E+01 | 4.99E-03 | 1.42E+01 | n/a | n/a | 6.22E-03 | 1.77E+01 |
| | | | | | 2 | 7.45E-03 | 2.11E+01 | 5.22E-03 | 1.48E+01 | n/a | n/a | 6.34E-03 | 1.80E+01 |
| GAMW13 | 7/7/2016 | 5-15 | Transducer (Rising) | <2 min | 1 | 5.75E-02 | 1.63E+02 | 3.91E-02 | 1.11E+02 | n/a | n/a | 4.83E-02 | 1.37E+02 |
| | | | | | 2 | 6.50E-02 | 1.84E+02 | 4.81E-02 | 1.36E+02 | n/a | n/a | 5.66E-02 | 1.60E+02 |
| GAMW15 | 7/7/2016 | 5-15 | Transducer (Rising) | <2 min | 1 | 2.59E-02 | 7.34E+01 | 1.63E-02 | 4.63E+01 | n/a | n/a | 2.11E-02 | 5.99E+01 |
| | | | | | 2 | 1.11E-02 | 3.15E+01 | 1.08E-02 | 3.05E+01 | n/a | n/a | 1.10E-02 | 3.10E+01 |
| GAMW19 | 7/7/2016 | 6-16 | Transducer (Rising) | <2 min | 1 | 3.70E-02 | 1.05E+02 | 2.25E-02 | 6.38E+01 | n/a | n/a | 2.98E-02 | 8.44E+01 |
| | | | | | 2 | 1.01E-01 | 2.87E+02 | 6.85E-02 | 1.94E+02 | n/a | n/a | 8.48E-02 | 2.41E+02 |
| **Average Shallow (515 ftbgs)** | | | | | | **3.90E-02** | **1.11E+02** | **2.69E-02** | **7.63E+01** | **n/a** | **n/a** | **3.30E-02** | **9.35E+01** |
| GAMW03B | 7/6/2016 | 27-37 | Transducer (Falling) | <2 min | 1 | 6.78E-03 | 1.92E+01 | 5.81E-03 | 1.65E+01 | n/a | n/a | 6.30E-03 | 1.79E+01 |
| | | | | | 2 | 4.30E-03 | 1.22E+01 | 4.79E-03 | 1.36E+01 | n/a | n/a | 4.55E-03 | 1.29E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 5.65E-03 | 1.60E+01 | 6.42E-03 | 1.82E+01 | n/a | n/a | 6.04E-03 | 1.71E+01 |
| | | | | | 2 | 1.47E-02 | 4.16E+01 | 1.25E-02 | 3.55E+01 | 1.49E-02 | 4.22E+01 | 1.36E-02 | 3.86E+01 |
| GAMW13B | 7/7/2016 | 25-35 | Transducer (Falling) | <2 min | 1 | 8.48E-03 | 2.40E+01 | 9.27E-03 | 2.63E+01 | n/a | n/a | 8.88E-03 | 2.52E+01 |
| | | | | | 2 | 8.09E-03 | 2.29E+01 | 9.27E-03 | 2.63E+01 | n/a | n/a | 8.68E-03 | 2.46E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 1.11E-02 | 3.15E+01 | 1.16E-02 | 3.30E+01 | 2.73E-02 | 7.74E+01 | 1.14E-02 | 3.23E+01 |
| | | | | | 2 | 1.06E-02 | 3.00E+01 | 1.08E-02 | 3.06E+01 | 1.06E-02 | 3.01E+01 | 1.07E-02 | 3.03E+01 |
| GAMW15B | 7/7/2016 | 27.7-37.7 | Transducer (Falling) | <2 min | 1 | 4.50E-03 | 1.28E+01 | 3.45E-03 | 9.79E+00 | n/a | n/a | 3.98E-03 | 1.13E+01 |
| | | | | | 2 | 1.03E-02 | 2.91E+01 | 8.75E-03 | 2.48E+01 | 9.53E-03 | 2.70E+01 | 9.53E-03 | 2.70E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 1.17E-02 | 3.32E+01 | 1.06E-02 | 3.02E+01 | 1.24E-02 | 3.50E+01 | 1.12E-02 | 3.17E+01 |
| | | | | | 2 | 1.06E-02 | 3.02E+01 | 9.79E-03 | 2.77E+01 | 1.69E-02 | 4.80E+01 | 1.02E-02 | 2.90E+01 |
| GAMW19B | 7/7/2016 | 23-33 | Transducer (Falling) | <2 min | 1 | 1.37E-02 | 3.88E+01 | 1.44E-02 | 4.09E+01 | n/a | n/a | 1.41E-02 | 3.99E+01 |
| | | | | | 2 | 6.82E-03 | 1.93E+01 | 6.31E-03 | 1.79E+01 | n/a | n/a | 6.57E-03 | 1.86E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 1.84E-02 | 5.21E+01 | 1.83E-02 | 5.18E+01 | 1.29E-02 | 3.67E+01 | 1.84E-02 | 5.20E+01 |
| | | | | | 2 | 1.21E-02 | 3.43E+01 | 1.03E-02 | 2.91E+01 | 1.21E-02 | 3.43E+01 | 1.12E-02 | 3.17E+01 |
| **Average Deep (2535 ftbgs)** | | | | | | **9.86E-03** | **2.80E+01** | **9.52E-03** | **2.70E+01** | **1.46E-02** | **4.13E+01** | **9.69E-03** | **2.75E+01** |

**Notes:**
ft/day = feet per day
cm/sec = centimeters per second
n/a = not analyzed

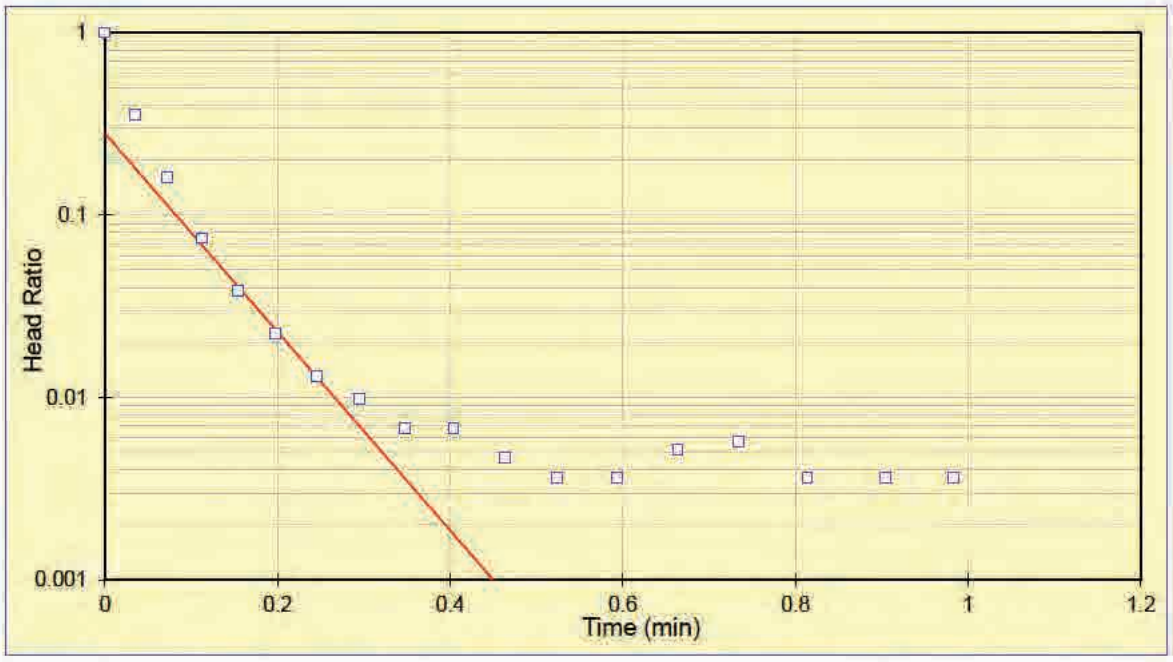
Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 7.44E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.11E+01 | ft/day |
| $t_2$ = | 0.45 | | | |
| $h_1/h_0$ = | 0.28 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/25/2016

# BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

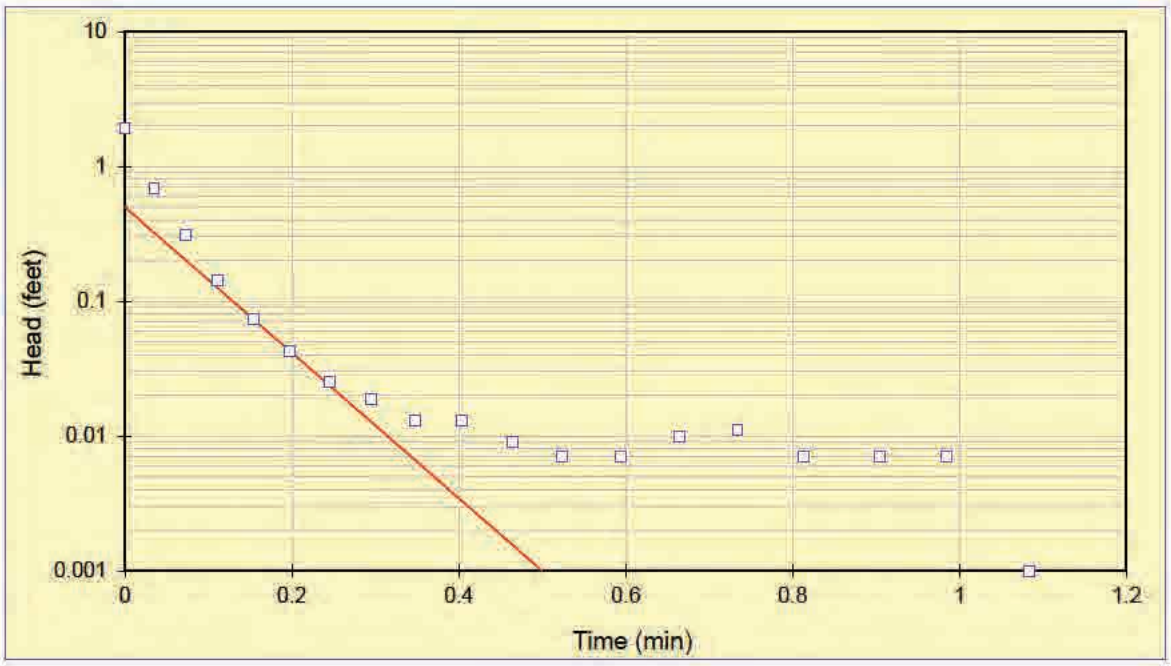
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.28 |
| $y_0$ = | 0.50 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 4.99E-03 | cm/sec |
| K= | 1.42E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

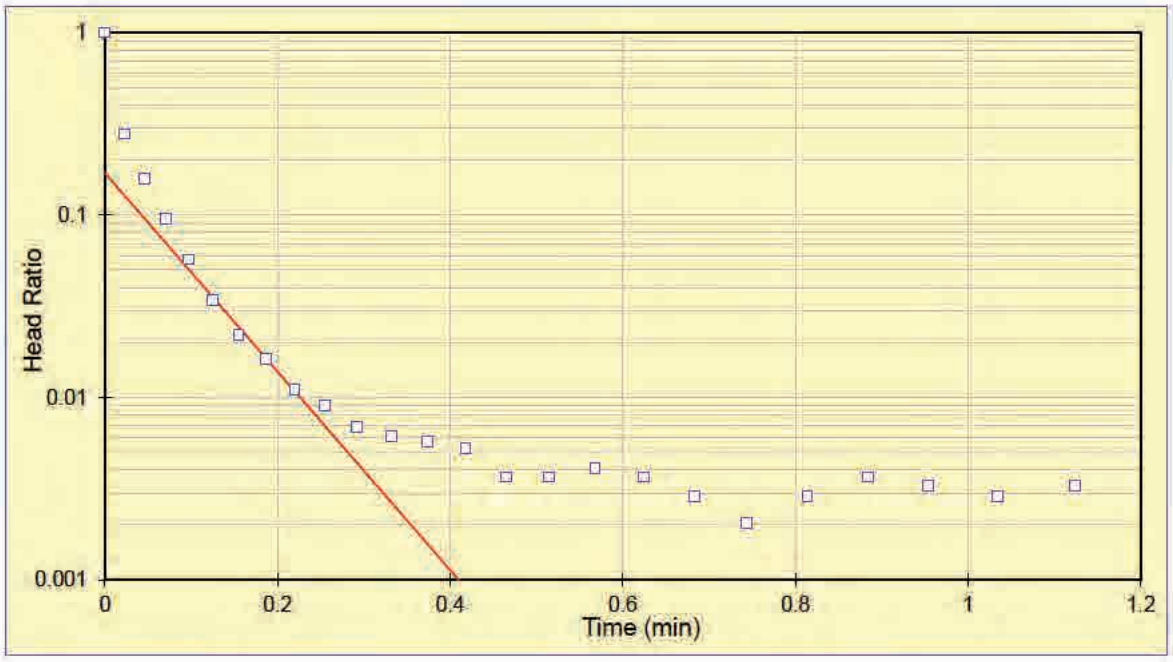
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 7.45E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.11E+01 | ft/day |
| $t_2$ = | 0.41 | | | |
| $h_1/h_0$ = | 0.17 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

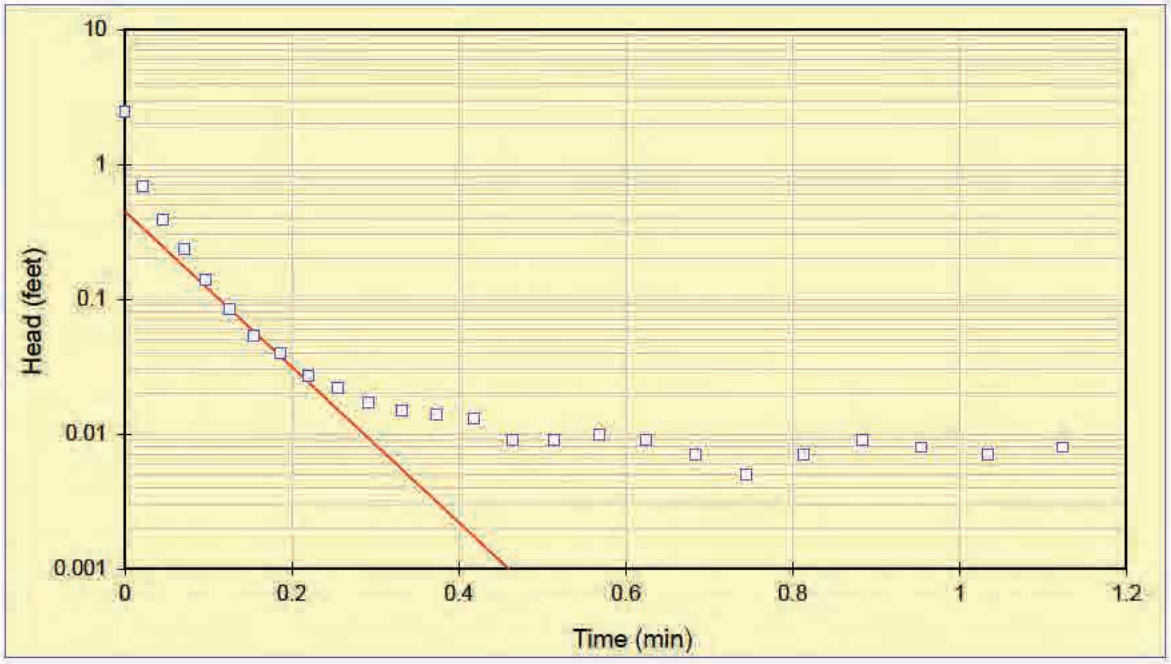
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.23 |
| $y_0$ = | 0.45 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 5.22E-03 | cm/sec |
| K= | 1.48E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

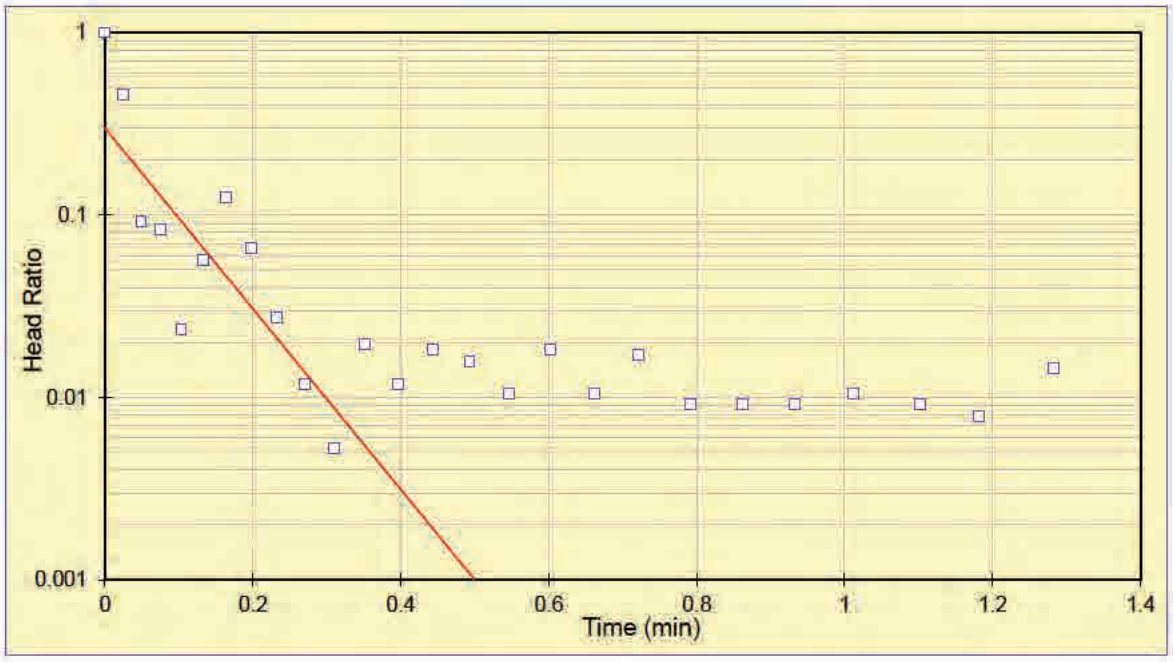
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 6.78E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.92E+01 | ft/day |
| $t_2$ = | 0.5 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

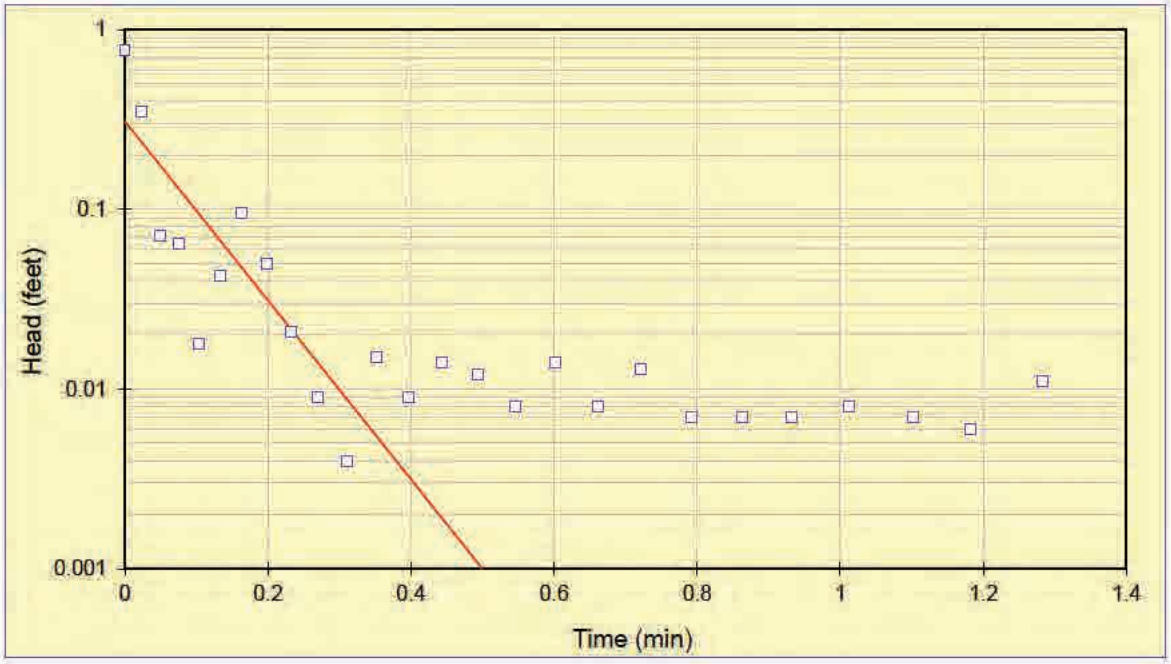
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.87 |
| $y_0$ = | 0.31 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 5.81E-03 | cm/sec |
| K= | 1.65E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

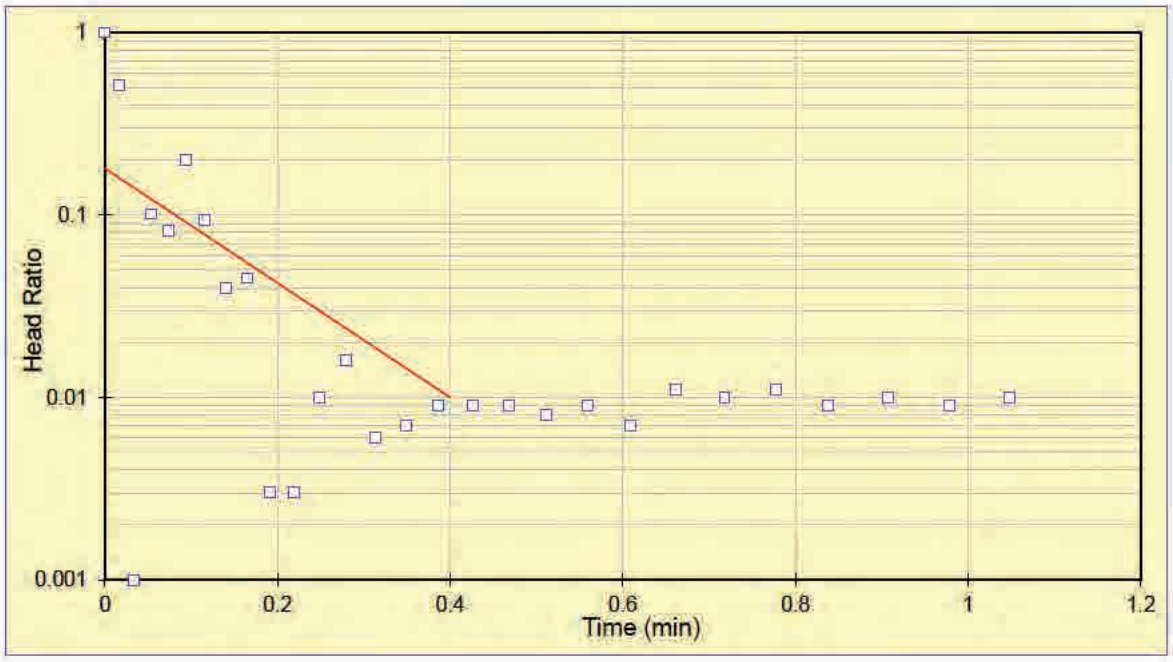
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 4.30E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.22E+01 | ft/day |
| $t_2$ = | 0.4 | | | |
| $h_1/h_0$ = | 0.18 | | | |
| $h_2/h_0$ = | 0.01 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

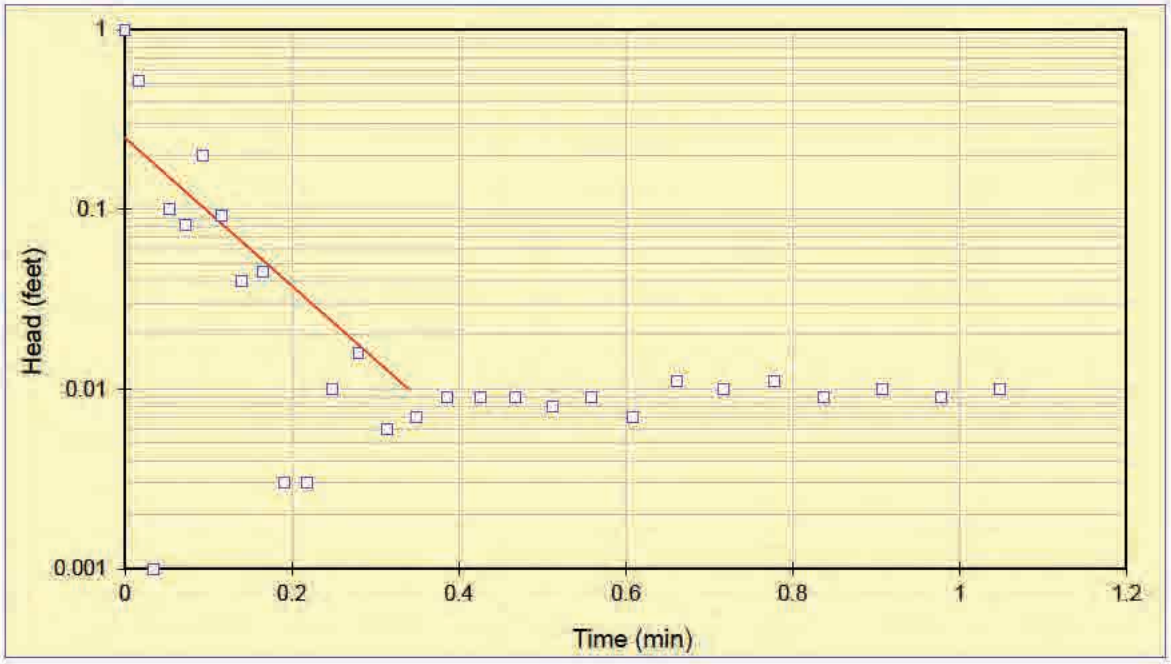
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.87 |
| $y_0$ = | 0.25 |
| $y_t$ = | 0.010 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 4.79E-03 | cm/sec |
| K= | 1.36E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

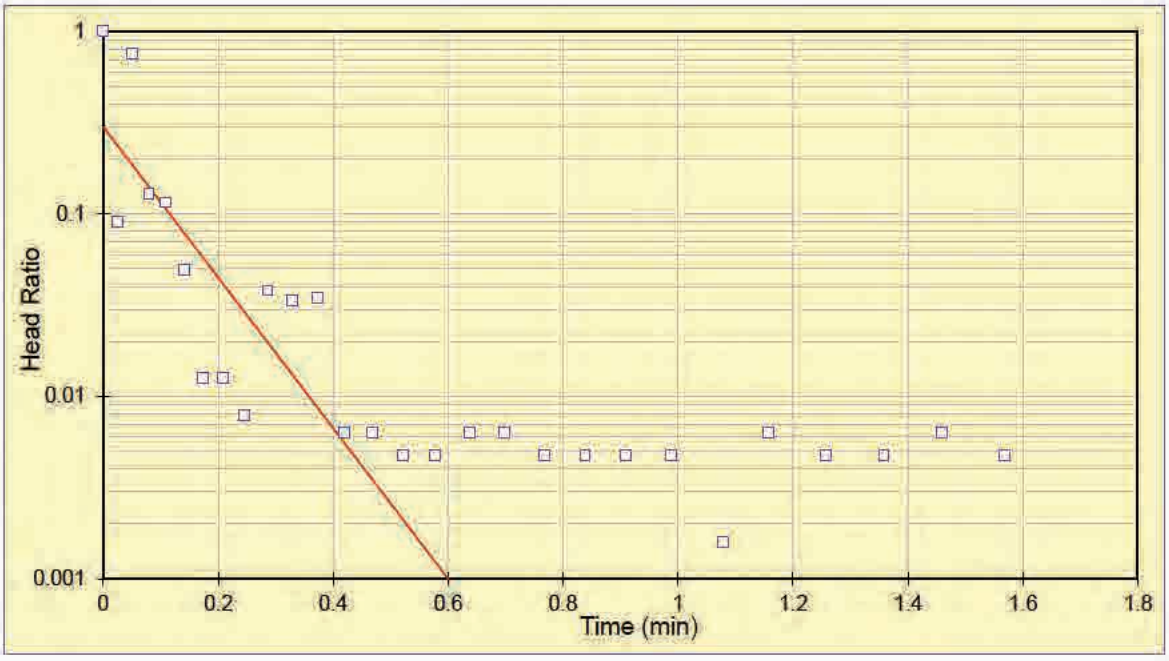
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 5.65E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.60E+01 | ft/day |
| $t_2$ = | 0.6 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

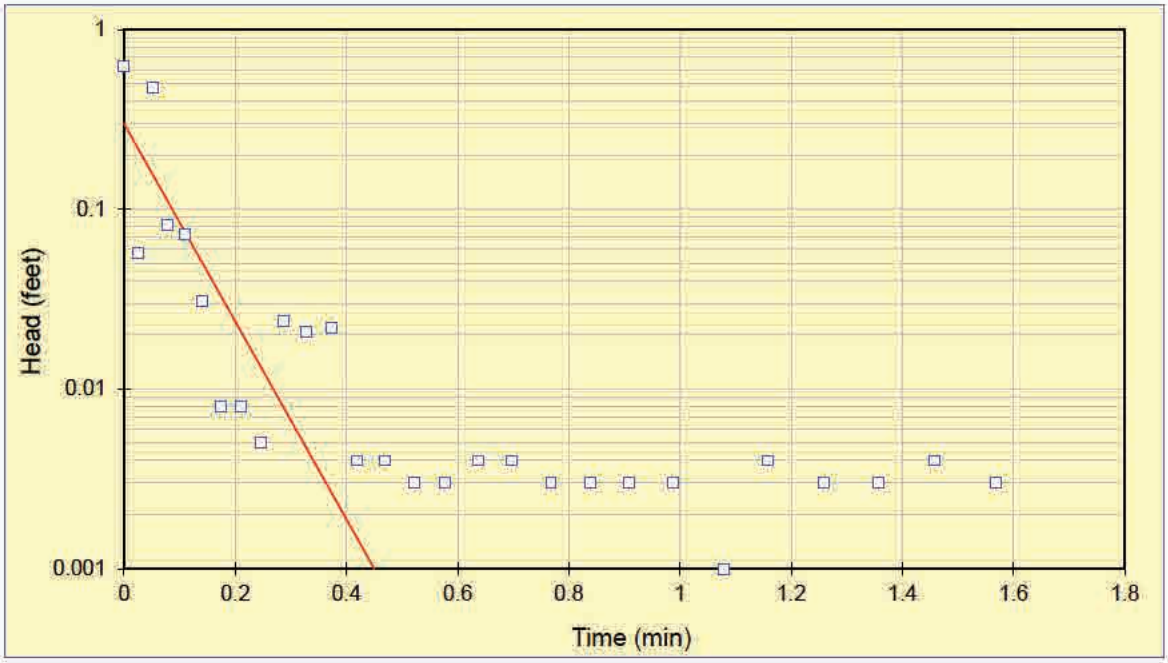
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.87 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.42E-03 | cm/sec |
| K= | 1.82E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-03B (TEST 2)

$$T = b + a \ln T$$

where:

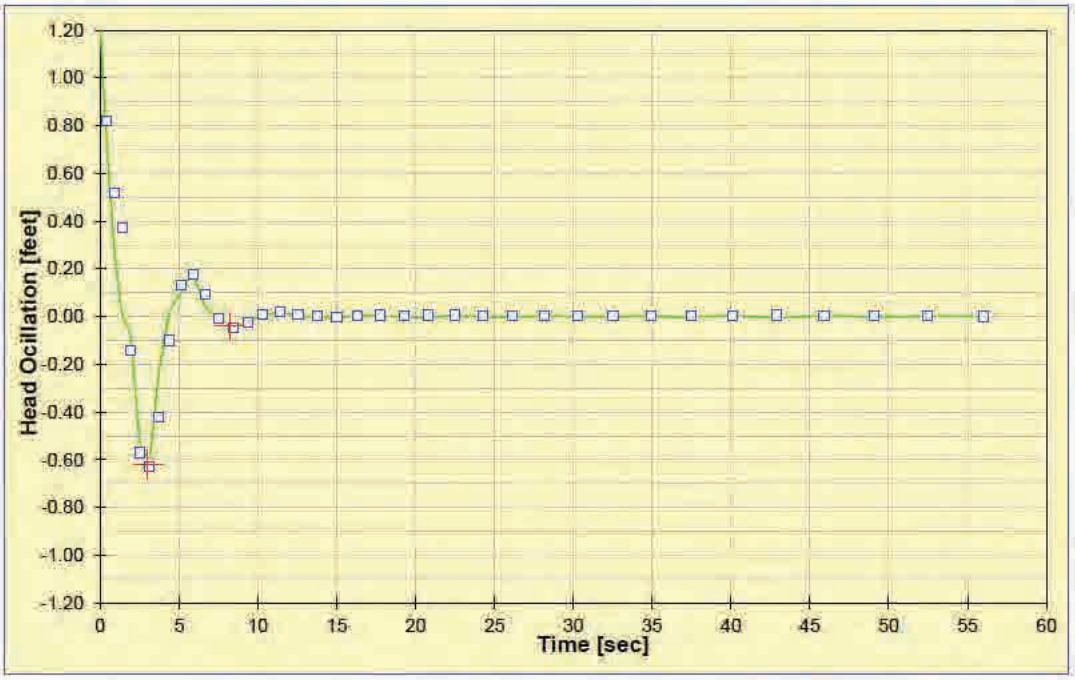
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g / L^{1/2}\right) / 8 d$$
$$d = \gamma / (g / L)^{1/2}$$
$$L = g / (\omega^2 + \gamma^2)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.31826 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.3998 | $ft^{-1}$ |
| $L_c$ = | 19.62 | ft | $a$ = | 0.00286 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 3.00 | sec |
| $\omega$ = | 1.2083 | $ft^{-1}$ | $t_2$ = | 8.20 | sec |
| $\gamma$ = | 0.5271 | $ft^{-1}$ | $h(t_1)$ = | 0.62 | ft |
| $L$ = | 18.52 | $ft^3/sec^2$ | $h(t_2)$ = | 0.04 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.73E-02 $ft^2/sec$ | $\alpha$ < 0.1? | YES |
| $T$ = | 1.53E-02 $ft^2/sec$ | $d$ < 0.7? | YES |
| $T$ = | 1.32E+03 $ft^2/day$ | $L_1$ = | 18.52 |
| $K$ = | 4.22E+01 ft/day | $L_2$ = | 24.62 |
| $K$ = | 1.49E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

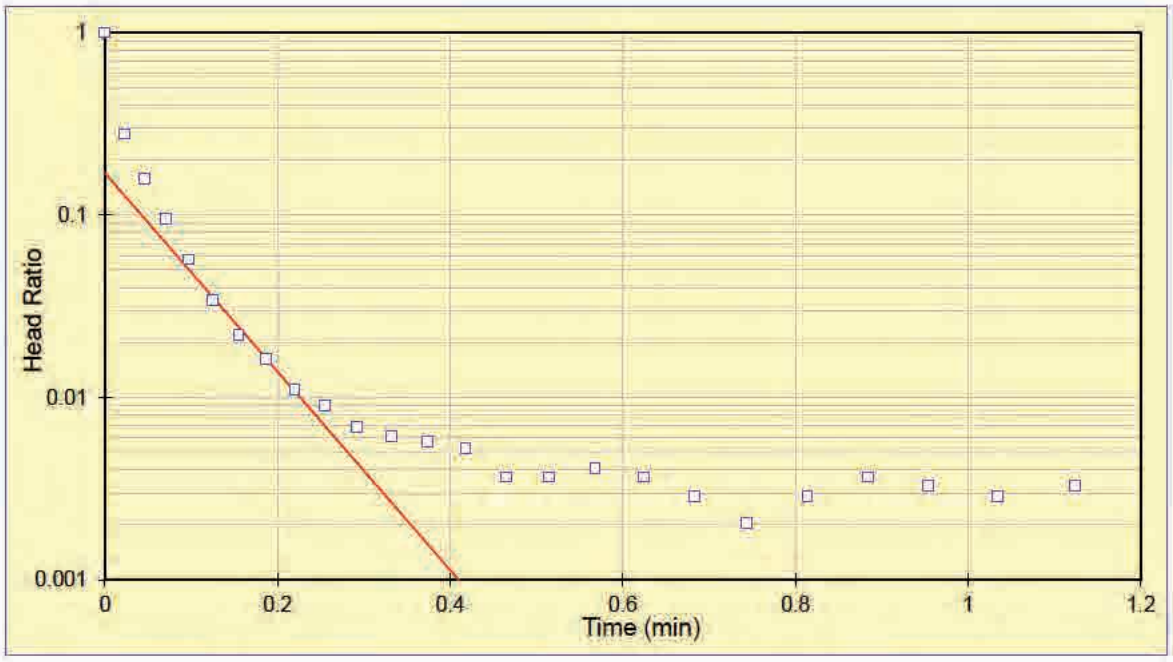
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 7.45E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.11E+01 | ft/day |
| $t_2$ = | 0.41 | | | |
| $h_1/h_0$ = | 0.17 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

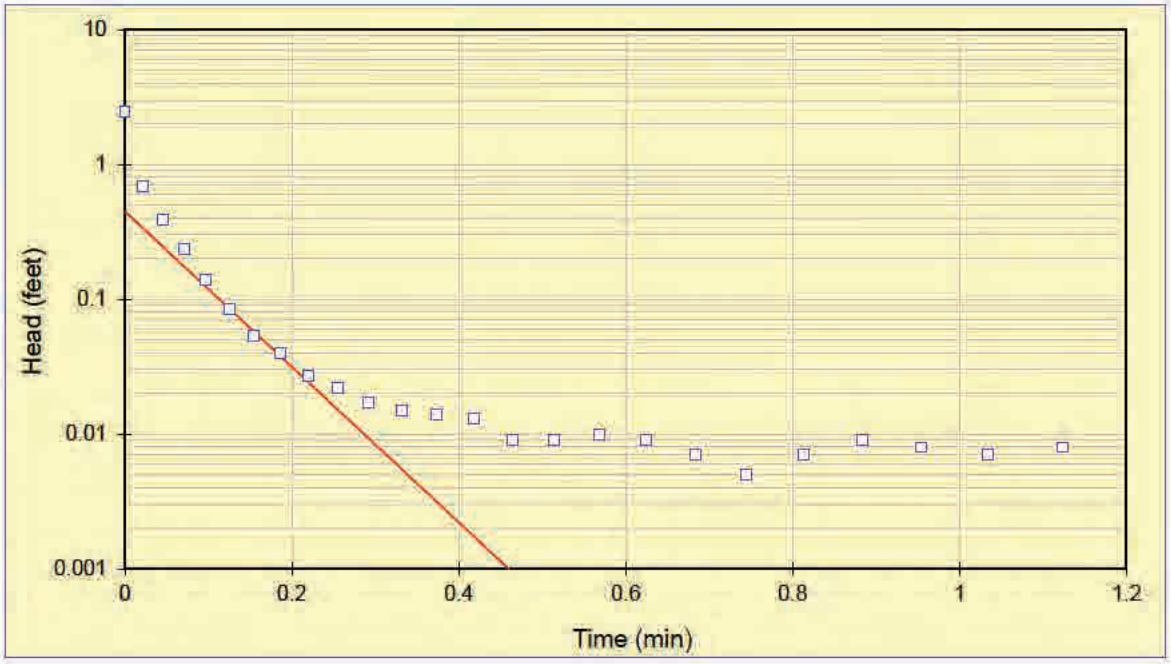
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.23 |
| $y_0$ = | 0.45 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 5.22E-03 | cm/sec |
| K= | 1.48E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

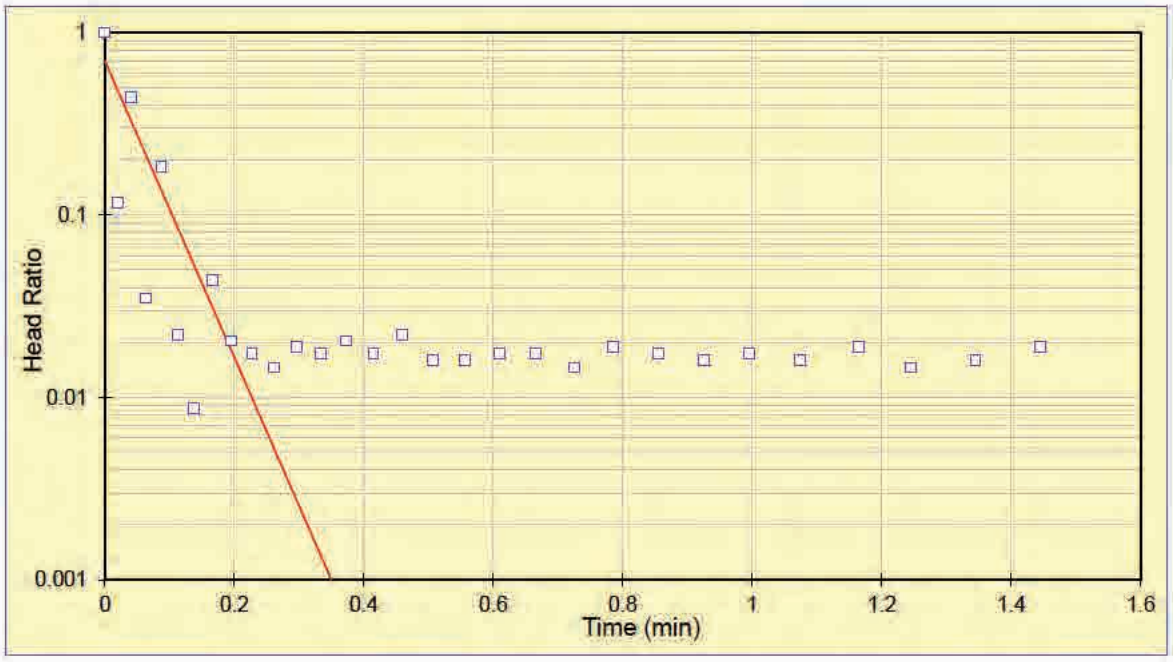
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.11E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.15E+01 | ft/day |
| $t_2$ = | 0.35 | | | |
| $h_1/h_0$ = | 0.70 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

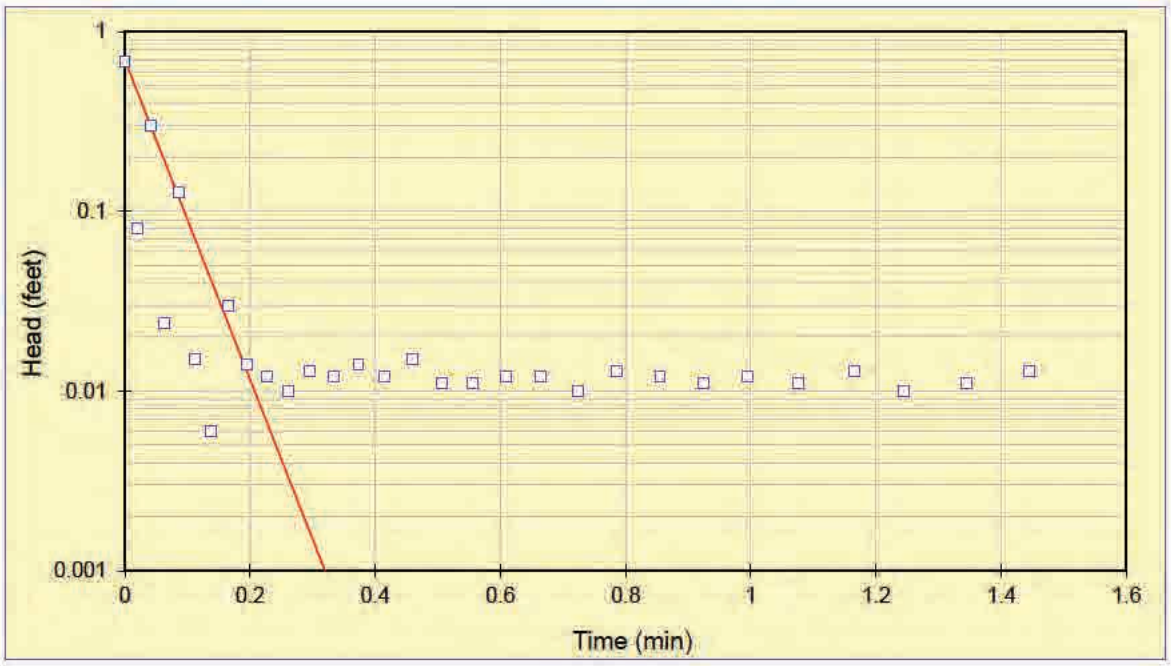
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.70 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.16E-02 | cm/sec |
| K= | 3.30E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

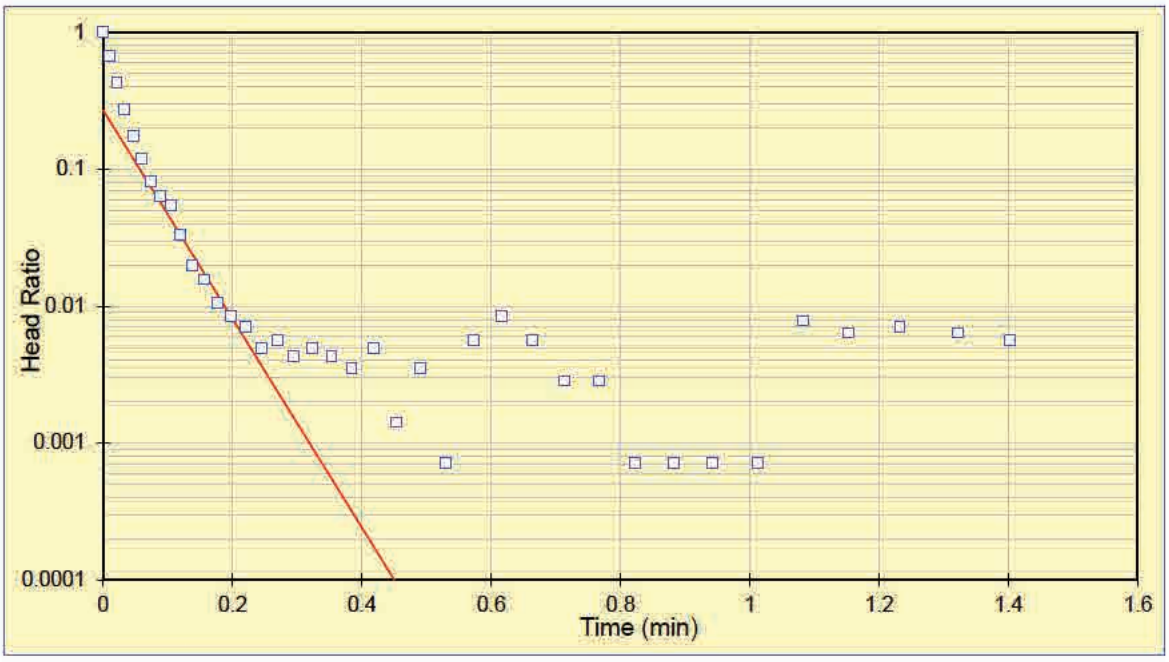
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.037 | K= | 6.50E-02 | cm/sec |
| $t_1$ = | 0 | K= | 1.84E+02 | ft/day |
| $t_2$ = | 0.45 | | | |
| $h_1/h_0$ = | 0.27 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

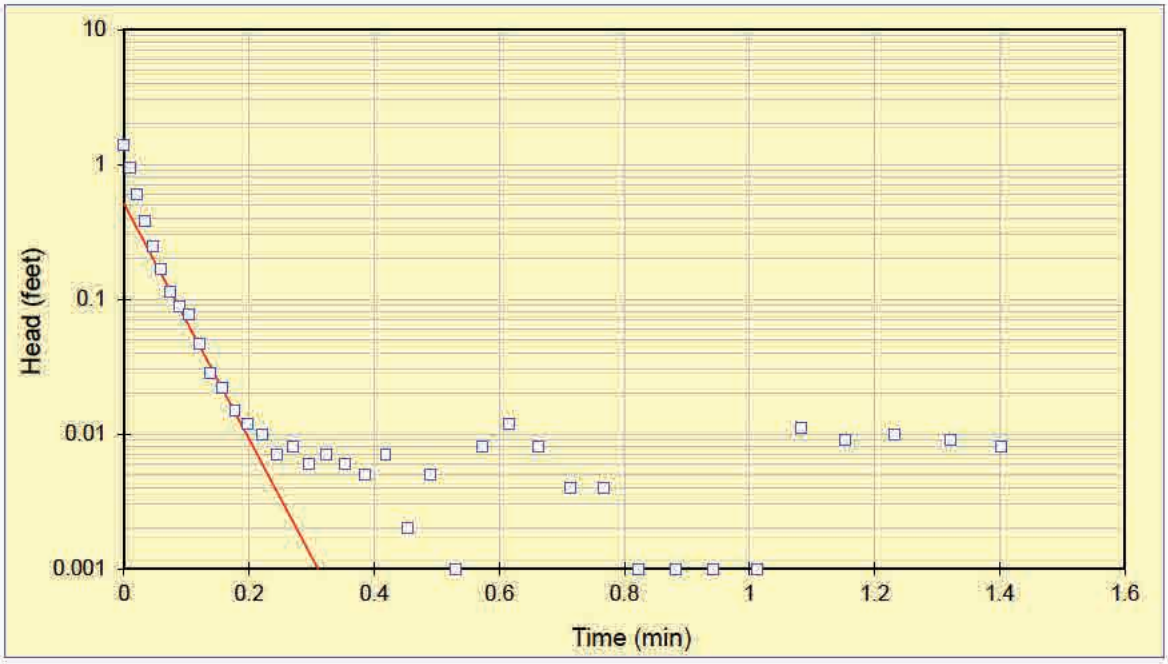
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.037 |
| $\ln(R_e/r_w)$= | 2.11 |
| $y_0$ = | 0.51 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 4.81E-02 | cm/sec |
| K= | 1.36E+02 | ft/day |




Project Name: NIPSCO Schahfer
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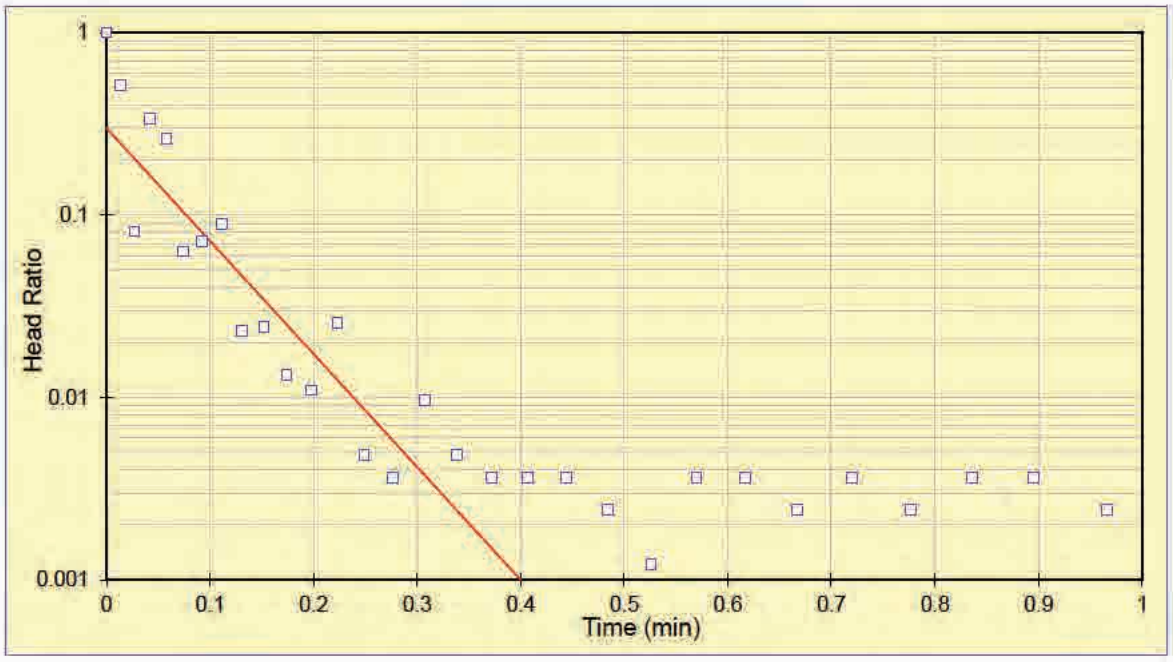
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 8.48E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.40E+01 | ft/day |
| $t_2$ = | 0.4 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

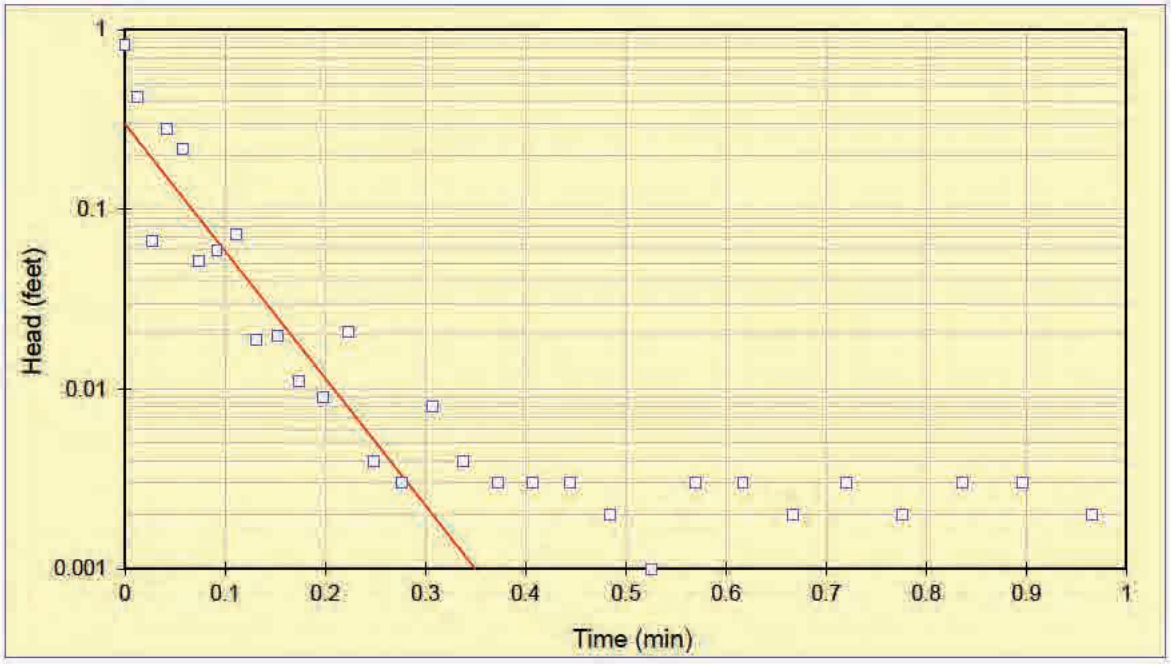
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 9.27E-03 | cm/sec |
| K= | 2.63E+01 | ft/day |




Project Name: NIPSCO Schahfer
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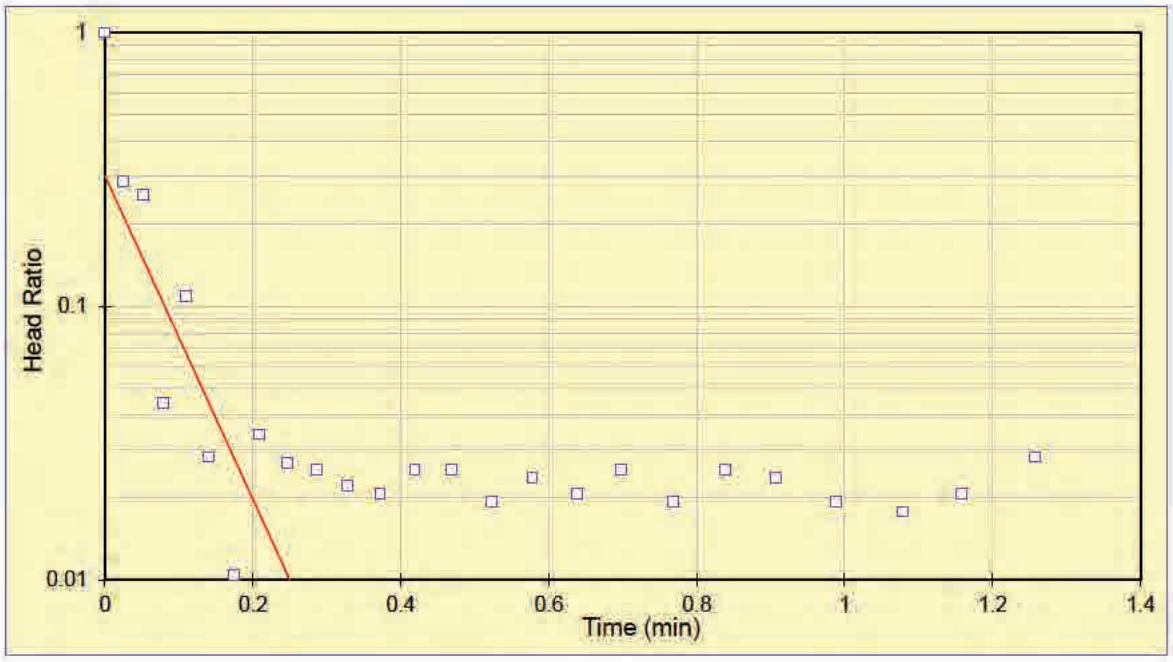
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 8.09E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.29E+01 | ft/day |
| $t_2$ = | 0.25 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.01 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

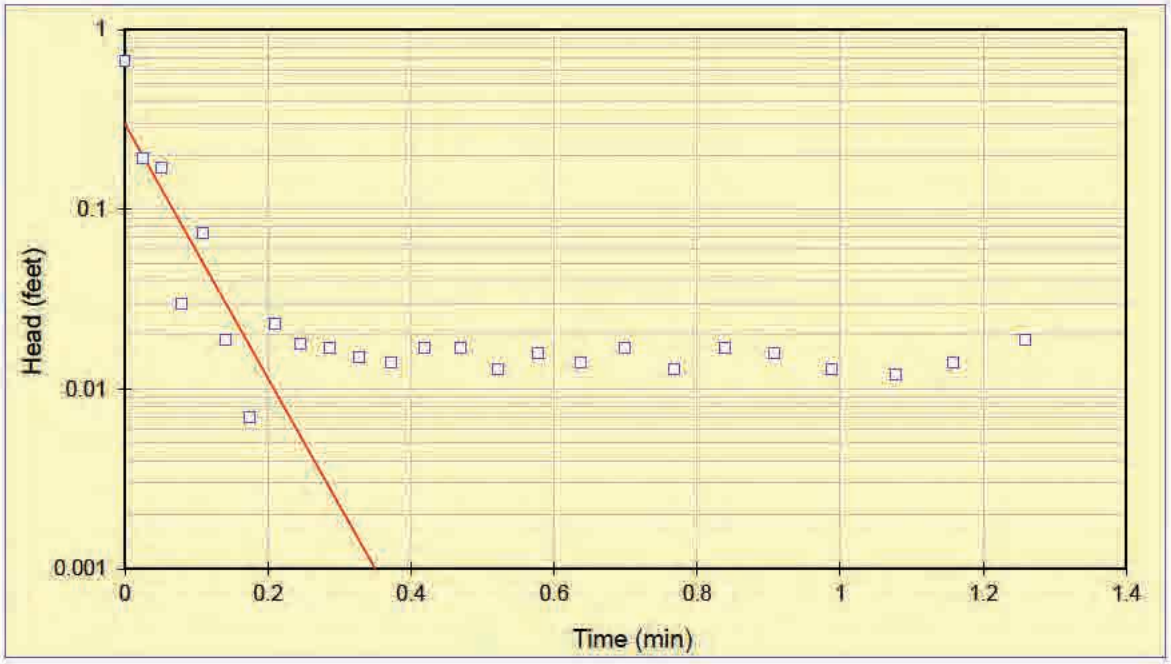
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 9.27E-03 | cm/sec |
| K= | 2.63E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-13B (TEST 1)

$$T = b + a \ln T$$

where:

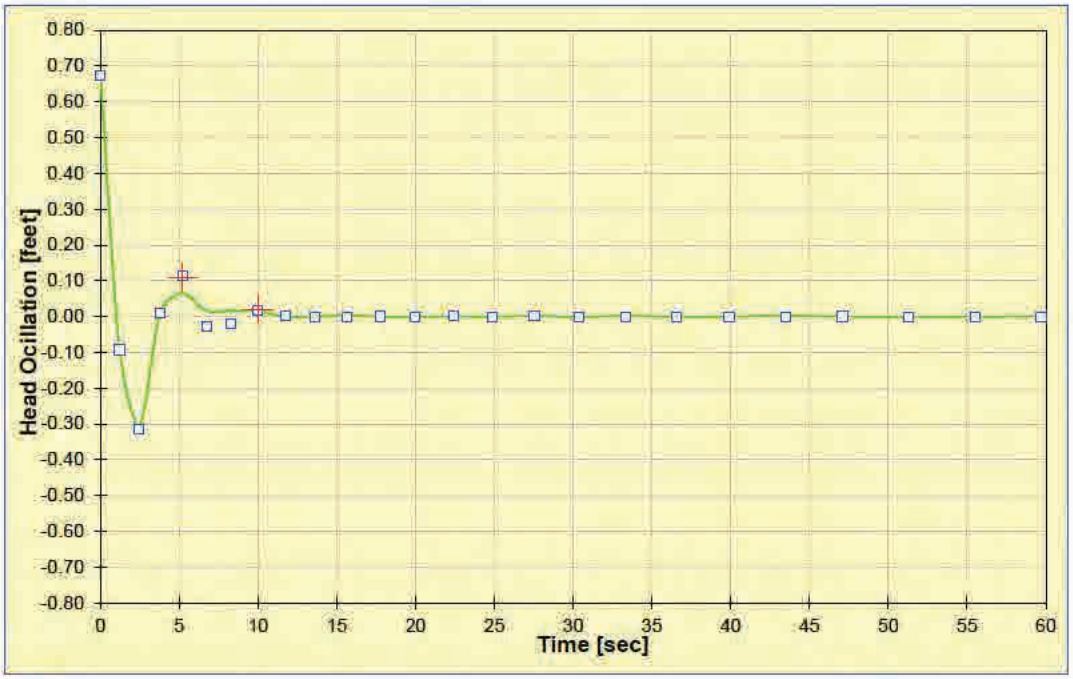
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.35632 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.2619 | $ft^{-1}$ |
| $L_c$ = | 19.45 | ft | $a$ = | 0.00450 | $ft^3$ |
| $L_s$ = | 9.98 | ft | $t_1$ = | 5.20 | sec |
| $w$ = | 1.3090 | $ft^{-1}$ | $t_2$ = | 10.00 | sec |
| $g$ = | 0.3552 | $ft^{-1}$ | $h(t_1)$ = | 0.11 | ft |
| $L$ = | 17.50 | $ft^3/sec^2$ | $h(t_2)$ = | 0.02 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 4.27E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 2.64E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 2.28E+03 $ft^2/day$ | $L_1$ = | 17.50 |
| $K$ = | 7.74E+01 ft/day | $L_2$ = | 24.44 |
| $K$ = | 2.73E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

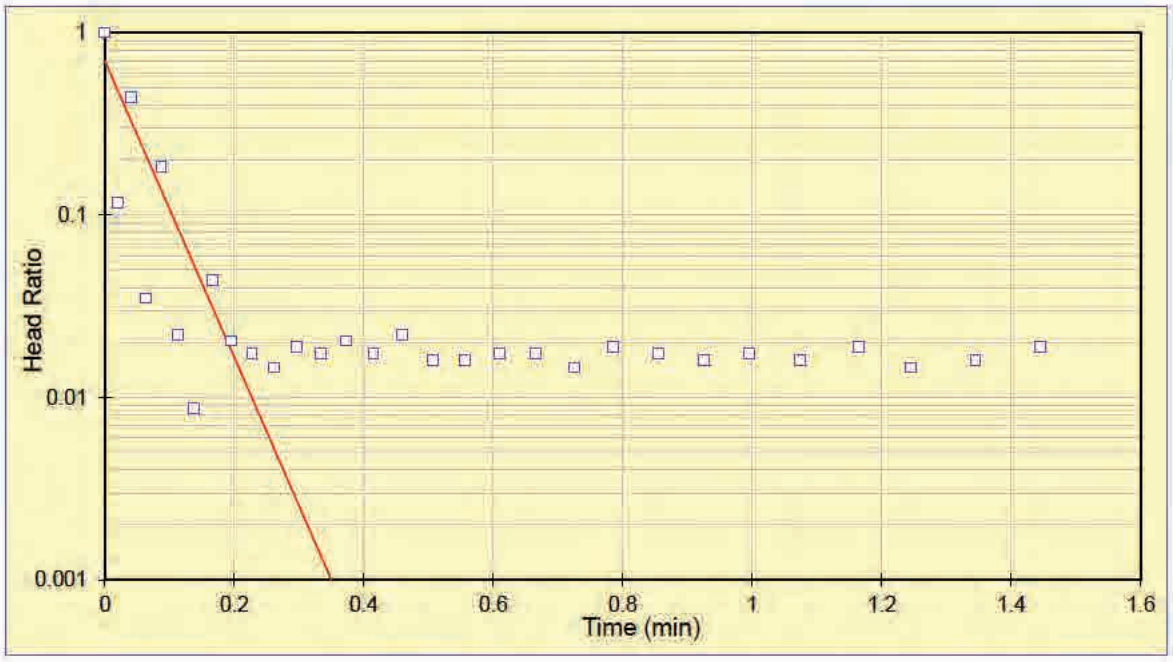
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.11E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.15E+01 | ft/day |
| $t_2$ = | 0.35 | | | |
| $h_1/h_0$ = | 0.70 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

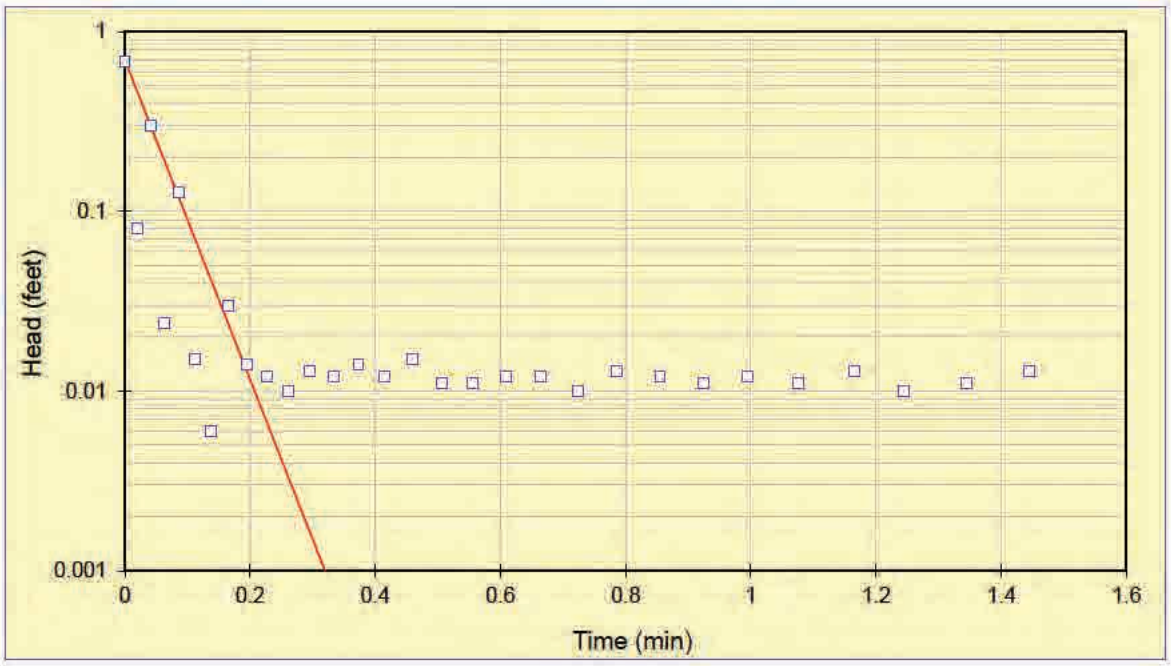
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.70 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.16E-02 | cm/sec |
| K= | 3.30E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-13B (TEST 2)

$$T = b + a \ln T$$

where:

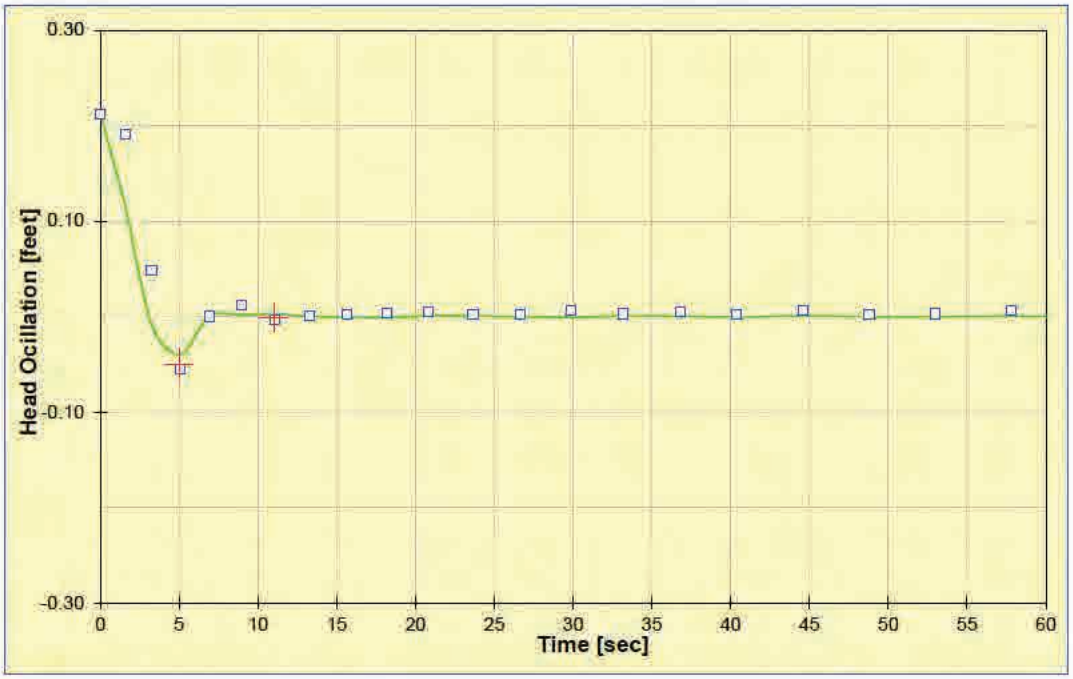
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.23358 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.5285 | $ft^{-1}$ |
| $L_c$ = | 19.14 | ft | $a$ = | 0.00203 | $ft^3$ |
| $L_s$ = | 9.98 | ft | $t_1$ = | 5.00 | sec |
| $w$ = | 1.0472 | $ft^{-1}$ | $t_2$ = | 11.00 | sec |
| $g$ = | 0.6520 | $ft^{-1}$ | $h(t_1)$ = | 0.05 | ft |
| $L$ = | 21.15 | $ft^3/sec^2$ | $h(t_2)$ = | 0.00 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 1.95E-02 $ft^2/sec$ | $a$ < 0.1? | YES |
| $T$ = | 1.02E-02 $ft^2/sec$ | $d$ < 0.7? | YES |
| $T$ = | 8.77E+02 $ft^2/day$ | $L_1$ = | 21.15 |
| $K$ = | 3.01E+01 ft/day | $L_2$ = | 24.13 |
| $K$ = | 1.06E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

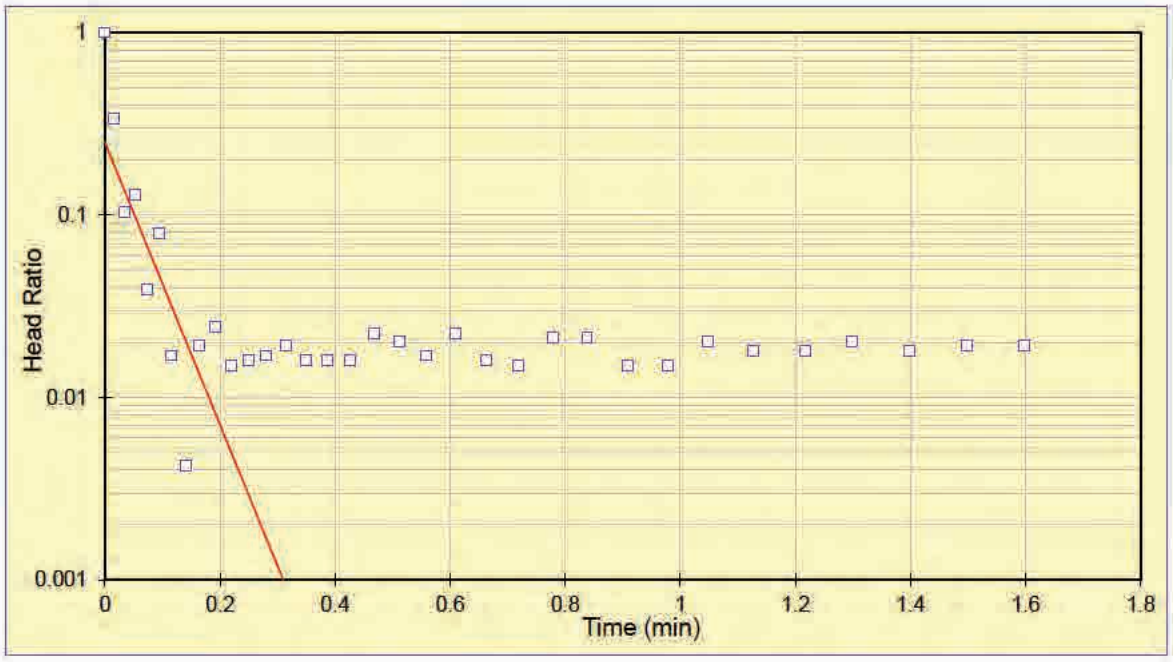
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.06E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.00E+01 | ft/day |
| $t_2$ = | 0.31 | | | |
| $h_1/h_0$ = | 0.25 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

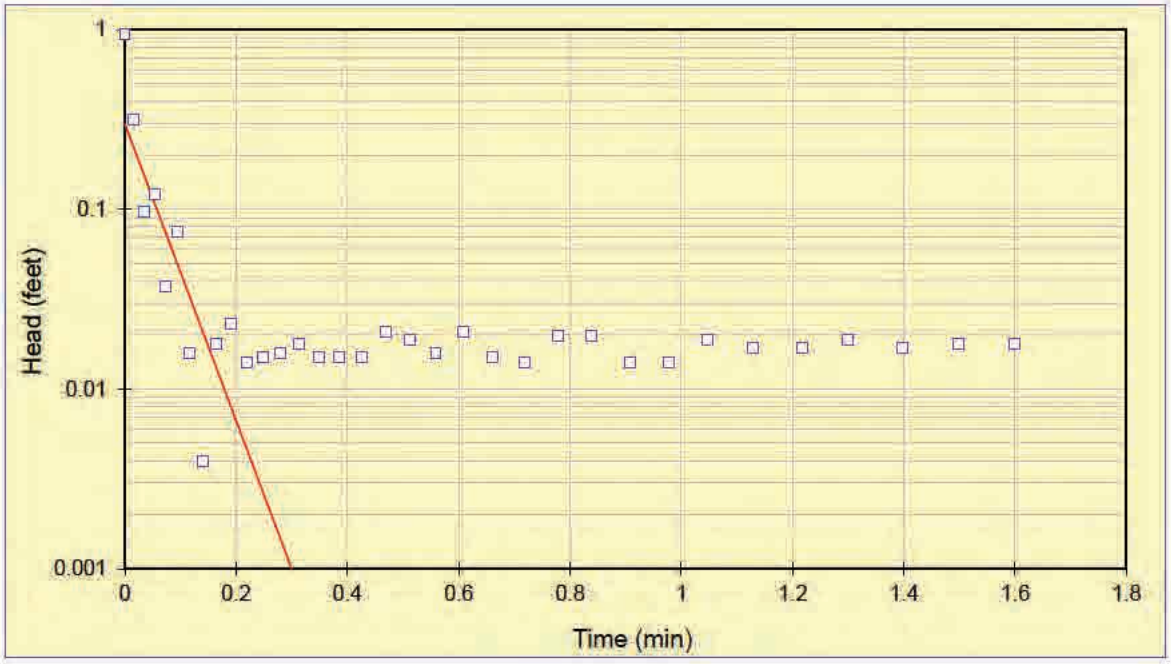
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.08E-02 | cm/sec |
| K= | 3.06E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

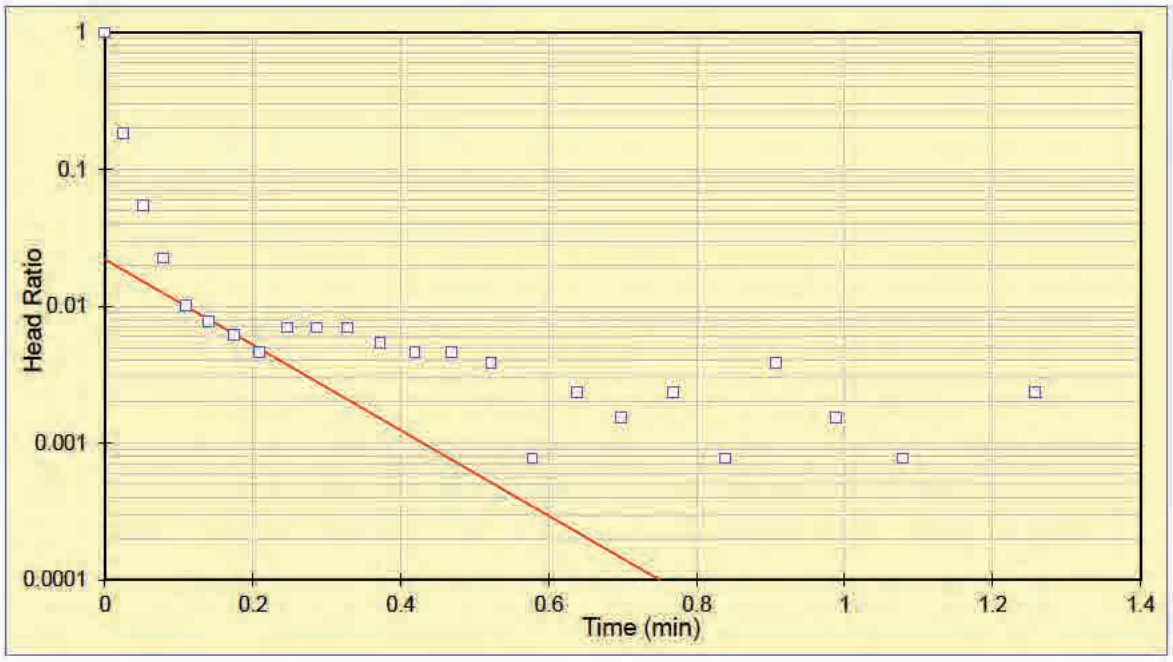
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.417 | K= | 2.59E-02 | cm/sec |
| $t_1$ = | 0 | K= | 7.34E+01 | ft/day |
| $t_2$ = | 0.75 | | | |
| $h_1/h_0$ = | 0.02 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

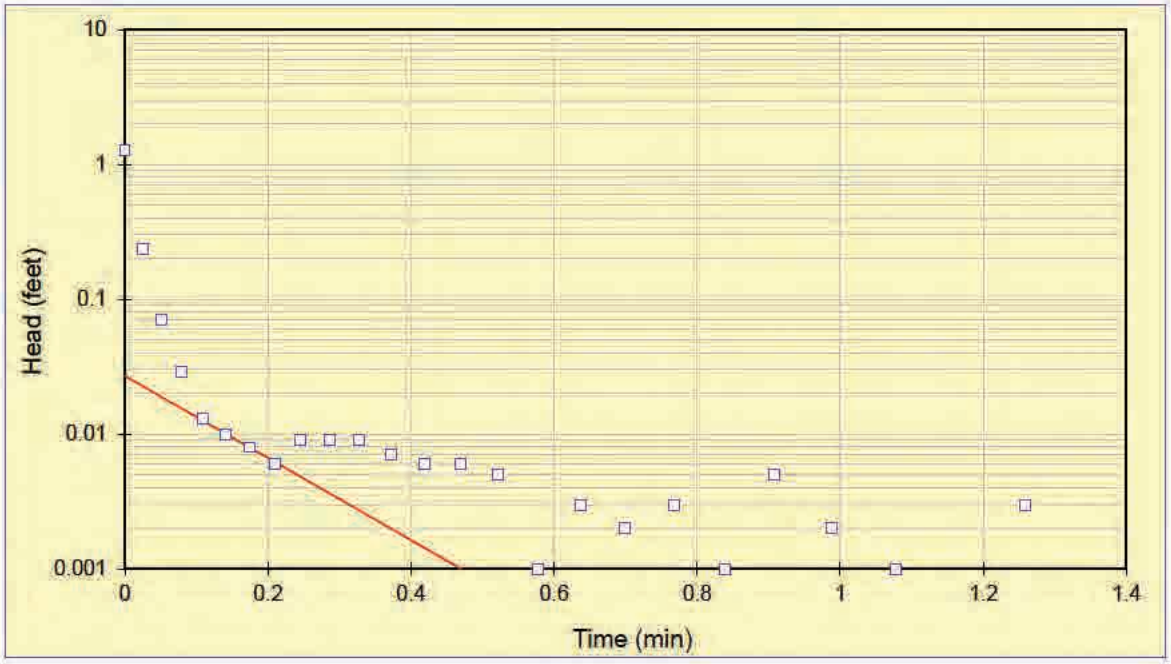
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.417 |
| $\ln(R_e/r_w)$= | 2.14 |
| $y_0$ = | 0.03 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.63E-02 | cm/sec |
| K= | 4.63E+01 | ft/day |




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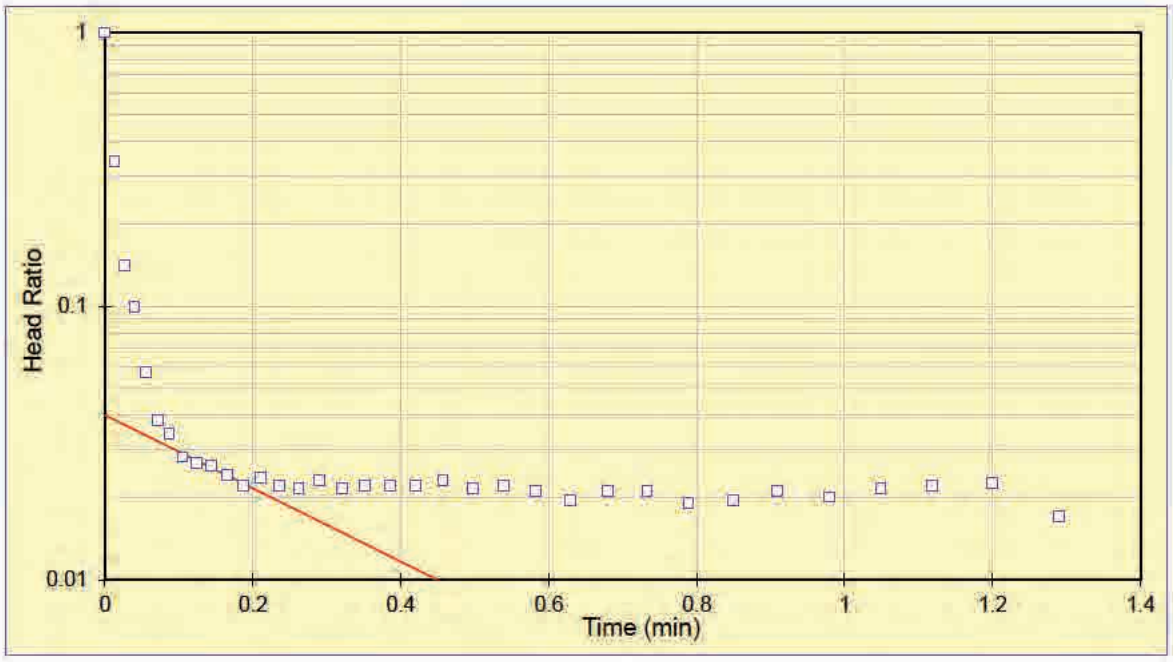
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.348 | K= | 1.11E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.16E+01 | ft/day |
| $t_2$ = | 0.45 | | | |
| $h_1/h_0$ = | 0.04 | | | |
| $h_2/h_0$ = | 0.01 | | | |




Project Name: NIPSCO Schahfer
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Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

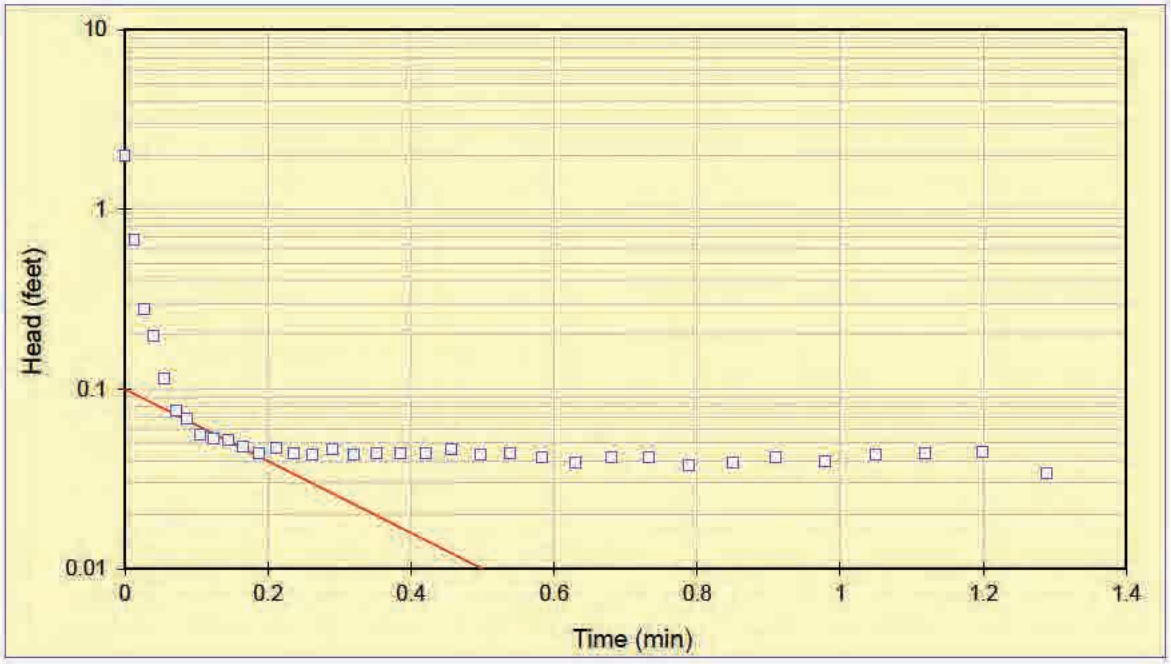
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.348 |
| $\ln(R_e/r_w)$= | 2.13 |
| $y_0$ = | 0.10 |
| $y_t$ = | 0.010 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.08E-02 | cm/sec |
| K= | 3.05E+01 | ft/day |




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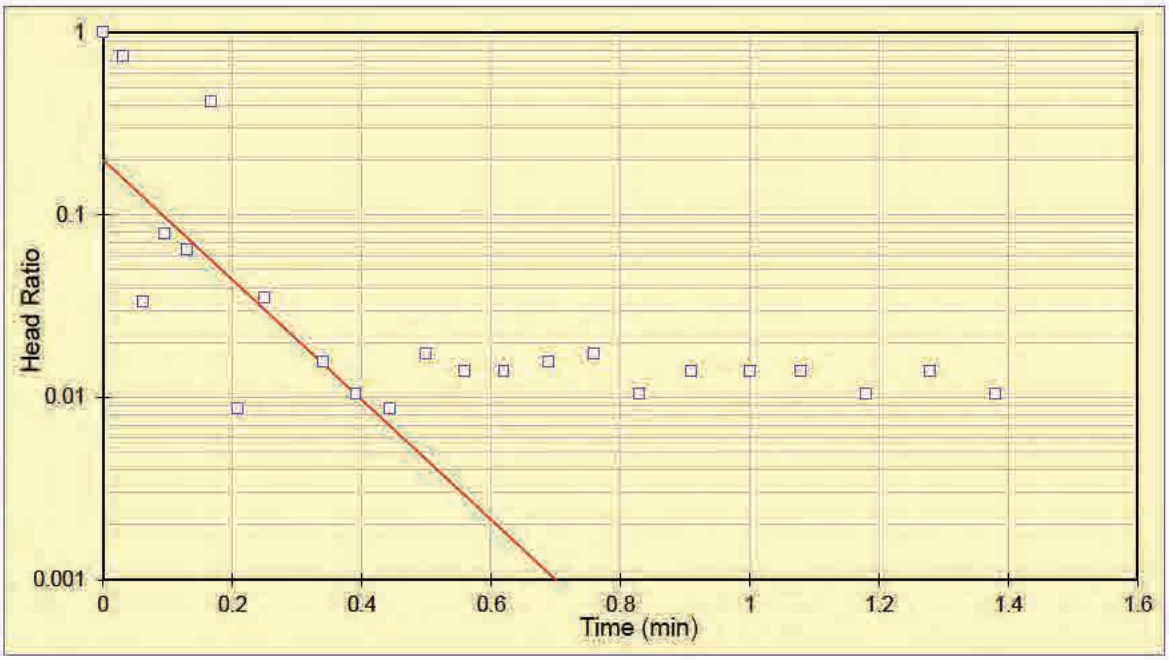
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 4.50E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.28E+01 | ft/day |
| $t_2$ = | 0.7 | | | |
| $h_1/h_0$ = | 0.20 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
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Analysis By: DFS
Checked By: JRS
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## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

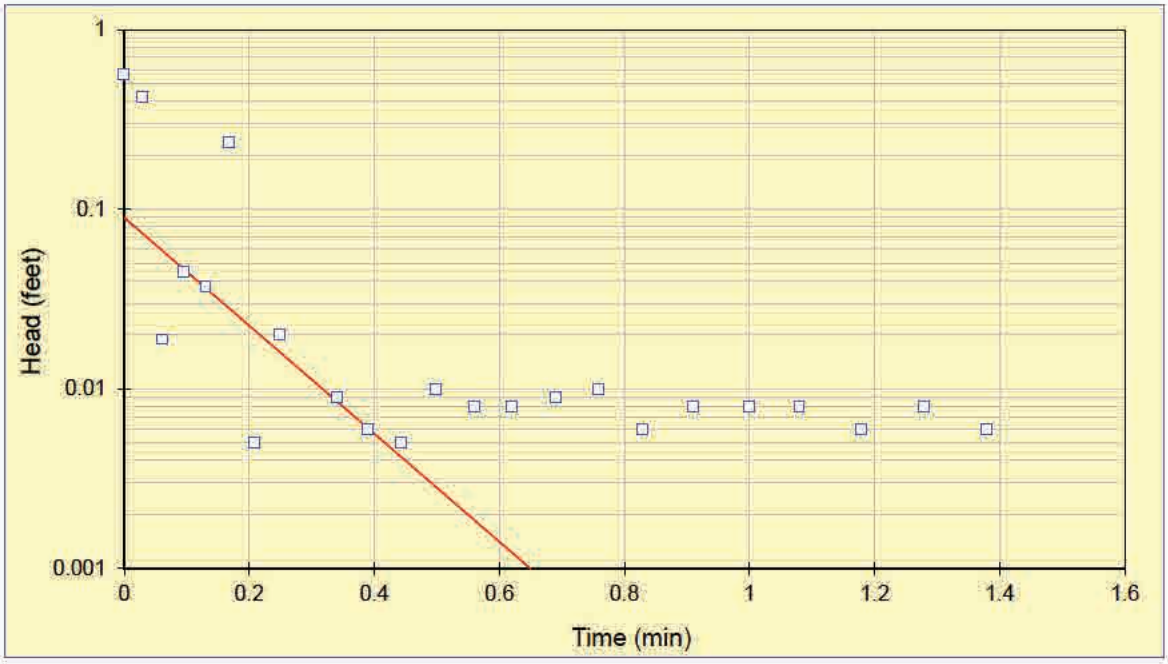
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.83 |
| $y_0$ = | 0.09 |
| $y_t$ = | 0.001 |
| $t$ = | 0.7 |

**RESULTS**

| | | |
|---|---|---|
| K= | 3.45E-03 | cm/sec |
| K= | 9.79E+00 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

# van der KAMP FALLING HEAD SLUG TEST ANALYSIS

## UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

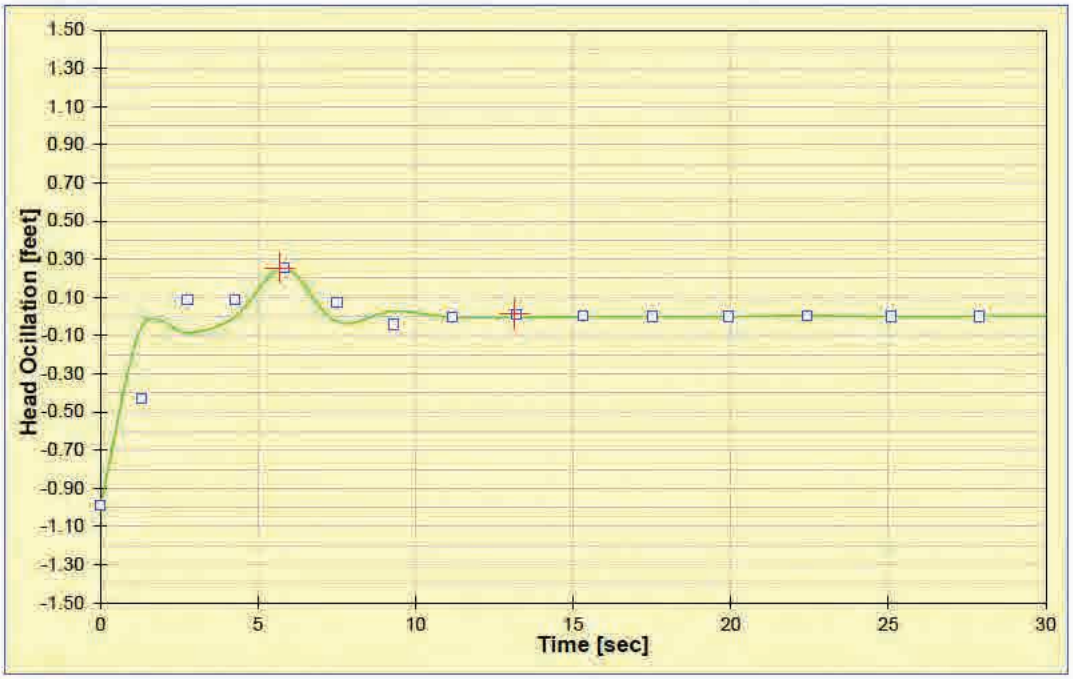
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 0.93787 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.4374 | $ft^{-1}$ |
| $L_c$ = | 19.23 | ft | $a$ = | 0.00186 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 5.70 | sec |
| $w$ = | 0.8434 | $ft^{-1}$ | $t_2$ = | 13.15 | sec |
| $g$ = | 0.4102 | $ft^{-1}$ | $h(t_1)$ = | 0.26 | ft |
| $L$ = | 36.60 | $ft^3/sec^2$ | $h(t_2)$ = | 0.01 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 1.84E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 9.76E-03 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 8.44E+02 $ft^2/day$ | $L_1$ = | 36.60 |
| $K$ = | 2.70E+01 ft/day | $L_2$ = | 24.23 |
| $K$ = | 9.53E-03 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
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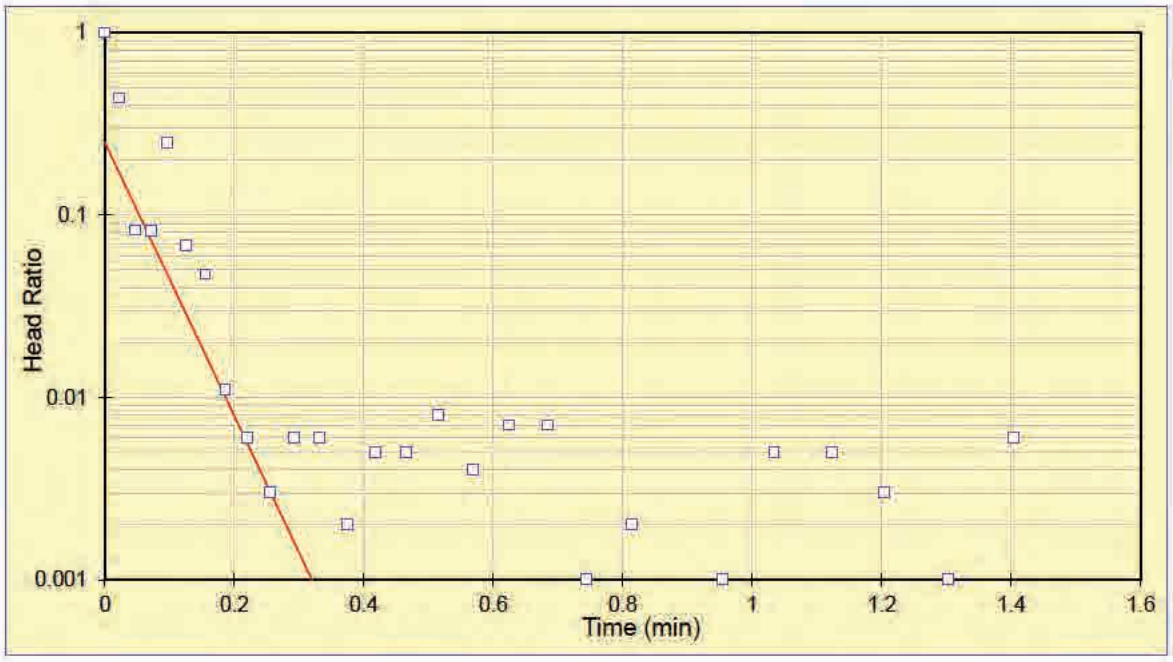
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.03E-02 | cm/sec |
| $t_1$ = | 0 | K= | 2.91E+01 | ft/day |
| $t_2$ = | 0.32 | | | |
| $h_1/h_0$ = | 0.25 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

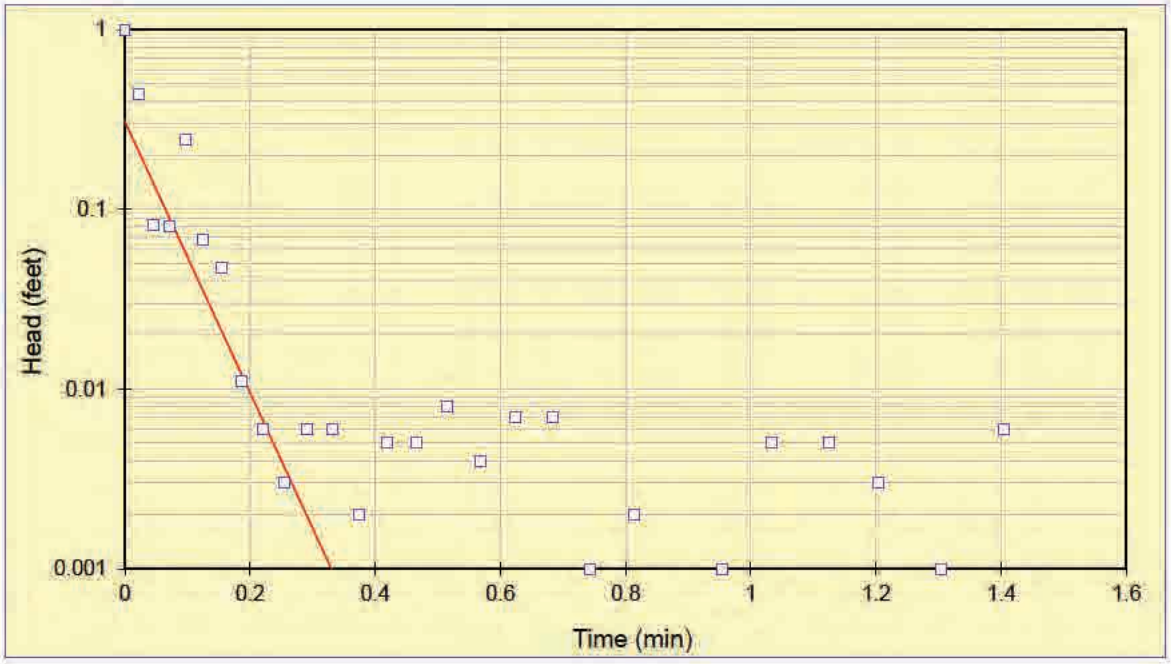
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.85 |
| $y_0$ = | 0.31 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 8.75E-03 | cm/sec |
| K= | 2.48E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-15B (TEST 1)

$$T = b + a \ln T$$

where:

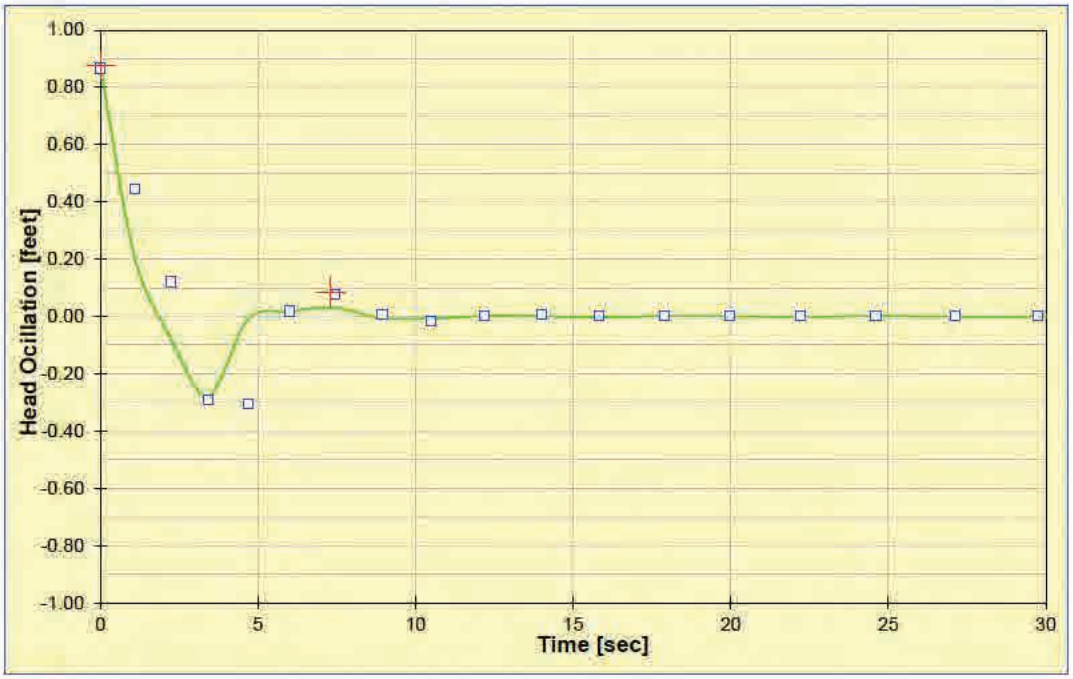
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 0.91806 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.3479 | $ft^{-1}$ |
| $L_c$ = | 19.23 | ft | $a$ = | 0.00229 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 0.8607 | $ft^{-1}$ | $t_2$ = | 7.30 | sec |
| $g$ = | 0.3194 | $ft^{-1}$ | $h(t_1)$ = | 0.88 | ft |
| $L$ = | 38.19 | $ft^3/sec^2$ | $h(t_2)$ = | 0.09 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.27E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.27E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 1.09E+03 $ft^2/day$ | $L_1$ = | 38.19 |
| $K$ = | 3.50E+01 ft/day | $L_2$ = | 24.23 |
| $K$ = | 1.24E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

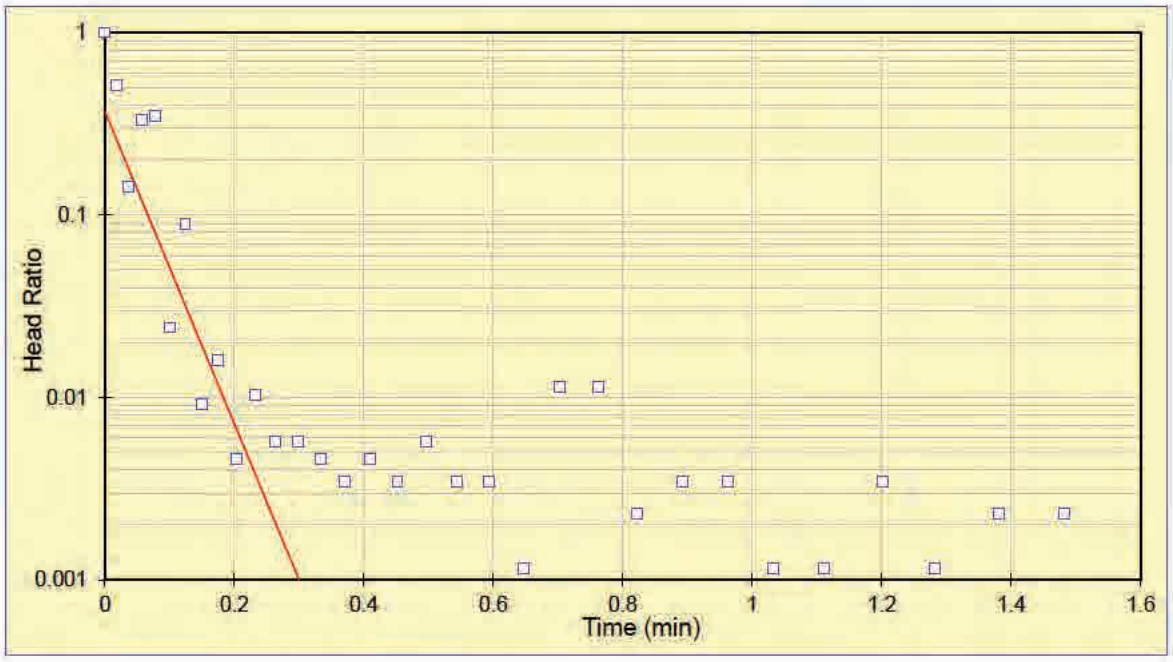
## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:

$r_c$ = casing radius (feet)
$R_e$ = equivalent radius (feet)
$L_e$ = length of screened interval (feet)
$t$ = time (minutes)
$h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.17E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.32E+01 | ft/day |
| $t_2$ = | 0.3 | | | |
| $h_1/h_0$ = | 0.37 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

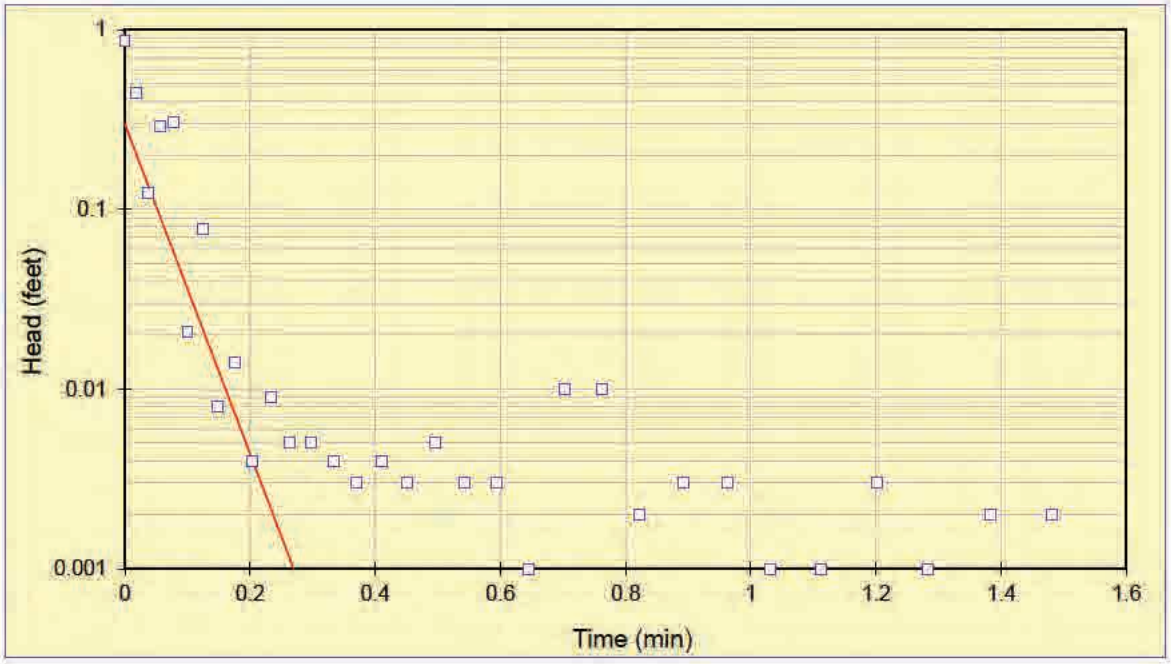
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.85 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.06E-02 | cm/sec |
| K= | 3.02E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

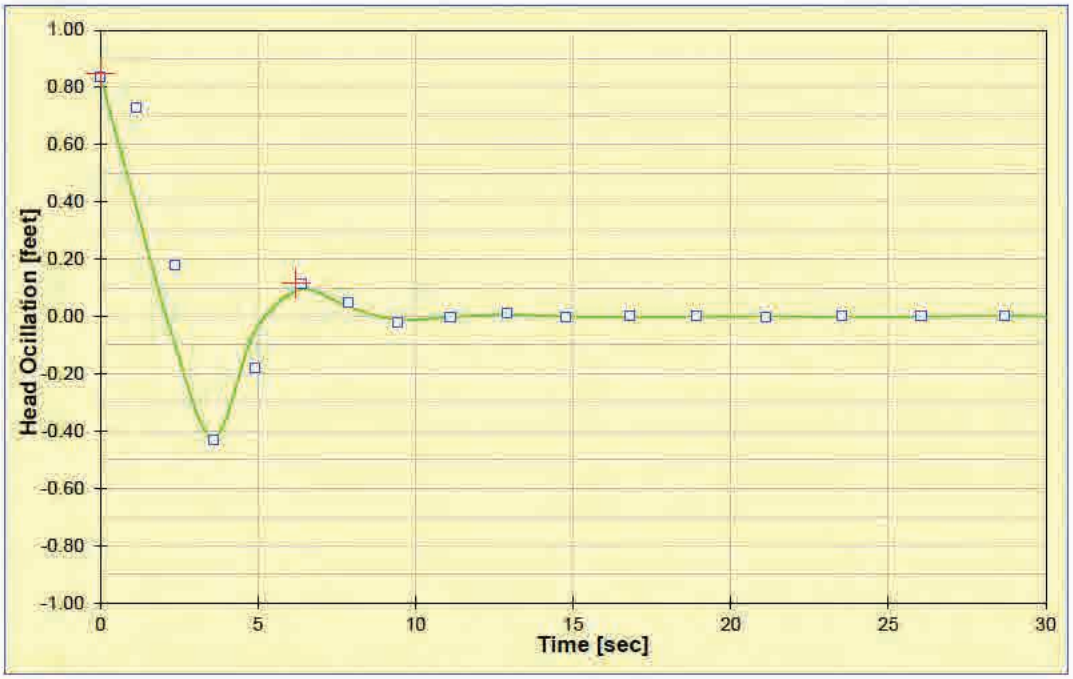
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.06353 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.3034 | $ft^{-1}$ |
| $L_c$ = | 19.22 | ft | $a$ = | 0.00304 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 1.0134 | $ft^{-1}$ | $t_2$ = | 6.20 | sec |
| $g$ = | 0.3226 | $ft^{-1}$ | $h(t_1)$ = | 0.85 | ft |
| $L$ = | 28.46 | $ft^3/sec^2$ | $h(t_2)$ = | 0.12 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.97E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.73E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 1.50E+03 $ft^2/day$ | $L_1$ = | 28.46 |
| $K$ = | 4.80E+01 ft/day | $L_2$ = | 24.22 |
| $K$ = | 1.69E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 2)

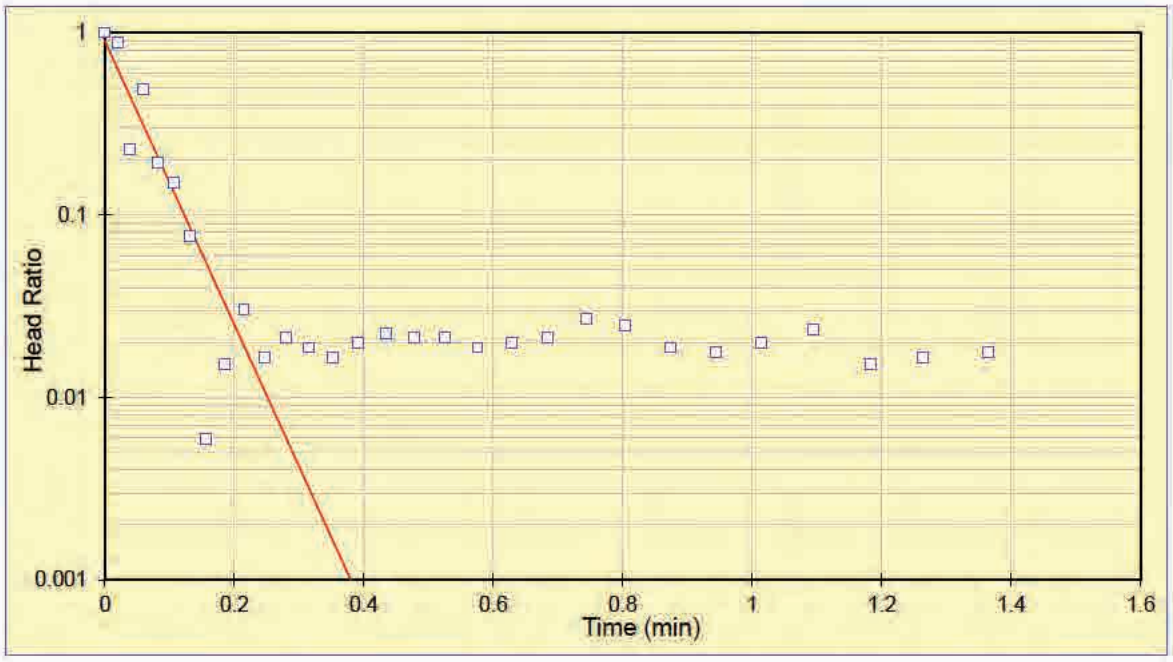
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $R_e$ = | 0.34 |
| $L_e$ = | 10 |
| $t_1$ = | 0 |
| $t_2$ = | 0.38 |
| $h_1/h_0$ = | 0.90 |
| $h_2/h_0$ = | 0.00 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.06E-02 | cm/sec |
| K= | 3.02E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

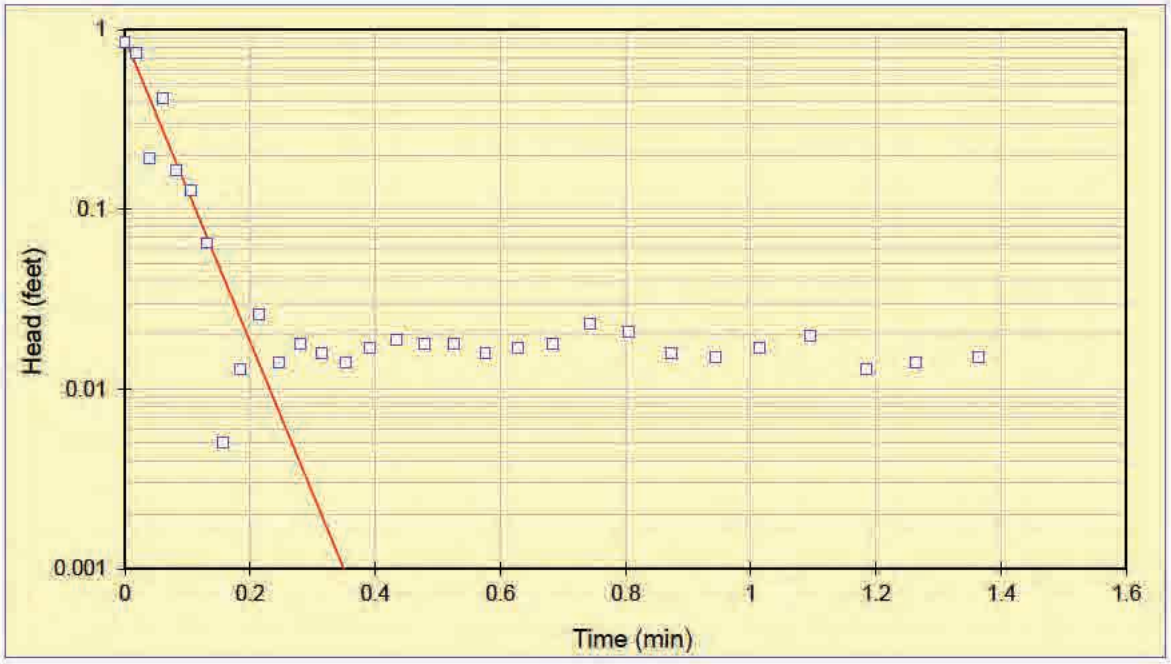
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.85 |
| $y_0$ = | 0.90 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 9.79E-03 | cm/sec |
| K= | 2.77E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

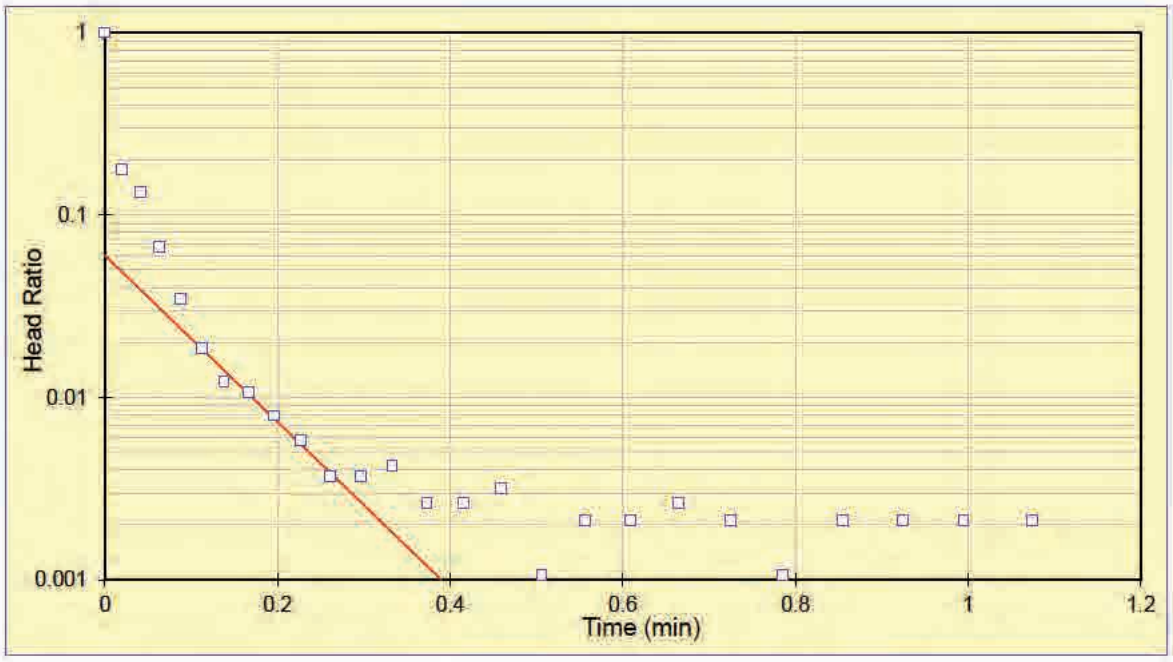
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.705 | K= | 3.70E-02 | cm/sec |
| $t_1$ = | 0 | K= | 1.05E+02 | ft/day |
| $t_2$ = | 0.39 | | | |
| $h_1/h_0$ = | 0.06 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 1)

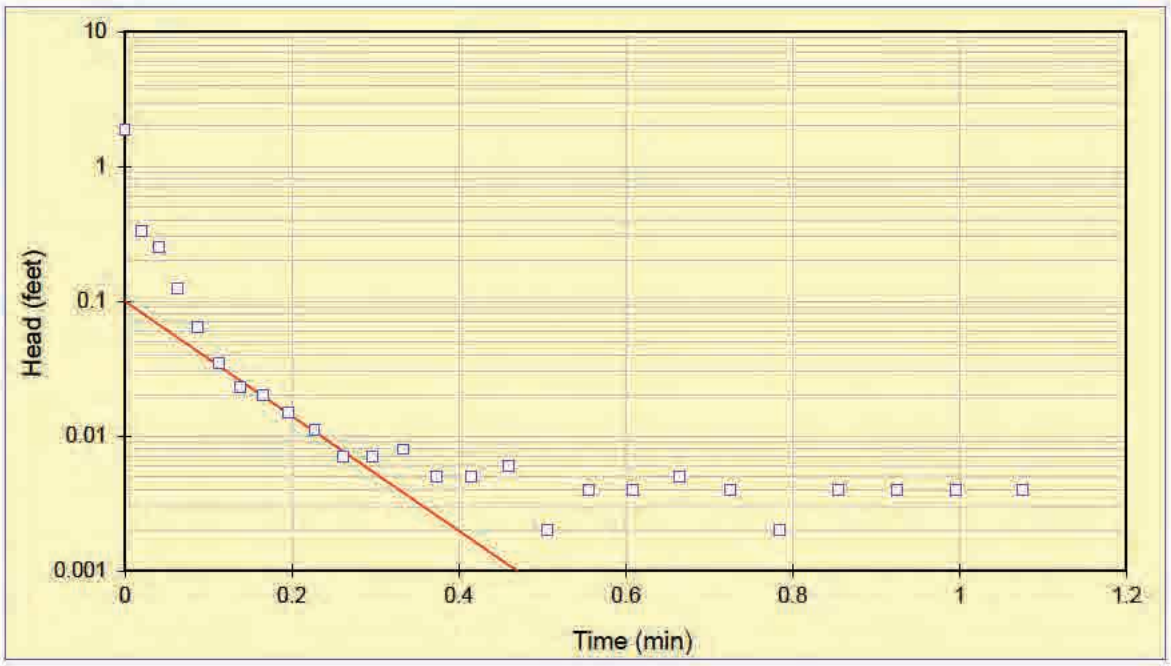
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.705 |
| $\ln(R_e/r_w)$= | 2.18 |
| $y_0$ = | 0.10 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

| RESULTS | | |
|---|---|---|
| K= | 2.25E-02 | cm/sec |
| K= | 6.38E+01 | ft/day |




Project Name: NIPSCO Schahfer
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Test Date: 07/07/16

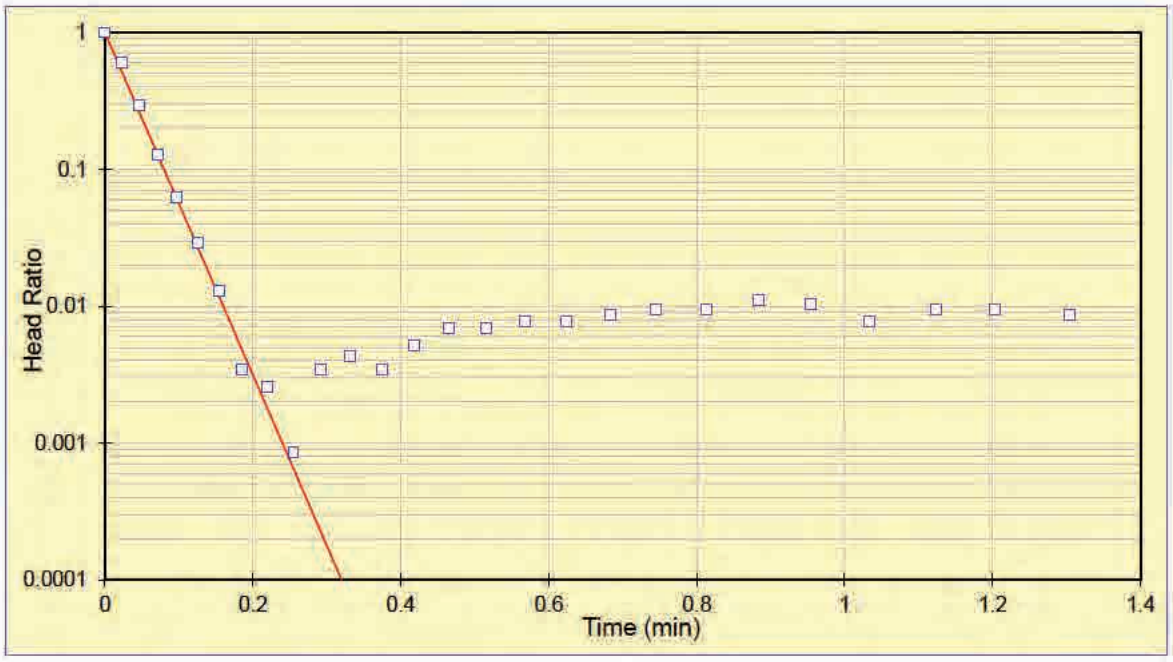
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.735 | K= | 1.01E-01 | cm/sec |
| $t_1$ = | 0 | K= | 2.87E+02 | ft/day |
| $t_2$ = | 0.32 | | | |
| $h_1/h_0$ = | 1.00 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

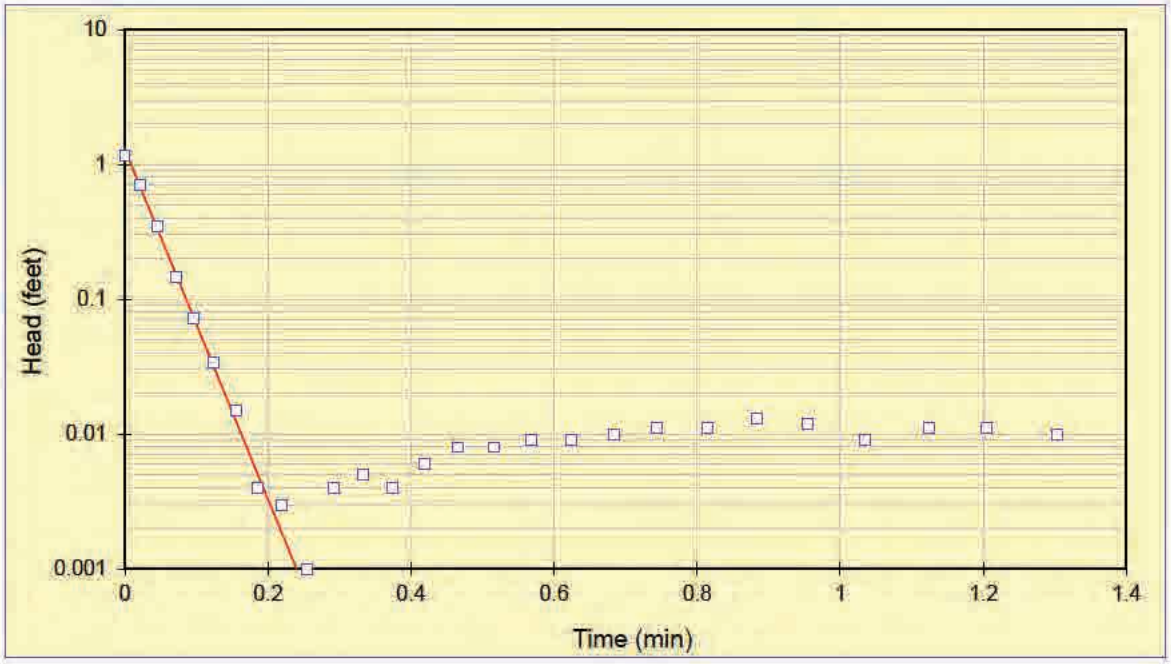
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.735 |
| $\ln(R_e/r_w)$= | 2.18 |
| $y_0$ = | 1.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.2 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.85E-02 | cm/sec |
| K= | 1.94E+02 | ft/day |




Project Name: NIPSCO Schahfer
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Test Date: 07/07/16

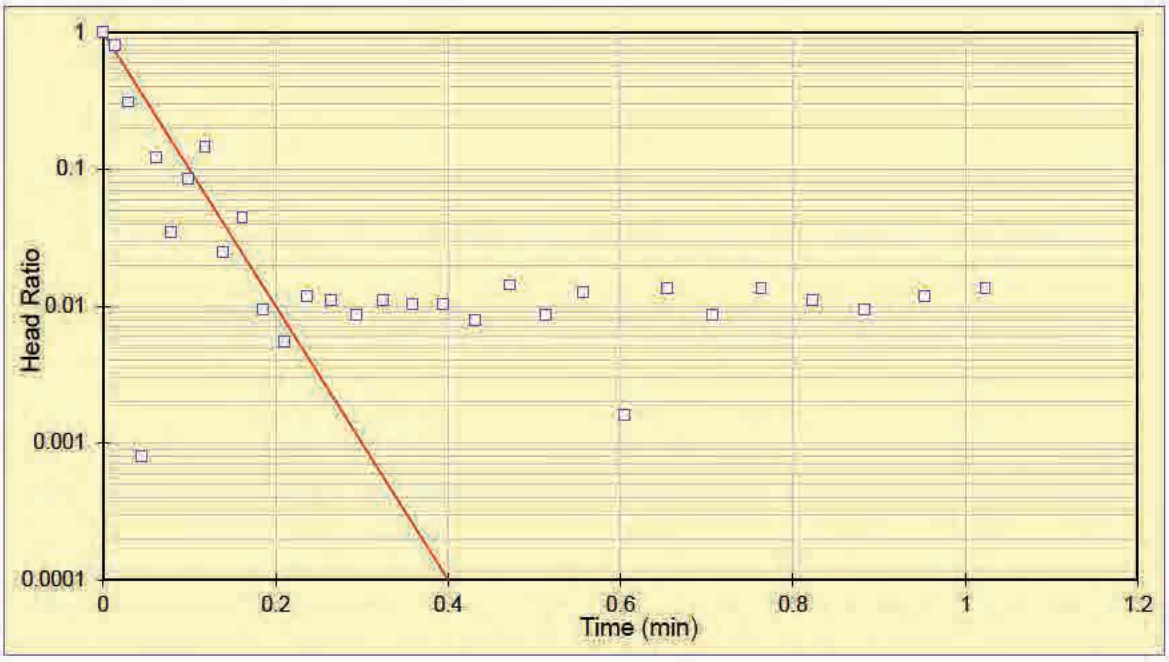
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.37E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.88E+01 | ft/day |
| $t_2$ = | 0.4 | | | |
| $h_1/h_0$ = | 1.00 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

# BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 1)

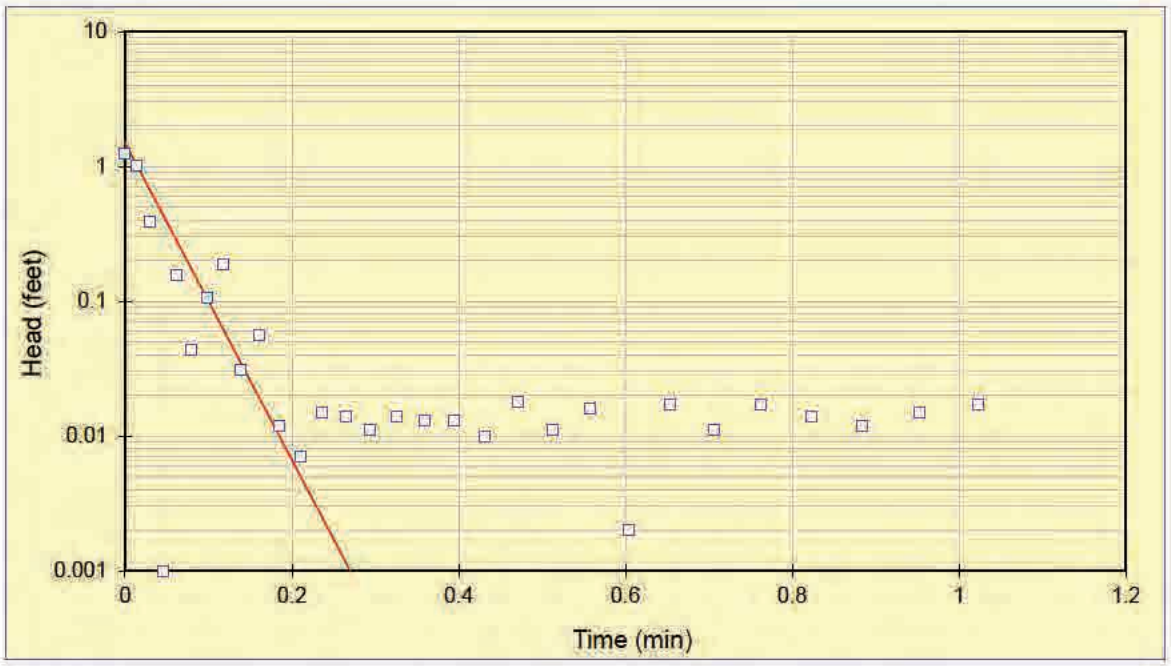
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 1.50 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

| RESULTS | | |
|---|---|---|
| K= | 1.44E-02 | cm/sec |
| K= | 4.09E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 2)

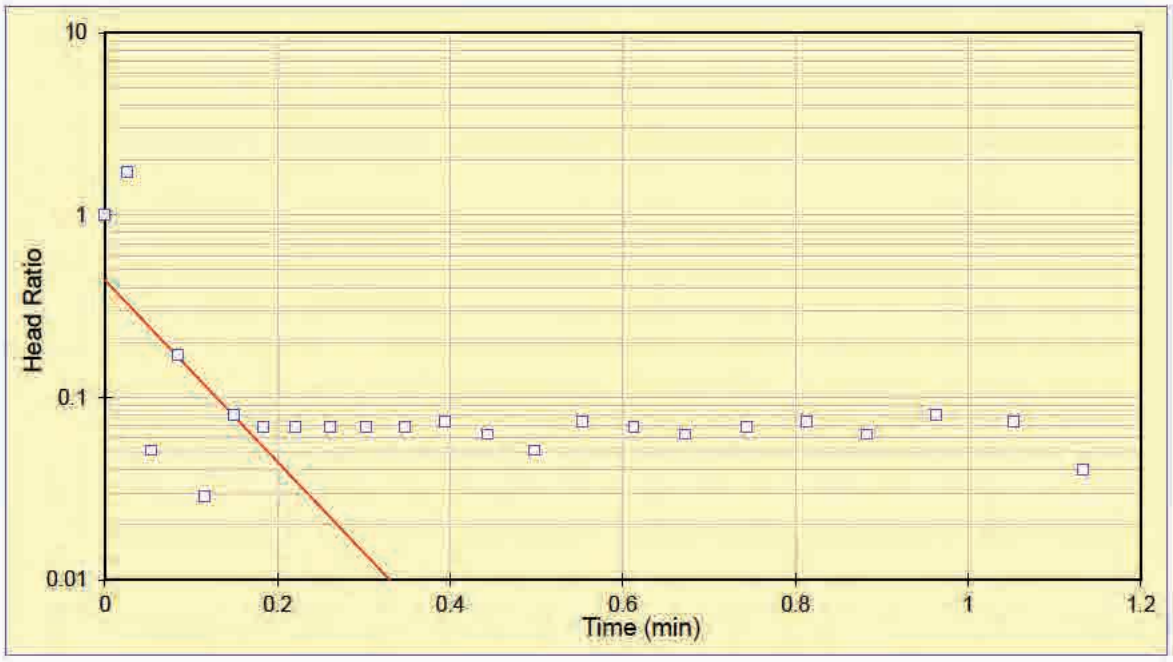
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
$r_c$ = casing radius (feet)
$R_e$ = equivalent radius (feet)
$L_e$ = length of screened interval (feet)
$t$ = time (minutes)
$h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $R_e$ = | 0.34 |
| $L_e$ = | 10 |
| $t_1$ = | 0 |
| $t_2$ = | 0.33 |
| $h_1/h_0$ = | 0.44 |
| $h_2/h_0$ = | 0.01 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.82E-03 | cm/sec |
| K= | 1.93E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

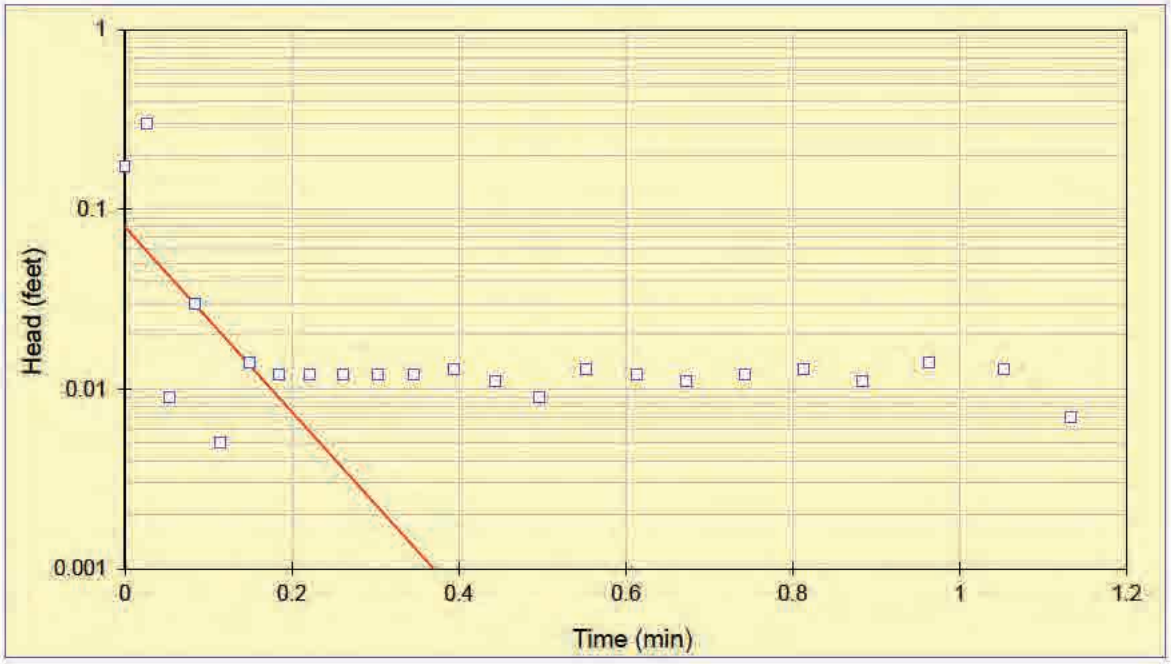
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 0.08 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.31E-03 | cm/sec |
| K= | 1.79E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-19B (TEST 1)

$$T = b + a \ln T$$

where:

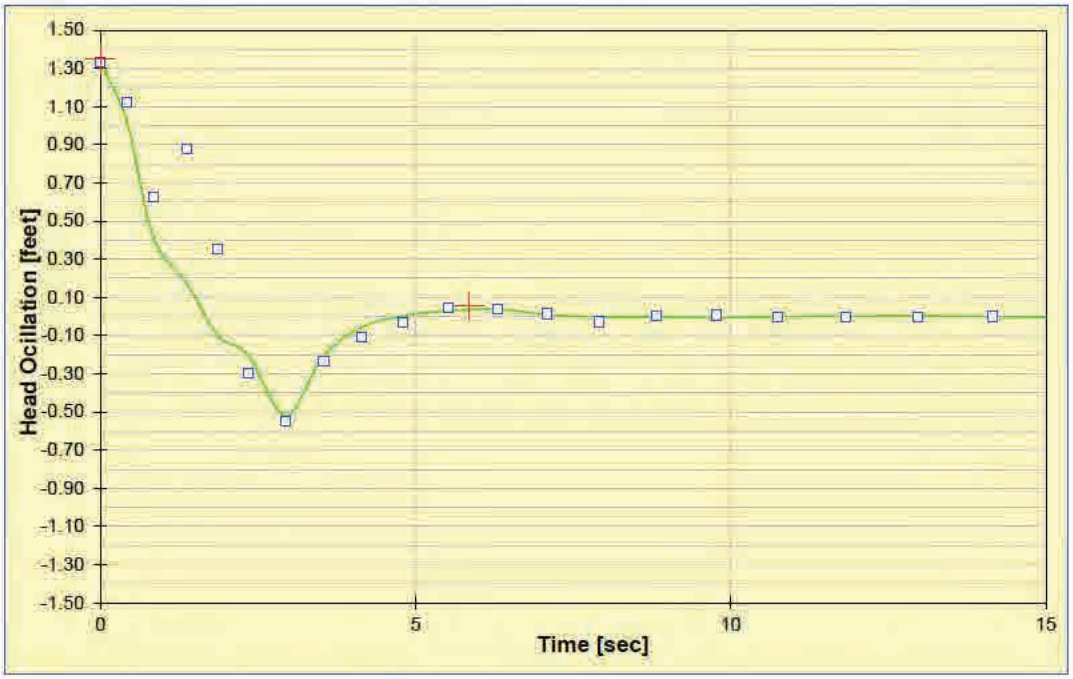
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.20536 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.4539 | $ft^{-1}$ |
| $L_c$ = | 17.92 | ft | $a$ = | 0.00231 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 1.0740 | $ft^{-1}$ | $t_2$ = | 5.85 | sec |
| $g$ = | 0.5471 | $ft^{-1}$ | $h(t_1)$ = | 1.35 | ft |
| $L$ = | 22.16 | $ft^3/sec^2$ | $h(t_2)$ = | 0.06 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.22E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.20E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 1.04E+03 $ft^2/day$ | $L_1$ = | 22.16 |
| $K$ = | 3.67E+01 ft/day | $L_2$ = | 22.92 |
| $K$ = | 1.29E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

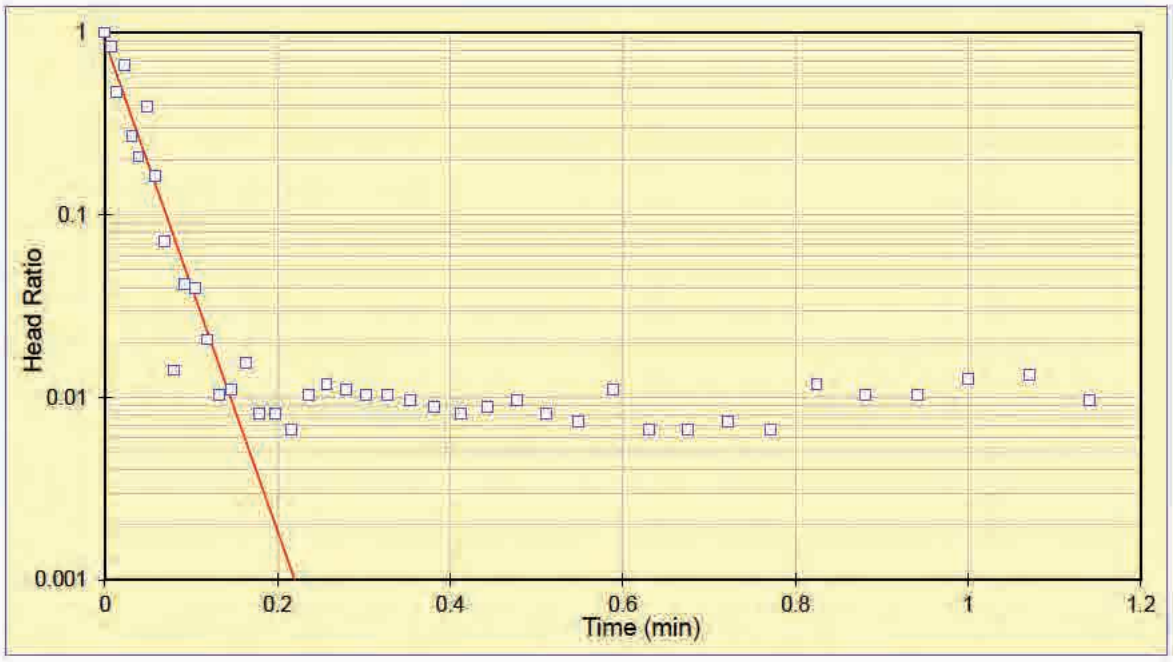
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.84E-02 | cm/sec |
| $t_1$ = | 0 | K= | 5.21E+01 | ft/day |
| $t_2$ = | 0.22 | | | |
| $h_1/h_0$ = | 0.90 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

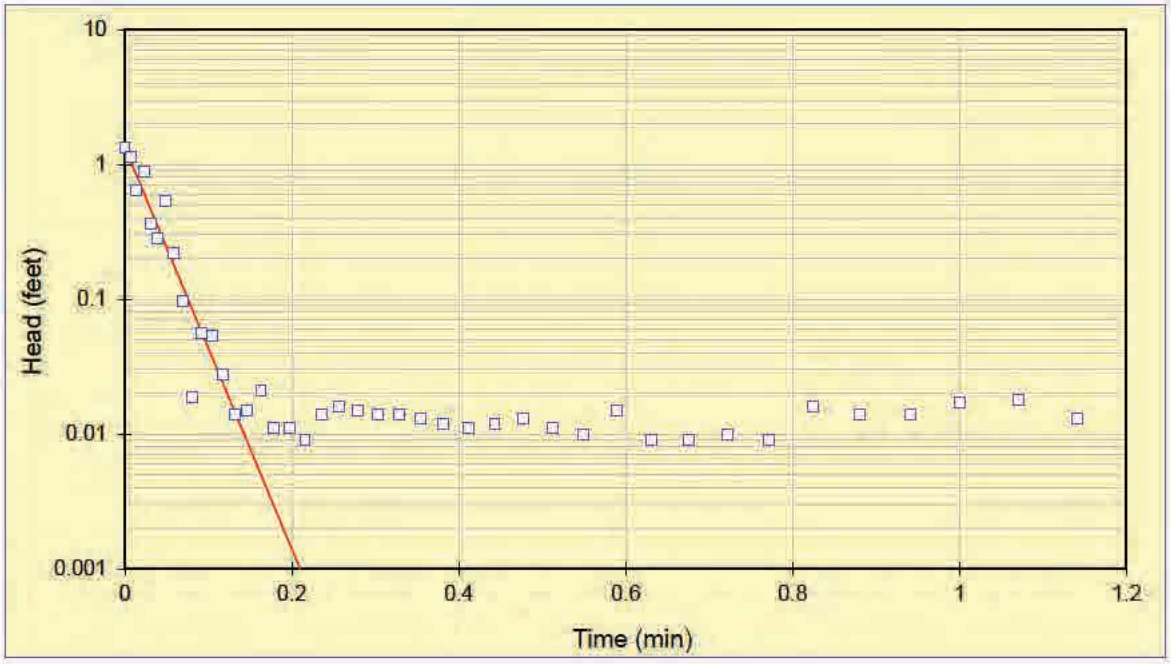
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 1.35 |
| $y_t$ = | 0.001 |
| $t$ = | 0.2 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.83E-02 | cm/sec |
| K= | 5.18E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-19B (TEST 2)

$$T = b + a \ln T$$

where:

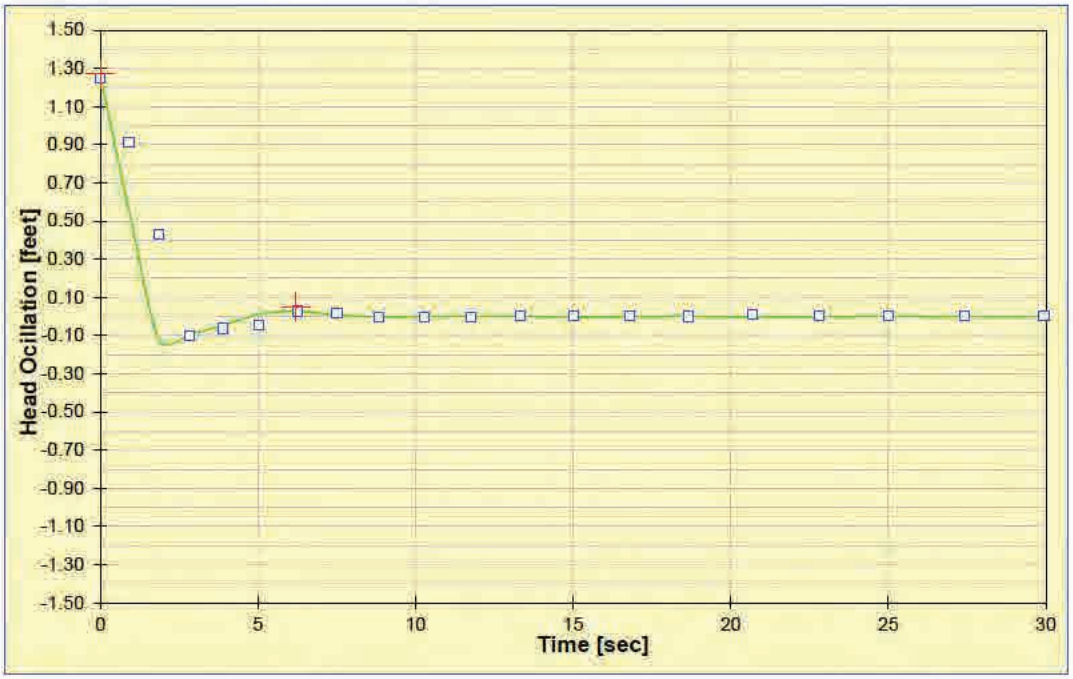
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.13983 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.4577 | $ft^{-1}$ |
| $L_c$ = | 17.95 | ft | $a$ = | 0.00216 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 1.0134 | $ft^{-1}$ | $t_2$ = | 6.20 | sec |
| $g$ = | 0.5217 | $ft^{-1}$ | $h(t_1)$ = | 1.27 | ft |
| $L$ = | 24.78 | $ft^3/sec^2$ | $h(t_2)$ = | 0.05 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.09E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.12E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 9.69E+02 $ft^2/day$ | $L_1$ = | 24.78 |
| $K$ = | 3.43E+01 ft/day | $L_2$ = | 22.95 |
| $K$ = | 1.21E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

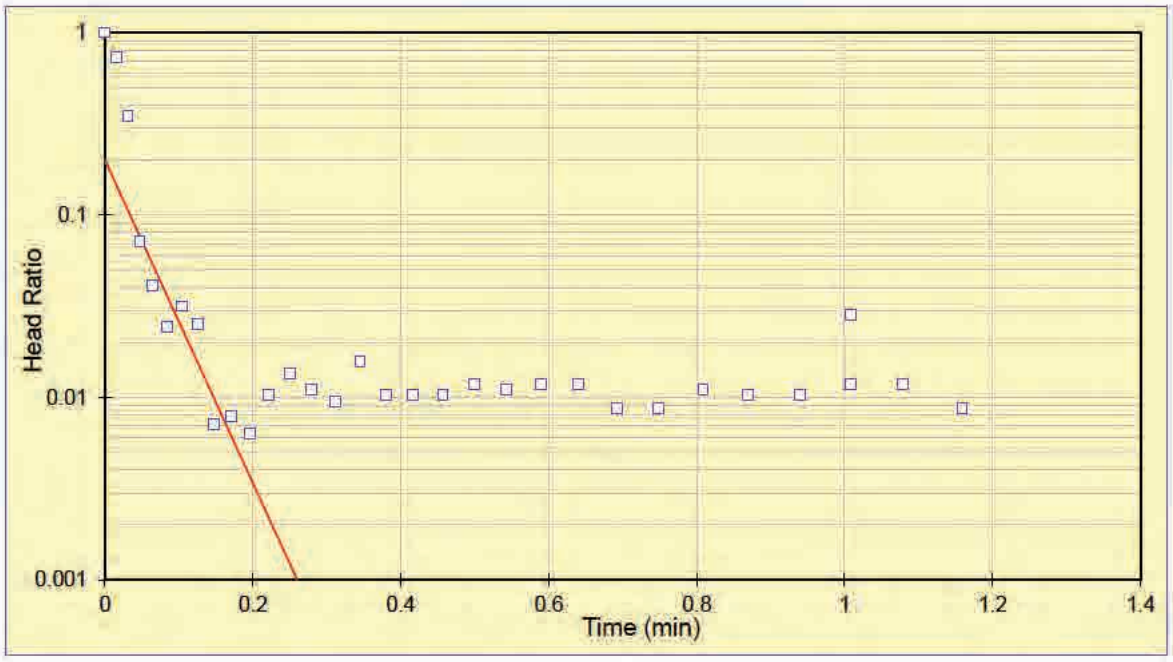
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.21E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.43E+01 | ft/day |
| $t_2$ = | 0.26 | | | |
| $h_1/h_0$ = | 0.20 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

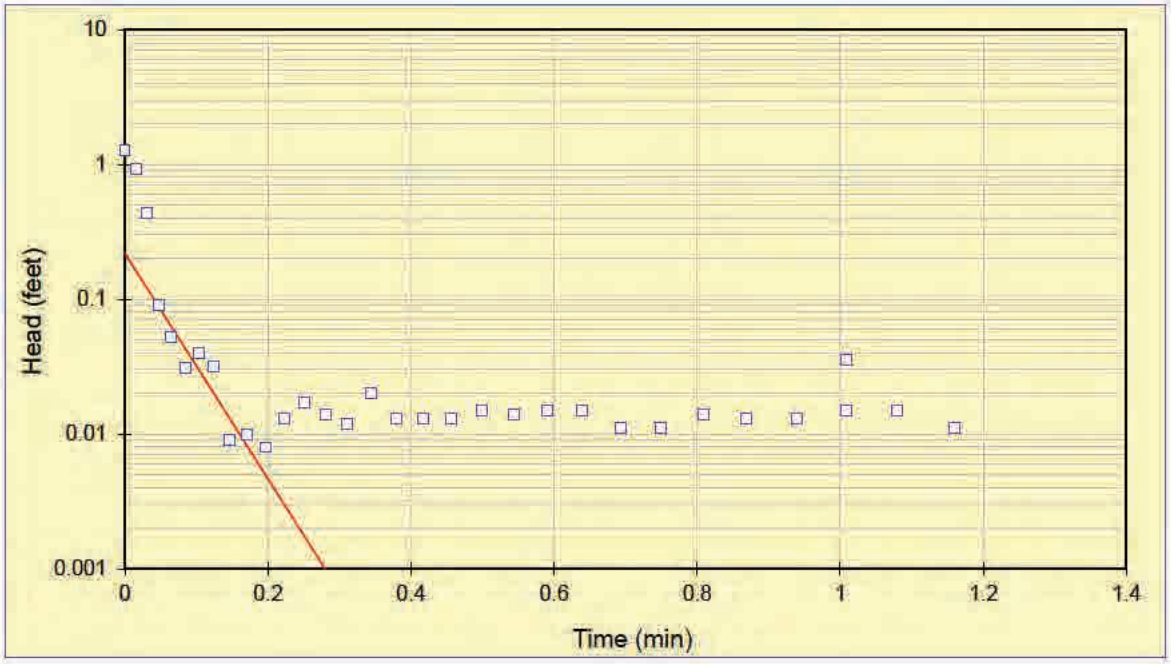
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 0.22 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.03E-02 | cm/sec |
| K= | 2.91E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

**APPENDIX C**

# Vertical Gradient Calculation

Appendix D
VERTICAL GRADIENT FLOW CALCULATIONS

| Monitoring Well Locations | Ground Surface Elevation (ft-masl) | Top of Casing Elevation (ft-masl) | Screen Interval | | | | June 13, 2016 | | | | July 15, 2016 | | | | September 9, 2016 | | | | November 2, 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft bgs) | Center (ft masl) | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction |
| GAMW07 | 993.02 | 993.94 | 5 | 15 | 10 | 983.02 | 10.77 | 983.17 | | | 10.84 | 983.10 | | | 9.55 | 984.39 | | | 9.96 | 983.98 | | |
| GAMW07B | 993.01 | 993.93 | 30 | 40 | 35 | 958.01 | | | | | | | | | | | | | 11.04 | 982.90 | -0.0815 | Down |
| GAMW08 | 992.85 | 993.76 | 5 | 15 | 10 | 982.85 | 9.91 | 983.85 | N/A | N/A | | | NA | NA | 9.61 | 984.15 | N/A | N/A | 10.16 | 983.60 | -0.1568 | Down |
| GAMW08B | 992.92 | 993.81 | 30 | 40 | 35 | 957.92 | | | | | | | | | | | | | 10.14 | 983.68 | | |
| GAMW09 | 992.1 | 992.99 | 5 | 15 | 10 | 982.10 | 9.09 | 983.90 | | | 10.04 | 982.95 | | | 8.11 | 984.88 | | | 8.92 | 984.07 | -0.0459 | Down |
| GAMW09B | 992.16 | 992.98 | 24.5 | 34.5 | 29.5 | 962.66 | 9.15 | 983.83 | -0.180-02 | Down | 9.81 | 983.17 | -0.145-02 | Down | 8.15 | 984.83 | -0.245-02 | Down | 8.98 | 984.00 | | |
| GAMW10 | 993.21 | 993.95 | 5 | 15 | 10 | 983.21 | 9.52 | 984.43 | | | 9.82 | 984.13 | | | 8.29 | 985.66 | | | 8.96 | 984.99 | | |
| GAMW10B | 993.11 | 993.05 | 29.3 | 37.1 | 33.2 | 959.91 | 9.12 | 983.93 | -0.417-03 | Down | 9.42 | 983.63 | 0.00E+00 | Up | 8.18 | 984.87 | 0.417-03 | Up | 8.96 | 984.09 | 0.000000 | Up |
| GAMW11 | 992.57 | 993.37 | 5 | 15 | 10 | 982.57 | 9.21 | 984.16 | 0.00E-00 | Down | 9.61 | 983.76 | 1.46E-01 | Up | 8.18 | 985.19 | 0.417-03 | Up | 8.52 | 984.85 | 0.000000 | Up |
| GAMW11B | 992.16 | 992.76 | 70.16 | 74.71 | 72.44 | 919.72 | 8.91 | 983.85 | | | 9.40 | 983.36 | | | 7.91 | 984.85 | | | 8.64 | 984.12 | | |
| GAMW12 | 993.61 | 994.60 | 5 | 15 | 10 | 983.61 | 10.10 | 984.50 | | | 9.29 | 985.31 | | | 10.05 | 984.55 | | | 9.25 | 985.35 | | |
| GAMW12B | 993.63 | 994.05 | 35 | 45 | 40 | 953.63 | 10.19 | 983.87 | -0.228-03 | Up | 9.77 | 984.29 | 0.417-03 | Down | 10.05 | 983.99 | 4.22E-04 | Down | 9.23 | 984.83 | 0.228-04 | Down |
| GAMW13 | 993.74 | 994.73 | 5 | 15 | 10 | 983.74 | 9.75 | 983.98 | N/A | N/A | 9.96 | 983.77 | N/A | N/A | 8.44 | 985.29 | N/A | N/A | 8.90 | 984.83 | 0.000E+00 | Down |
| GAMW13B | 993.64 | 994.47 | 25 | 35 | 30 | 958.64 | – | – | – | – | – | – | – | – | – | – | – | – | 8.54 | 985.93 | | |
| GAMW14 | 991.90 | 992.83 | 5 | 15 | 10 | 981.90 | – | – | N/A | N/A | – | – | N/A | N/A | – | – | N/A | N/A | 7.06 | 985.84 | 0.000E+00 | Down |
| GAMW14B | 992.80 | 993.79 | 22 | 32 | 27 | 970.80 | – | – | – | – | – | – | – | – | – | – | – | – | 7.05 | 985.84 | 0.000E+00 | Down |
| GAMW15 | 994.27 | 995.12 | 5 | 15 | 10 | 984.27 | – | – | N/A | N/A | – | – | N/A | N/A | – | – | N/A | N/A | 7.06 | 988.06 | 1.00E-01 | Up |
| GAMW15B | 992.20 | 993.10 | 27 | 37 | 32 | 960.20 | – | – | – | – | – | – | – | – | – | – | – | – | 7.05 | 986.05 | 1.00E-01 | Up |
| GAMW15C | 991.89 | 992.84 | 5 | 15 | 10 | 981.89 | – | – | N/A | N/A | – | – | N/A | N/A | – | – | N/A | N/A | 6.85 | 986.04 | 1.42E-01 | Up |
| GAMW15D | 992.07 | 993.02 | 26 | 36 | 31 | 961.07 | – | – | – | – | – | – | – | – | – | – | – | – | 6.97 | 986.05 | | |
| GAMW16 | 992.97 | 993.91 | 5 | 15 | 10 | 982.97 | – | – | N/A | N/A | – | – | NA | NA | – | – | N/A | N/A | 6.85 | 986.06 | 1.41E-01 | Up |
| GAMW16B | 992.99 | 993.87 | 32 | 42 | 37 | 955.99 | – | – | – | – | – | – | – | – | – | – | – | – | 7.07 | 986.80 | | |
| GAMW17 | 992.95 | 993.84 | 5 | 15 | 10 | 982.95 | – | – | N/A | N/A | – | – | NA | NA | – | – | N/A | N/A | 6.54 | 987.30 | 0.00E+00 | Down |
| GAMW20B | 995.16 | 997.03 | 45 | 55 | 50 | 945.16 | – | – | – | – | – | – | – | – | – | – | – | – | 10.41 | 986.62 | | |
| GAMW18 | 990.43 | 991.41 | 5 | 15 | 10 | 980.43 | – | – | N/A | N/A | – | – | NA | NA | – | – | N/A | N/A | 7.96 | 983.45 | -0.0815 | Down |
| GAMW19B | 988.35 | 990.84 | 50 | 60 | 55 | 933.35 | – | – | – | – | – | – | – | – | – | – | – | – | 7.83 | 983.01 | | |

Notes:
bgs = Feet below ground surface
amsl = Feet above mean sea level
Bold = Calculation is missing
ft/ft = Feet/Feet
NA = Not available

| Monitoring Well Location | Ground Surface Elevation (ft-masl) | Top of Casing Elevation (ft-masl) | Screen Interval | | | January 4, 2017 | | | | February 21, 2017 | | | | April 24, 2017 | | | | June 26, 2017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft-bgs) | Center (ft-masl) | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction |
| GAMW07 | 991.11 | 993.94 | 5 | 15 | 10 | 981.11 | 12.83 | 981.11 | 1.10E-03 | Down | 12.83 | 981.11 | 0.00E+00 | Flat | 12.83 | 981.11 | 0.00E+00 | Flat | 12.83 | 981.11 | 0.00E+00 | Flat |
| GAMW07B | 991.61 | 994.10 | 30 | 40 | 35 | 956.61 | 37.99 | 956.12 | | | 37.99 | 956.12 | | | 37.99 | 956.12 | | | 37.99 | 956.12 | | |
| GAMW08 | 992.45 | 995.15 | 5 | 15 | 10 | 982.45 | 13.60 | 981.55 | 1.54E-03 | Up | 13.73 | 981.42 | 2.61E-04 | Down | 13.71 | 981.44 | 1.42E-04 | Up | 13.75 | 981.40 | 3.42E-04 | Up |
| GAMW08B | 979.15 | 981.97 | 20 | 35 | 27 | 952.15 | 24.51 | 957.46 | | | 24.57 | 957.40 | | | | | | | | | | |
| GAMW09 | 990.1 | 992.86 | 5 | 15 | 10 | 980.10 | 9.49 | 983.37 | | | 9.50 | 983.36 | | | 9.25 | 983.61 | 2.53E-03 | Down | 9.30 | 983.56 | 2.1E-03 | Down |
| GAMW09B | 990.19 | 992.96 | 34.5 | 44.5 | 39.5 | 955.69 | 9.65 | 983.31 | 2.00E-03 | Down | 9.81 | 983.15 | 2.00E-03 | Down | 9.56 | 983.40 | | | 9.60 | 983.36 | | |
| GAMW10 | 993.17 | 995.95 | 5 | 15 | 10 | 983.17 | 9.83 | 986.12 | | | 9.90 | 986.05 | | | 9.60 | 986.35 | | | 9.80 | 986.15 | | |
| GAMW10B | 993.13 | 995.95 | 29.5 | 39.5 | 34.5 | 958.63 | 9.83 | 986.12 | 1.23E-03 | Up | 9.91 | 986.04 | 1.89E-04 | Up | 9.77 | 986.18 | 1.47E-03 | Up | 9.80 | 986.15 | 0.00E+00 | Flat |
| GAMW11B | 992.37 | 994.97 | 5 | 15 | 10 | 982.37 | 8.83 | 986.14 | | | 8.86 | 986.11 | | | 8.77 | 986.20 | | | 8.72 | 986.25 | | |
| GAMW11C | 992.76 | 995.26 | 27.5 | 34.75 | 30.75 | 962.01 | 9.41 | 985.85 | 1.34E-03 | Up | 9.50 | 985.76 | 1.02E-03 | Up | 9.34 | 985.92 | 1.63E-03 | Up | 9.58 | 985.68 | 1.63E-03 | Up |
| GAMW14 | 993.51 | 996.30 | 5 | 15 | 10 | 983.51 | N/A | N/A | | | 12.49 | 984.02 | 1.02E-02 | Up | 11.35 | 985.16 | 9.46E-03 | Up | 11.51 | 984.93 | 1.56E-02 | Up |
| GAMW14B | 993.43 | 996.08 | 35 | 45 | 40 | 958.43 | 11.60 | 984.48 | | | 11.64 | 984.44 | | | 11.60 | 984.48 | | | 11.58 | 984.50 | | |
| GAMW15 | 993.74 | 996.57 | 5 | 15 | 10 | 983.74 | 9.49 | 987.08 | | | 9.56 | 987.01 | | | 9.45 | 987.12 | | | 9.56 | 987.01 | | |
| GAMW15B | 993.64 | 996.47 | 25 | 35 | 30 | 963.64 | 9.62 | 986.84 | 6.23E-03 | Down | 9.91 | 986.55 | 5.03E-03 | Down | | | | | | | | |
| GAMW16 | 991.00 | 993.83 | 5 | 15 | 10 | 981.00 | 9.75 | 984.08 | | | 9.84 | 983.99 | | | | | | | | | | |
| GAMW16B | 990.80 | 993.74 | 22 | 32 | 27 | 963.80 | 9.75 | 984.04 | -3.89E-04 | Down | 9.89 | 983.90 | 1.83E-04 | Up | | | | | | | | |
| GAMW17 | 994.27 | 997.13 | 5 | 15 | 10 | 984.27 | 9.77 | 987.14 | | | 9.84 | 987.07 | | | | | | | | | | |
| GAMW17B | 994.20 | 997.03 | 37 | 47 | 42 | 952.20 | 9.78 | 986.94 | 9.10E-03 | Up | 9.85 | 986.87 | 2.05E-03 | Up | | | | | | | | |
| GAMW18 | 990.89 | 993.84 | 5 | 15 | 10 | 980.89 | 9.55 | 984.08 | | | 9.61 | 984.11 | | | | | | | | | | |
| GAMW18B | 990.91 | 993.84 | 28 | 38 | 33 | 957.84 | 9.55 | 984.08 | 4.81E-03 | Up | 9.61 | 984.11 | 2.37E-03 | Up | | | | | | | | |
| GAMW19 | 992.07 | 994.91 | 5 | 15 | 10 | 982.07 | 9.85 | 985.06 | | | 9.91 | 985.00 | | | | | | | | | | |
| GAMW19B | 992.07 | 994.91 | 30 | 40 | 35 | 957.07 | 9.85 | 985.06 | 0.00E+00 | Flat | 9.91 | 985.00 | 2.80E-03 | Up | | | | | | | | |
| GAMW20B | 990.69 | 993.47 | 32 | 42 | 37 | 953.69 | 8.83 | 984.64 | | | 8.89 | 984.58 | | | | | | | | | | |
| GAMW20C | 990.76 | 993.54 | 5 | 15 | 10 | 980.76 | 9.03 | 984.51 | 1.50E-03 | Down | 9.09 | 984.45 | 1.93E-03 | Down | | | | | | | | |
| GAMW20D | 990.16 | 992.93 | 85 | 95 | 90 | 905.16 | 9.61 | 984.32 | | | 9.70 | 984.23 | | | | | | | | | | |
| GAMW21B | 990.23 | 992.91 | 5 | 15 | 10 | 980.23 | 9.33 | 984.13 | -1.50E-03 | Down | 9.38 | 984.08 | 4.64E-03 | Down | | | | | | | | |
| GAMW21D | 990.33 | 992.91 | 80 | 90 | 85 | 910.33 | 9.79 | 984.12 | | | 9.85 | 984.06 | | | | | | | | | | |

Notes:
ft-bgs = Feet below ground surface
ft-masl = Feet above mean sea level
ft-btoc = Feet below top of casing
m/m = Feet/Feet
N/A = Not available

| Monitoring Well Locations | Ground Surface Elevation (ft-msl) | Top of Casing Elevation (ft-msl) | Screen Interval | | | | August 21, 2017 | | | | October 2, 2017 | | | | February 26, 2018 | | | | March 12, 2018 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft bgs) | Center (ft msl) | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction |
| GAMW09 | 993.02 | 993.94 | 5 | 15 | 10 | 983.02 | 9.08 | 984.86 | | | 10.15 | 983.79 | | | | | | | 9.8 | 984.06 | | |
| GAMW09A | 994.67 | 995.02 | 30 | 40 | 35 | 959.67 | -- | -- | | | -- | -- | | | | | | | -- | -- | | |
| GAMW09B | 992.45 | 992.76 | 5 | 15 | 10 | 982.45 | 10.10 | 982.53 | NA | NA | 10 | -- | NA | NA | -- | -- | NA | NA | 9.88 | 982.88 | NA | NA |
| GAMW09B | 979.52 | 980.40 | 20 | 30 | 25 | 954.52 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW10A | 1,000.1 | 1,002.96 | 5 | 15 | 10 | 990.01 | 9.11 | 993.85 | | | 10.25 | 992.83 | | | -- | -- | | | 9.29 | 993.75 | | |
| GAMW10B | 993.19 | 995.16 | 24.5 | 34.5 | 29.5 | 963.69 | 1.62 | 993.54 | 0.2245.02 | Down | 9.91 | 985.28 | 0.2225.02 | Down | -- | -- | NW | NA | 9.92 | 985.24 | -0.1(1.02) | Down |
| GAMW10C | 993.01 | 995.05 | 5 | 15 | 10 | 983.01 | 1.68 | 993.37 | | | 9.80 | 985.25 | | | -- | -- | | | 9.96 | 985.09 | | |
| GAMW11A | 993.11 | 995.05 | 27.7 | 37.7 | 33.7 | 959.41 | 1.67 | 993.38 | 1.4(0.02) | Up | 9.80 | 985.25 | 1.4(0.02) | Up | -- | -- | NW | NW | 9.96 | 985.09 | 1.4(0.02) | Up |
| GAMW11B | 992.97 | 994.97 | 5 | 15 | 10 | 982.97 | 3.55 | 991.42 | | | 10.58 | 984.39 | | | -- | -- | | | 9.36 | 985.61 | | |
| GAMW11C | 992.76 | 994.76 | 170.16 | 181.73 | 175.95 | 816.81 | 7.64 | 987.12 | 0.6(0.02) | Up | 9.97 | 984.79 | 0.6(0.02) | Up | -- | -- | NW | NW | 9.81 | 984.95 | 0.6(0.02) | Up |
| GAMW11 | 993.51 | 995.83 | 5 | 15 | 10 | 983.51 | 17.56 | 978.27 | | | NA | | | | -- | -- | | | 10.45 | 985.38 | | |
| GAMW12A | 993.63 | 995.0 | 35 | 45 | 40 | 953.63 | 16.95 | 978.05 | 1.0(0.02) | Down | 2.23 | 992.77 | | | -- | -- | NW | NW | 9.12 | 985.88 | 1.0(0.02) | Up |
| GAMW12 | 993.74 | 995.57 | 5 | 15 | 10 | 983.74 | 9.23 | 986.34 | | | 10.73 | 984.84 | | | -- | -- | NW | NW | 9.7 | 985.71 | | |
| GAMW12B | 993.58 | 995.47 | 25 | 35 | 30 | 963.58 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| TRENCH01 | 991.00 | 992.69 | 5 | 20 | 13 | 987.00 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW08B | 993.90 | 995.74 | 22 | 32 | 27 | 974.08 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW20 | 994.27 | 996.10 | 5 | 15 | 10 | 984.07 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW20B | 994.20 | 995.93 | 37 | 47 | 42 | 952.20 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW53 | 995.80 | 997.64 | 5 | 15 | 10 | 984.80 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW53B | 995.61 | 997.19 | 26 | 36 | 31 | 959.80 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW54 | 995.97 | 998.01 | 5 | 15 | 10 | 985.97 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW54B | 995.99 | 997.47 | 32 | 42 | 37 | 958.99 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW55 | 997.05 | 999.04 | 5 | 15 | 10 | 987.05 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW55B | 996.18 | 997.93 | 35 | 45 | 40 | 951.18 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW56 | 997.03 | 999.01 | 5 | 15 | 10 | 987.03 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW56B | 996.33 | 997.84 | 33 | 43 | 38 | 958.33 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-bgs = Top of screen (ft-bgs) minus top of casing (ft-msl)
NA = Not applicable

| Monitoring Well Location | Ground Surface Elevation (ft-masl) | Top of Casing Elevation (ft-masl) | Screen Interval | | | | April 13, 2016 | | | | June 12, 2016 | | | | August 27-30, 2016 | | | | October 22-26, 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft-bgs) | Center (ft-masl) | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction |
| GAMW09 | 891.62 | 893.94 | 5 | 15 | 10 | 881.62 | 9.99 | 883.95 | 7.70E-01 | Up | 9.63 | 884.31 | 1.71E-01 | Up | 9.95 | 884.00 | 3.43E-01 | Up | 10.07 | 883.87 | 1.71E-01 | Up |
| GAMW09-R | 891.67 | 894.10 | 290 | 40 | 35 | 856.67 | 4 | 889.93 | | | 4.30 | 889.80 | | | 4.58 | 889.51 | | | 10.1 | 883.99 | | |
| GAMW08 | 892.45 | 895.15 | 5 | 15 | 10 | 882.45 | 9.84 | 885.31 | 0.00E+00 | Up | 9.60 | 885.55 | 1.03E-01 | Up | 12.50 | 882.65 | -1.24E-01 | Up | 11.16 | 883.99 | 2.56E-01 | Up |
| GAMW08B | 892.52 | 895.42 | 20 | 30 | 25 | 867.52 | 4 | 891.42 | | | 5.20 | 890.32 | | | 5.04 | 890.38 | | | 6.35 | 889.17 | | |
| GAMW06 | 890.1 | 892.96 | 5 | 15 | 10 | 880.01 | 7.42 | 885.54 | 0.00E+00 | Down | 7.5 | 885.46 | -2.15E-02 | Down | 8.12 | 884.83 | -2.04E-02 | Down | 8.89 | 884.06 | -2.04E-02 | Down |
| GAMW06B | 890.19 | 893.19 | 28.5 | 38.5 | 33.5 | 856.69 | 7.14 | 886.05 | | | 7.25 | 885.94 | | | 8.15 | 885.03 | | | 8.79 | 884.39 | | |
| GAMW15 | 883.07 | 885.95 | 5 | 15 | 10 | 873.07 | 1.62 | 884.33 | 9.53E-01 | Up | 1.4 | 884.55 | 1.71E-01 | Up | 2.58 | 883.37 | 1.71E-01 | Up | 2.73 | 883.21 | 1.71E-01 | Up |
| GAMW15B | 883.18 | 886.08 | 27.5 | 37.5 | 32.5 | 850.68 | 1.4 | 884.68 | | | 1.65 | 884.43 | | | 2.53 | 883.55 | | | 3.02 | 883.06 | | |
| GAMW16 | 882.0 | 884.97 | 5 | 15 | 10 | 872.0 | 3.15 | 881.82 | 9.53E-01 | Up | 3.36 | 881.61 | 3.41E-01 | Up | 3.95 | 881.02 | 1.71E-01 | Up | 4.2 | 880.77 | 1.71E-01 | Up |
| GAMW16B | 882.13 | 884.76 | 27.16 | 34.71 | 30.76 | 851.84 | 2.45 | 882.31 | | | 2.6 | 882.16 | | | 3.24 | 881.52 | | | 3.65 | 881.11 | | |
| GAMW17 | 884.51 | 887.60 | 5 | 15 | 10 | 874.51 | 11.35 | 876.25 | | | 11.45 | 876.15 | | | 11.86 | 875.74 | | | 12.1 | 875.50 | | |
| GAMW17B | 884.63 | 887.6 | 28 | 38 | 33 | 851.63 | 10.42 | 877.18 | -9.53E-01 | Up | 10.23 | 877.40 | 1.03E-01 | Up | 11 | 876.6 | -2.71E-01 | Down | 11.43 | 876.18 | 2.71E-01 | Down |
| GAMW18 | 884.74 | 888.07 | 5 | 15 | 10 | 874.74 | 3.17 | 884.90 | 1.36E-01 | Up | 3.12 | 884.95 | 1.03E-01 | Up | 3.66 | 884.41 | 1.71E-01 | Up | 3.8 | 884.27 | 2.05E-01 | Up |
| GAMW18B | 883.54 | 886.47 | 28 | 38 | 33 | 850.54 | 9 | 884.47 | | | 9.33 | 884.15 | | | 9.28 | 884.21 | | | 9.32 | 884.17 | | |
| GAMW01 | 891.00 | 893.69 | 5 | 20 | 13 | 878.00 | | | NA | NA | 7.60 | 887.20 | -1.88E-01 | Down | 8.04 | 886.76 | -1.03E-01 | Down | 8.39 | 886.41 | -1.03E-01 | Down |
| GAMW04B | 890.80 | 893.79 | 22 | 32 | 27 | 863.80 | – | – | | | 7.06 | 886.74 | | | 7.54 | 886.26 | | | 7.89 | 885.91 | | |
| GAMW10 | 894.27 | 896.91 | 5 | 15 | 10 | 884.27 | – | – | | | – | – | | | 9.15 | 887.76 | | | 9.49 | 887.42 | | |
| GAMW04B | 890.20 | 893.03 | 27 | 37 | 32 | 863.20 | – | – | NA | NA | – | – | NA | NA | 8.85 | 884.35 | >1.71E-01 | Up | 9.20 | 884.00 | 1.71E-01 | Up |
| GAMW05 | 886.89 | 889.84 | 5 | 15 | 10 | 876.89 | – | – | | | 11.05 | 878.84 | | | 8.85 | 881.04 | -1.37E-01 | Up | 9.10 | 880.79 | 1.71E-01 | Up |
| GAMW05B | 886.91 | 889.91 | 26 | 36 | 31 | 855.91 | – | – | | | 7.05 | 882.86 | | | 7.77 | 882.14 | | | 8.05 | 881.86 | | |
| GAMW04 | 883.97 | 886.97 | 5 | 15 | 10 | 873.97 | 7.23 | – | | | 7.05 | 880.92 | | | 7.58 | 880.39 | | | 7.99 | 879.97 | | |
| GAMW04B | 883.97 | 886.97 | 32 | 42 | 37 | 851.97 | 7.32 | -2.71E-01 | 1.03E-01 | Up | 7.07 | 880.90 | 3.41E-02 | Up | 7.72 | 880.25 | 3.41E-02 | Down | 8.02 | 879.95 | 3.41E-02 | Down |
| GAMW05 | 886.95 | 889.94 | 5 | 15 | 10 | 876.95 | – | – | NA | NA | 6.84 | 883.00 | 3.42E-02 | Up | 9.44 | 880.40 | 2.39E-01 | Down | 6.93 | 883.01 | 3.08E-01 | Down |
| GAMW05B | 886.18 | 889.33 | 26 | 36 | 31 | 855.18 | – | – | | | 6.66 | 882.67 | | | 6.93 | 882.40 | | | 6.95 | 882.38 | | |
| GAMW06 | 886.24 | 889.61 | 5 | 15 | 10 | 876.24 | – | – | NA | NA | 6.56 | 883.05 | -1.03E-01 | Down | 9.56 | 880.05 | -1.03E-01 | Up | 9.93 | 879.68 | 1.71E-01 | Up |
| GAMW06B | 886.35 | 889.31 | 27 | 37 | 32 | 854.35 | – | – | | | 6.64 | 882.67 | | | 6.83 | 882.48 | | | 6.85 | 882.46 | | |

Notes:
Bgs = Feet below ground surface
masl = Feet above mean sea level
Notes = Negative (-) is Upward
NA = Not Available

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

| Monitoring Well Locations | Ground Surface Elevation (masl) | Top of Casing Elevation (masl) | Screen Interval | | | | February 23, 2018 | | | | Average Vertical Gradient (m/m) | Flow Direction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (m bgs) | Bottom (m bgs) | Center (m bgs) | Center (masl) | Depth To Water (m BTOC) | Groundwater Elevation (masl) | Vertical Gradient (m/m) | Flow Direction | | |
| DAMW27 | 1000.23 | 999.95 | 5 | 10 | 7.5 | 992.45 | 10.55 | 989.40 | | | | |
| DAMW28 | 999.61 | 999.33 | 10 | 15 | 12.5 | 987.11 | 11.23 | 988.10 | 0.05E-02 | Up | 0.0050 | Up |
| DAMW29 | 999.95 | 999.66 | 5 | 10 | 7.5 | 992.16 | 10.89 | 988.77 | | | | |
| DAMW30 | 999.92 | 999.61 | 15 | 20 | 17.5 | 982.11 | 11.13 | 988.48 | 0.00E+00 | Up | 0.0031 | Up |
| DAMW31 | 999.5 | 999.19 | 5 | 10 | 7.5 | 992.19 | 10.68 | 988.51 | | | | |
| DAMW32 | 999.53 | 999.24 | 24.5 | 31.5 | 28.0 | 971.91 | 10.88 | 988.36 | -0.06E-02 | Down | -0.0214 | Down |
| DAMW33 | 999.07 | 998.79 | 5 | 10 | 7.5 | 991.51 | 9.98 | 988.81 | | | | |
| DAMW34 | 998.1 | 998.26 | 37.5 | 47.5 | 42.5 | 955.76 | 9.07 | 989.19 | 0.07E-02 | Up | 0.0051 | Up |
| DAMW35 | 999.2 | 998.92 | 5 | 10 | 7.5 | 991.71 | 10.20 | 988.72 | | | | |
| DAMW36 | 998.76 | 998.39 | 27.75 | 33.75 | 30.75 | 967.64 | 9.82 | 988.57 | 0.03E-02 | Up | 0.0027 | Up |
| DAMW37 | 998.81 | 998.53 | 5 | 10 | 7.5 | 991.03 | 10.04 | 988.49 | | | | |
| DAMW38 | 998.86 | 998.59 | 24 | 34 | 29 | 969.59 | 10.08 | 988.51 | -0.02E-02 | Down | -0.0111 | Down |
| DAMW39 | 999.03 | 998.77 | 5 | 10 | 7.5 | 991.53 | 9.94 | 988.83 | | | | |
| DAMW40 | 999.04 | 998.47 | 25 | 35 | 30 | 969.04 | 9.98 | 988.49 | 0.10E-02 | Up | 0.0055 | Up |
| DAMW41 | 997.90 | 997.63 | 5 | 10 | 7.5 | 990.13 | 9.06 | 988.57 | | | | |
| DAMW42 | 997.96 | 997.79 | 22 | 32 | 27 | 970.79 | 9.06 | 988.73 | -0.08E-02 | Up | -0.0103 | Down |
| DAMW43 | 997.97 | 997.70 | 5 | 10 | 7.5 | 990.20 | 9.09 | 988.61 | | | | |
| DAMW44 | 997.97 | 997.70 | 27 | 37 | 32 | 965.70 | 9.09 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW45 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW46 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW47 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW48 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW49 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW50 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW51 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW52 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW53 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW54 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW55 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW56 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW57 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW58 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW59 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW60 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |

Notes:
mbgs = meters below ground surface
masl = meters above mean sea level
mBTOC = meters below top of casing
NM = Flow Dry
NA = not available

Prepared by: EMW
Checked by: TV
Reviewed by: MAH

**APPENDIX D**

# Monitored Natural Attenuation Evaluation

GOLDER

**REPORT**

# MONITORED NATURAL ATTENUATION EVALUATION

*Northern Indiana Public Service Company LLC*
*Rollin M Schahfer Generating Station*
*Wheatfield, IN*

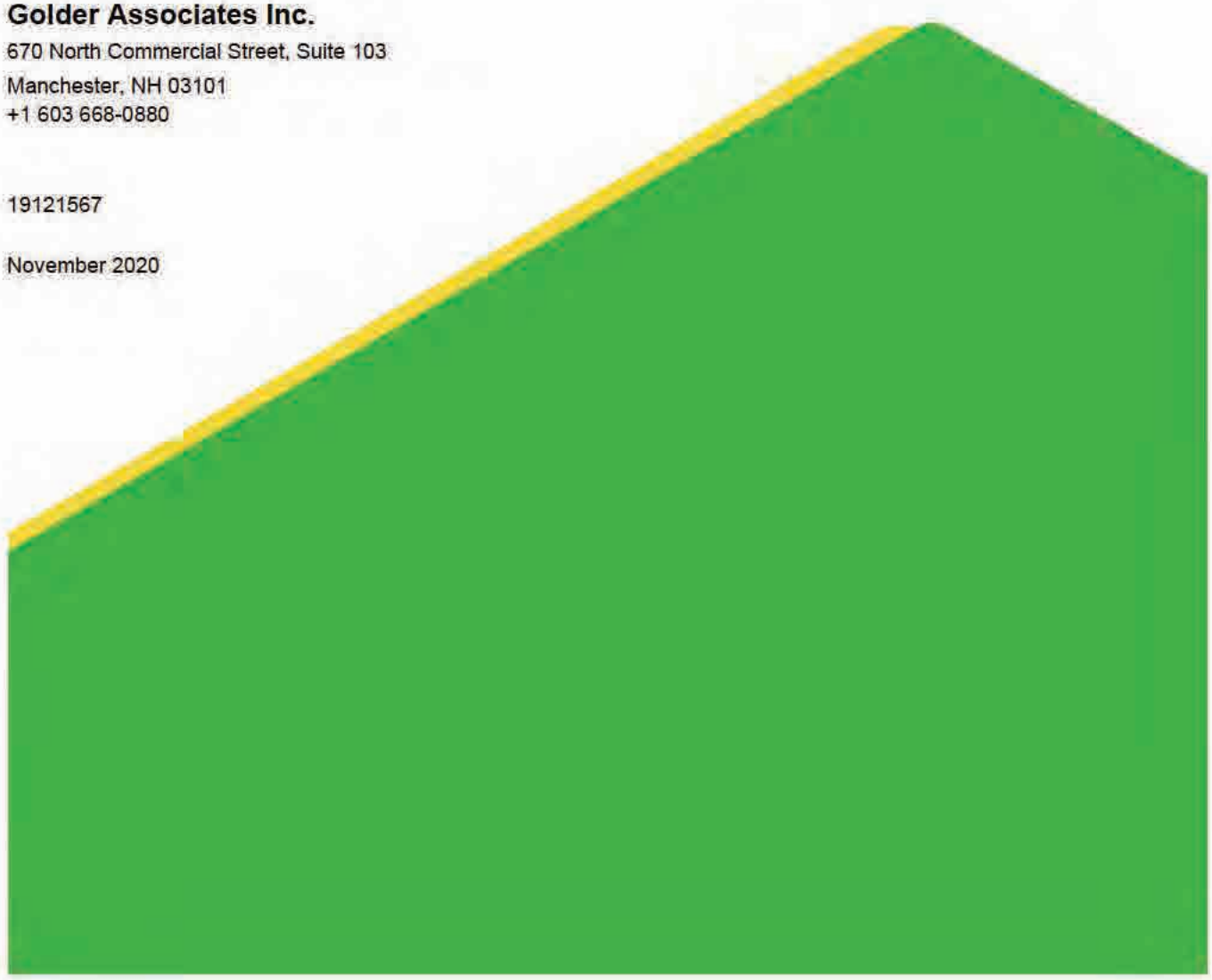
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November 2020



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**APPENDICES**

**APPENDIX A**
Groundwater and Porewater Monitoring Data

**APPENDIX B**
Groundwater Flow Model Technical Memorandum

# Acronyms

| | |
|---|---|
| ACM | Assessment of Corrective Measures |
| CCR | Coal Combustion Residuals |
| CFR | Code of Federal Regulations |
| DO | Dissolved Oxygen |
| Eh | Reduction Potential |
| ft bgs | feet below ground surface |
| g | Gram |
| GMPIM | Groundwater Monitoring Program Implementation Manual |
| GWPS | Groundwater Protection Standards |
| IAP | Ion Activity Product |
| IDEM | Indiana Department of Environmental Management |
| ITRC | Interstate Technology Regulatory Council |
| kg | kilogram |
| Ksp | Solubility Product |
| MCL | Maximum Contaminant Level |
| MCWB | Metal Cleaning Waste Basin |
| mg | milligram |
| mg/L | milligram per liter |
| MNA | Monitored Natural Attenuation |
| mV | millivolt |
| MSRB | Material Storage Runoff Basin |
| NIPSCO LLC | Northern Indiana Public Service Company LLC |
| ORP | Oxidation-Reduction Potential |
| RMSGS | R. M. Schahfer Generating Station |
| SCM | surface complexation model |
| SEP | Sequential Extraction Potential |
| SI | Saturation Index |
| SSL | Statistically Significant Level |
| SU | Standard Unit |
| TAL | Target Analyte List |
| TDS | Total Dissolved Solids |
| USEPA | United States Environmental Protection Agency |
| XRD | X-ray diffraction |

# 1.0 OVERVIEW

Groundwater and solid materials were evaluated to determine the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments (i.e., Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and the Drying Area (together, the CCR Unit) at the Northern Indiana Public Service Company LLC (NIPSCO LLC) Rollin M. Schahfer Generating Station (RMSGS, or Site). The structure of this feasibility evaluation closely follows the United States Environmental Protection Agency (USEPA) guidance on using MNA as a remedial strategy (USEPA 2007a and 2007b) and considers best practices from the Interstate Technology Regulatory Council (ITRC) document: “A Decision Framework for Applying Monitored Natural Attenuation Processes to Metals and Radionuclides in Groundwater” (ITRC 2010).

RMSGS manages CCR in the surface impoundments subject to applicable requirements of 40 Code of Federal Regulations (CFR) Part 257 as amended (CCR Rule). In April 2019, pursuant to 40 CFR §257.96(a), an assessment of corrective measures (ACM) was completed for the CCR Unit. This evaluation identified MNA as a potential remedial alternative for cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. Additionally, arsenic, boron, lithium, and molybdenum were evaluated as part of this assessment due to the potential for future SSLs, should they ever occur. The results of the evaluation will be used to assess the performance and reliability of MNA as a potential remedial alternative as required by 40 CFR §257.97, Golder determined the overall feasibility of MNA for the CCR Unit by evaluating the following tiers (USEPA 2007a,b):

1) Demonstrate active constituent removal from groundwater and dissolved plume stability (Tier I)

2) Determine the mechanisms and rates of the operative attenuation processes (Tier II)

3) Determine the long-term capacity for attenuation and the stability of immobilized constituents (Tier III)

Following completion of this multi-tier evaluation, the fourth and final tier of an MNA program, which involves the design of a performance monitoring program and the development of a contingency plan, will be developed.

# 2.0 APPROACH

Golder evaluated the feasibility, mechanisms, rates, and stability of MNA as a remedy for groundwater impacts from the CCR Unit. In order to perform the evaluation, Golder collected samples of groundwater and overburden soil between July 24, 2018 and March 3, 2020 for geochemical analysis. The supplemental MNA assessment included the following activities:

- Groundwater:
  - Characterization to identify temporal and geographical trends, where present, and to estimate site-wide attenuation rates using temporal and spatial trends in groundwater quality data.
  - Geochemical modeling to identify the major chemical species and evaluate saturation indices of minerals relevant to attenuation of arsenic, boron, cobalt, lithium, and molybdenum.
  - Determination of the capacity of different mechanisms to attenuate arsenic, boron, cobalt, lithium, and molybdenum, including adsorption, precipitation and co-precipitation, and physical attenuation (dilution/dispersion).
  - Geochemical modeling to assess the stability and reversibility of attenuation due to adsorption.

- Overburden soil:
  - Mineralogical analysis of overburden soils to identify and quantify the major mineral components.
  - Chemical analysis of overburden soils to quantify the total metal content and identify the environmentally-available fraction of metals.

The results generated by this supplemental assessment were used by Golder to complete the Tier I, Tier II, and Tier III evaluation (USEPA 2007a,b). In addition, groundwater data collected during previous sampling events were used. The results of the Tier I, Tier II, and Tier III are described in the subsequent sections to establish a basis for the likely success of MNA at the RMSGS site.

## 2.1 Groundwater and Porewater Sampling

### 2.1.1 Sample Collection

Golder personnel collected groundwater and porewater samples in accordance with the Golder RMSGS Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) from the background, downgradient, Assessment, and property boundary monitoring wells presented in Table 1, and from piezometers located within the CCR Unit. Piezometer GAPIEZ-06 is located interior of the slurry wall on the western edge of the MSRB and is screened within the CCR materials. Piezometers DAPZ-02A and DAPZ-02B (abandoned in April 2020) were installed interior of the slurry wall on the eastern edge of the Drying Area and were screened in native materials (i.e., below the extent of CCR) from approximately five to 20 feet below ground surface (ft bgs) and 33 to 38 ft bgs, respectively. The monitoring well and former piezometer locations are shown in Figure 1.

**Table 1: Overview of the Wells Used in the Monitored Natural Attenuation Assessment**

| Background Wells | Downgradient Wells | Assessment Wells | Property Boundary Wells |
|---|---|---|---|
| GAMW-04, GAMW-07, GAMW-07B, GAMW-15, GAMW-15B | GAMW-08, GAMW-08B, GAMW-09, GAMW-09B, GAMW-16, GAMW-16B, GAMW-17, GAMW-17B, GAMW-18, GAMW-18B | GAMW-52, GAMW-52B, GAMW-53, GAMW-53B, GAMW-54, GAMW-54B, GAMW-55/55R, GAMW-55B, GAMW-56, GAMW-56B | GAMW-46, GAMW-46B |

### 2.1.2 Groundwater and Porewater Analysis

The geochemical characterization of porewater and groundwater samples included the measurement of field parameters and the laboratory analysis of samples for total metals and major cations and anions. The field parameters and laboratory analyses included:

**Field Parameters:** Parameters measured in the field included pH, dissolved oxygen (DO), oxidation reduction potential (ORP), conductivity, and temperature. These measurements were used to determine general geochemical conditions in the groundwater and support geochemical modeling.

**Metals:** Analysis of Appendix III and IV metals concentrations was conducted to understand the geochemical composition of groundwater and porewater. Metals analysis allows for the delineation of a potential plume, evaluation of mineral saturation indices, development of partitioning coefficients (in conjunction with solid material analyses), and evaluation of background contributions from natural sources or anthropogenic sources.

**Major Cations and Anions:** Geochemical modeling of mineral solubility, metals attenuation and background contributions requires analysis of major cations and anions because they affect and participate in sorption and mineral dissolution or precipitation reactions.

The groundwater and porewater samples were analyzed using the following methods:

- pH following SW846 9040C “pH Electrometric Measurement” (USEPA 2004)
- Total dissolved solids standard method (SM) 2540C “Total Dissolved Solids Dried at 180°C” (USEPA 1993a)
- Total hardness following SM 2340B (USEPA 1997)
- Chloride, fluoride, and sulfide following USEPA SW846 9056A “Determination of Inorganic Anions by Ion Chromatography”, Revision 1 (USEPA 2007c)
- Nitrate and nitrite following USEPA 353.2 “Determination of Nitrate-Nitrite Nitrogen by Automated Colorimetry, Revision 2.0” (USEPA 1993b)
- Alkalinity following SM 2320B “Alkalinity by Titration” (USEPA 2005a)
- Phosphorous following SM 4500-P E “Phosphorous by Ascorbic Acid Method” (USEPA 2005b)
- Total Target Analyte List (TAL) metals following USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3, SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2, and SW846 6020A “Inductively Coupled Plasma-Mass Spectrometry”, Revision 1 (USEPA 1998a)

## 2.2 Overburden Soil Sampling and Analysis

### 2.2.1 Sample Collection

Golder subcontracted a licensed well driller to advance borings into the overburden soil and install monitoring wells using roto sonic drilling methods. During boring operations, the driller collected continuous drill cores from all deep wells (i.e.” B” flagged wells). From the drill cores, Golder staff collected overburden samples from the depth of the screened intervals (i.e. 10-foot screened interval) from one background well soil boring (SB-07B), two downgradient well soil borings (SB-08B and SB-18B) and from five Assessment Monitoring well soil borings (SB-52B, SB-53B, SB-54B, SB-55B, and SB-56B). Golder staff also collected an additional sample from SB-53B (25’-27’) at the top of the screened interval due to minor unidentified visual soil staining encountered within the planned interval itself. An additional soil boring was completed just external to the slurry wall on the eastern side of the MCWB (OW-9) and samples were collected on approximately 10-foot intervals.

The driller used a “marsh buggy” with a hollow stem auger drill rig specifically designed to work in the wet, soft soil/ash conditions inside the CCR Unit to advance eight soil borings within the Drying Area. From these eight borings, 23 samples were analyzed for total metals with one of these samples (DA-14_4-6’) also analyzed using the 7-step sequential extraction. The only sample for which data are included in this report is DA-14_4-6’; all other data, which were obtained for other purposes, are provided in the Ash Pond Assessment Report (Golder 2020).

Soil borings were numbered to match the equivalent monitoring wells, where applicable. Golder field staff prepared a composite overburden sample from boreholes by selecting a two-foot interval from each drill core and submitting it to the laboratory for analysis under chain-of-custody procedures. The unique descriptions used to

identify the samples included the boring name and depth of the sample below ground surface (e.g., SB-07B-35'-37'). The sample type and analytical testing conducted on each sample are provided in Table 2.

**Table 2: Summary of Overburden Soil Samples/Analyses**

| Sample Location | Number of Samples | Analyses |
|---|---|---|
| Background boring (SB-07B) 35'-37' | 1 | Total metals, sequential extraction |
| Downgradient boring (SB-08B) 30'-32' | 1 | Total metals, sequential extraction |
| Downgradient boring (SB-18B) 32'-34' | 1 | Total metals, sequential extraction |
| Assessment boring (SB-52B) 35'-37' | 1 | Total metals, sequential extraction, mineralogical composition |
| Assessment boring (SB-53B) 25'-27' & 30'-32' | 2 | Total metals, sequential extraction |
| Assessment boring (SB-54B) 30'-32' | 1 | Total metals, sequential extraction, mineralogical composition |
| Assessment boring (SB-55B) 30'-32' | 1 | Total metals, sequential extraction |
| Assessment boring (SB-56B) 30'-32' | 1 | Total metals, sequential extraction, mineralogical composition |
| Downgradient boring (OW-9) 10'-12' & 18'-20' | 2 | Total metals, sequential extraction, mineralogical composition |
| Drying area boring (DA-14) 4'-6' | 1 | Total metals, sequential extraction |

### 2.2.2 Overburden Soil Analyses

Multiple geochemical methods were used to assess the mineralogical and chemical composition of the overburden soil samples. The selected geochemical test methods included the following:

- **Mineralogical composition:** The mineralogical analysis was used to identify and quantify the crystalline mineral phases in each sample. This information is required for geochemical modeling as the release or attenuation of constituents of interest is influenced by the mineral phase(s) present in the aquifer (Hem 1985). The mineralogical testing laboratory (SGS Minerals Services) performed the mineralogical analysis using quantitative (Rietveld) X-ray diffraction (XRD) and a Bruker AXS D8 Advance Diffractometer.
- **Total metals:** This analysis was used to quantify the chemical composition of overburden soils. The total mass of metals, in combination with the results of sequential extraction testing, can be used to determine the provenance of metals and verify sequential extraction results. The laboratory analyzed a target analyte list of

metals following the methods USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3 (November 2000) and USEPA SW846 7471B “Mercury in Solid or Semisolid Wastes (Manual Cold-Vapor Technique)”, Revision 2.

- **Sequential extraction:** The sequential extraction procedure (SEP) consisted of a seven-step procedure to extract metals from solids, as per Tessier et al. (1979), to identify the provenance of constituents of interest (i.e. the operationally-defined fraction that contains the metal)[1] and determine their potential environmental mobility. For instance, metals bound in the carbonate fraction, or that are exchangeable, are much more likely to become mobile due to changes in groundwater conditions than metals bound within a sulfide or silicate fraction. The summed concentration of a metal measured from all seven steps (SEP SUM) can be compared to the concentration determined from a total metals analysis (SEP Total) for compositional accountability. The laboratory analyzed the metals content of the extracted samples using the method USEPA SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2 (July 2014).

## 2.3 Groundwater Assessment Monitoring

Following the installation of a groundwater monitoring system in 2016 and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring around the CCR Unit pursuant to the requirements of 40 CFR §257.94. In 2018, Golder performed the first and second Assessment Monitoring sampling events pursuant to the requirements of 40 CFR §257.95. Following the first Assessment Monitoring sampling event, including verification sampling, the constituents that were detected above the groundwater protection standards (GWPS) at SSLs included:

- Cobalt and Lithium at GAMW-08
- Molybdenum at GAMW-18

The GWPS is the larger value of the Maximum Contaminant Level (MCL) or the unit-specific background concentration for each analyte based on a tolerance/prediction limit statistical procedure. However, USEPA amended the CCR Rule (i.e., Phase 1 Part 1 amendment) and created health-based standards for cobalt, lead, lithium, and molybdenum, constituents that do not have MCLs, as of August 29, 2018. Pursuant to 40 CFR §257.95(h)(2), the health-based standards can be used in place of background levels to calculate the GWPS. Consequently, after the second Assessment Monitoring event (October 2018), cobalt in monitoring well GAMW-08 remained as the only constituent detected at an SSL. Arsenic has never been detected above the GWPS or at an SSL, however, Golder also assessed arsenic as part of this evaluation due to sporadic detections at or above the MCL.

[1] Sequential extraction of metals from overburden samples consisted of seven discrete steps for this investigation:

Step 1 - Exchangeable Phase: This extraction includes trace elements that are revers bly adsorbed to overburden minerals, amorphous solids, and/or organic material by electrostatic forces.

Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.

Step 3 – Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g., iron).

Step 4 - Metal Hydroxide Phase: Trace elements bound to hydroxides of iron, manganese, and/or aluminum.

Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.

Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.

Step 7 - Residual Fraction: Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.

Although boron is not currently an Appendix IV constituent, USEPA is reportedly considering adding it to the Appendix IV list. The Indiana Department of Environmental Management (IDEM) has, however, established a health-based standard as part of the state cleanup program. Boron is frequently used as a tracer to indicate the extent of a release from a CCR management unit. Due to these characteristics and as a conservative measure, boron was selected by Golder to assess the nature and extent of groundwater impacts at the Site.

The health-based standards, unit-specific background concentration, and groundwater protection standards used in this evaluation are summarized in Table 3.

**Table 3: Summary of Health-Based Standards, Background Concentrations, and Groundwater Protection Standards for the Constituents of Interest**

| Constituent | Health-Based Standard (mg/L) | Background Concentration (mg/L) | Groundwater Protection Standard (mg/L) |
|---|---|---|---|
| Arsenic | 0.01 | 0.091 | 0.091 |
| Boron | 4(1) | | |
| Cobalt | 0.006 | 0.01 | 0.01 |
| Lithium | 0.04 | 0.01 | 0.04 |
| Molybdenum | 0.1 | 0.05 | 0.1 |

(1) IDEM health-based standard, not currently part of the CCR Rule

## 2.4 Groundwater and Porewater Geochemical Analysis

### 2.4.1 Estimation of Attenuation Rates

To evaluate the attenuation of arsenic, boron, cobalt, lithium, and molybdenum in groundwater at the Site and to assess the rate of attenuation, Golder applied the point decay method (USEPA 2011). The point decay method is used to determine the rate at which a constituent's concentrations are increasing or decreasing in groundwater at a single well between sampling events and this method can thus be used to predict when the constituent's concentrations will fall back below regulatory limits. Equation 1 describes first-order decay for a constituent:

$$Ln(C_t) = kt + Ln(C_0) \qquad \text{(Equation 1)}$$

where $C_0$ is the initial constituent concentration, $C_t$ is the constituent concentration at time t, t is the amount of time in years that has passed since the initial concentration measurement, and k is the first-order decay rate constant (1 per year). Equation 2 shows Equation 1 reorganized to solve for the decay rate constant:

$$k = (Ln(C_t) - Ln(C_0))/t \qquad \text{(Equation 2)}$$

Groundwater water quality data from the background and downgradient wells collected between July 2016 and November 2019 were used to determine the mean first-order decay rate for each constituent of interest. Due to variable detection limits, results that were reported as below detection limits were not used in the point decay analysis. Using Equation 1 and the mean first-order decay rate, Golder calculated the number of years that it would take for constituents of interest concentrations greater than the GWPS to decrease below their respective thresholds.

### 2.4.2 Geochemical Speciation Modeling Methods

Golder conducted geochemical modeling to evaluate general groundwater and porewater composition, determine the potential for precipitation of sorbent media, evaluate the potential for mineral precipitation or adsorption in the aquifer, and determine the speciation of metals of interest. The geochemical computer code developed by the United States Geological Survey (USGS), PHREEQC (Parkhurst and Appelo 2013), was used for these simulations. PHREEQC version 3.4 is a general-purpose geochemical modeling code used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). Reactions include aqueous equilibria, mineral dissolution and precipitation, ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely-accepted thermodynamic database, Minteq.v4, 2017 edition, was used as a basis for the thermodynamic constants required for modeling (USEPA 1998b).

The Geochemist's Workbench version 12 (Bethke 2015) was used to generate graphical representations of geochemical modeling outputs in the form of predominance, or Pourbaix diagrams (also known as Eh-pH diagrams) for the species of interest (i.e. arsenic, boron, cobalt, lithium, and molybdenum) and trilinear plots (also known as Piper plots) displaying the relative abundance of major ions. The Minteq.v4 database was used as the basis for the Pourbaix diagrams.

### 2.4.3 Predictive Geochemical Modeling Methods

Golder performed geochemical modeling to assess viable attenuation mechanisms and to predict the quantity and stability of the attenuated constituents of concern.

#### *2.4.3.1 Capacity of Adsorption as an Attenuation Mechanism*

Adsorption is an important mechanism by which constituents in groundwater can be attenuated. The adsorptive partitioning between dissolved and solid phases was simulated using a two-layer surface complexation model (SCM). The SCM approach is described in Davis and Kent (1990), with additional parameterization based on Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) utilizing iron (hydrous ferric oxide [Hfo]) as ferrihydrite [$Fe(OH)_{3(am)}$], and aluminum (hydrous aluminum oxide [Hao]) as gibbsite [$Al(OH)_{3(am)}$], as adsorbing surfaces.

The amount of Hfo and Hao available at the site for attenuation was based on the amorphous and metal hydroxide phase iron and aluminum concentrations measured in the SEP as described in Section 3.2.2. The minimum, mean, and maximum concentrations in soil borings were used in the adsorption models to capture the range of expected site concentrations. The Hfo and Hao surface properties (i.e., surface area, site density, and types of sites) from Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) were used to quantify the iron and aluminum adsorption sites per mole of mineral.

The calculation methodology of Appelo and Postma (2010) was used to determine the specific quantity of sites on each mineral surface type as a function of the amount of mineral available to participate in these reactions. The methodology assumes the number of surface sites (sites) equals the product of the moles of iron ([Fe]) and the moles of surface sites per mole of iron ([sites]/[Fe]= 0.2 moles of sites per mole of iron). For the amount of ferrihydrite available for sorption, the Appelo and Postma methodology further assumes the mass of ferrihydrite ($M_{HFO}$) in grams (g) available equals the product of the [Fe] and the molecular weight of ferrihydrite ($MW_{HFO}$ = 88.85 g/mole). The same approach was used to calculate the number of sites from gibbsite, assuming the [sites]/[Al] is 0.41 moles of sites per mole of aluminum and the molecular weight of gibbsite is 78.003 g/mole.

The geochemical thermodynamic database Minteq V.4 was used to conduct adsorption modeling. However, new and updated thermodynamic data have been released in scientific literature. These new data are important to include in the geochemical modeling exercises for certain elements or minerals as they allow further refinement of potential reactions, or for correction of previous data that may have been less accurate or more broadly defined. For groundwater modeling at the Site, Golder made numerous updates to the Minteq V.4 database, including the addition of data relating to partitioning coefficients for metals on gibbsite, developed by Karamalidis and Dzombak (2011). Of the five constituents of interest, the database did not contain partitioning coefficients for ferrihydrite or gibbsite for lithium, so its potential for adsorption could not be assessed.

To quantify current levels of adsorption, the concentration of constituents that adsorb in soils (as milligram (mg) of constituent/kilogram (kg) of soil) was modeled for the minimum, maximum, and mean Hfo and Hao contents when equilibrated with the range of groundwater qualities observed at the Site. To quantify the capacity of soil to adsorb additional amounts of each constituent, Golder simulated a step-wise increase in arsenic, boron, cobalt, and molybdenum concentrations (similar in concept to a titration, using the mean proportions observed in porewater) into the range of observed groundwater qualities while allowing equilibration with the sorption surfaces in soils (minimum, maximum and mean Hfo and Hao). The model was then used to predict the quantity of each constituent that would adsorb with this titration of additional arsenic, boron, cobalt, and molybdenum.

#### 2.4.3.2 Mineral Precipitation and Co-precipitation

The potential for mineral precipitation was assessed in PHREEQC using a saturation index (SI) calculated according to Equation 3.

$$SI = \log (IAP/Ksp) \quad \text{(Equation 3)}$$

The saturation index is the ratio of the ion activity product (IAP) of a mineral to the solubility product (Ksp). An SI value greater than zero indicates that the solution is supersaturated with respect to a particular mineral phase and, therefore, precipitation of this mineral may occur. An evaluation of precipitation kinetics is then required to determine whether the supersaturated mineral will indeed form. An SI value less than zero indicates the solution is undersaturated with respect to a particular mineral phase. An SI value close to zero indicates equilibrium conditions exist between the mineral and the solution. SI values between -0.5 and 0.5 are considered to represent ‘equilibrium’ in this report to account for the uncertainties inherent in the analytical methods and geochemical modeling.

Co-precipitation was evaluated based on published literature and known association between minerals and constituents of concern. For example, cobalt is known to coprecipitate with iron oxyhydroxides as well as adsorb to Hfo (Norstrom and Alpers 1999). Therefore, to evaluate co-precipitation, minerals identified by PHREEQC to be at equilibrium (SI > -0.5) were evaluated for their potential to host arsenic, boron, cobalt, lithium, and molybdenum.

#### 2.4.3.3 Capacity of Dilution and Dispersion as Attenuation Mechanisms

Dilution and dispersion are physical mechanisms of attenuation by which concentrations of constituents in groundwater decrease with migration along groundwater flowpaths.

To assess the potential for dilution and dispersion downgradient of the CCR Unit, Golder used MODPATH (Pollack 1989) and the calibrated Site Groundwater Flow model (discussed in Section 4.0 and Appendix B) to simulate travel times for particles released from the MCWB. The length of the particle traces produced by

MODPATH along with travel time estimates were used to calculate average groundwater velocities for the following flow paths: (see Figure 1):

- GAMW-16 to GAMW-53
- GAMW-18 to GAMW-55
- GAMW-17 to GAMW-54
- GAMW-09 to GAMW-54

The results of these flow path travel time simulations are presented in Table 4.

Golder estimated the capacity of dilution and dispersion to attenuate constituent concentrations from the CCR Unit using ratios of concentrations measured in monitoring wells along these flow paths, as presented in Table 8. For example, along the flow path from GAMW-16 to GAMW-53, concentrations of boron decreased from 9.7 milligram per liter (mg/L) to 3.1 mg/L, representing an estimated 68% decrease in concentration along the flow path due to dilution and attenuation.

#### *2.4.3.4 Long Term Stability of Attenuated Constituents*

Three sensitivity analyses were performed to assess the stability of adsorbed constituents under variable pH, redox, and ionic strength conditions. Variations in pH, redox, and ionic strength are the most likely types of changes that will occur in an aquifer over time affecting the stability of the constituents of interest (ITRC 2010). The sensitivity analyses were conducted applying the minimum, mean, and maximum Hfo and Hao contents determined for the Site soils, equilibrated with the groundwater qualities observed at the Site at the measured pH and redox conditions. For each sensitivity analysis, a single parameter was varied:

- **pH -** Hydrochloric acid or sodium hydroxide addition was modeled to vary the pH between 4 and 12 standard units (SU). A pH range of 4 to 10 is the typical range considered for evaluating metal speciation.
- **Redox -** DO addition was simulated to adjust reduction potential (Eh) values between -200 and +700 millivolts (mV) based on the historical and anticipated range of Eh in the region.
- **Ionic Strength -** Total dissolved solids (TDS) concentrations were increased by titrating in calcium, magnesium, sodium, potassium, chloride, and sulfate in the proportions observed in porewater. TDS concentrations were evaluated up to 10,000 mg/L, which is approximately four times higher than the highest TDS concentration observed in groundwater at the CCR Unit.

### 2.4.4 Geochemical Modeling Assumptions and Data Handling

Geochemical modeling assumptions and data handling included the following:

- **Groundwater continuity:** Three or four groundwater quality samples were collected from each well during sampling events conducted between September 2018 and November 2019. Samples from this period were selected for the geochemical modeling because all wells related to the CCR Unit were sampled and analyzed for the full suite of parameters described in Section 2.1.2 and the resulting data are assumed to provide a comprehensive overview of groundwater conditions. Temporal trend analysis for arsenic, boron, cobalt, lithium, and molybdenum made use of all available sampling events between July 2016 and November 2019.

- **Porewater chemistry:** Porewater samples collected from GAPIEZ-06 (three samples total in August, September, and October 2018), DAPZ-02A (one sample collected in March 2020), and DAPZ-02B (one sample collected in March 2020) were assumed to be representative of porewater found in the CCR Unit. Data from three sampling events from GAPIEZ-06 were used to evaluate porewater trends.
- **Redox values:** ORP values measured in the field were converted to Eh by adding 200 mV to the field-measured values as per YSI Tech Note (YSI 2015).
- **Non-detect values:** Constituents with concentrations less than their respective method reporting limits were assumed to have a concentration equal to half the reporting limit in model simulations.
- **Total recoverable concentrations:** Total recoverable fraction results were used for geochemical modeling.
- **Charge balance:** Groundwater and porewater compositions with charge balance errors less than 10% were considered valid. Compositions with charge balance errors greater than 10% were flagged as potentially less reliable, but still included in the geochemical modeling effort.

# 3.0 SUPPLEMENTAL ASSESSMENT RESULTS

## 3.1 Groundwater and Porewater

### 3.1.1 Groundwater Characterization

Groundwater quality data for background, downgradient, and Assessment Monitoring wells used for this evaluation were collected from September 2016 to November 2019. Non-regulated (per the CCR Rule) groundwater parameters (e.g., alkalinity, potassium, sodium) are only available from September 2018 to November 2019. The assessment of trends in arsenic, boron, cobalt, lithium, and molybdenum concentrations in groundwater included observations of all validated data collected during that time frame. Groundwater quality monitoring data are presented in Appendix A and can be summarized as follows:

- **Charge balance error:** Charge balance errors could only be assessed for samples for which the full suite of cations and anions was reported. Eleven groundwater samples had charge balance errors greater than 10%. Eight out of the eleven samples (GAMW-07 in November 2019, GAMW-07B in November 2019, GAMW-08B October 2018, GAMW-08B in November 2019, GAMW-18 in October 2018, GAMW-18B in October 2018, GAMW-18B in November 2019 and GAMW-56B in April 2019) reported charge balance errors between 10% and 15%. Only samples from GAMW-07B in September 2018, GAMW-18B in April 2019, and GAMW-56 in April 2019 had a charge balance error greater than 40%. All eleven results were flagged (Table 5) and retained, with the understanding that they may be somewhat less reliable. Upon subsequent sampling, charges balance errors decreased to <10 % in these wells.
- **pH:** Groundwater pH across background, downgradient, and Assessment Monitoring wells ranged from 5.2 to 8.7. The geometric mean pH across all wells was 7.2. GAMW-07B, GAMW-52B, GAMW-54B were the only wells that produced samples with a pH exceeding 8.0.
- **ORP (Redox):** Field-measured redox, corrected to Eh (+200 millivolts [mV]) values, ranged from -115 to +335 mV in the background monitoring well, downgradient monitoring well, Assessment Monitoring well, and porewater samples collected between September 2018 to November 2019. There was no apparent trend in redox conditions based on sample location or depth.

- **Total Dissolved Solids:** Groundwater TDS concentrations were variable. Generally, the lowest TDS concentrations (less than 400 mg/L) were measured in groundwater at Assessment Monitoring wells (GAMW-46, GAMW-46B, GAMW-52, GAMW-53) while TDS concentrations up to an order of magnitude higher were determined in groundwater at wells located immediately downgradient of the CCR Unit (e.g., GAMW-08B). In general, deep wells demonstrated higher TDS concentrations than shallower companion wells at the same locations.

- **Major ion chemistry:** A Piper plot was generated for all porewater samples and groundwater samples from background, downgradient, and Assessment Monitoring wells to facilitate the identification of water types and changes in major ion chemistry over time (Figure 2a-c). The majority of background, downgradient, and porewater samples are calcium-sulfate dominated. In general, deep wells have a higher proportion of sodium and sulfate than the shallower companion wells. The differences between shallow and deep companion wells are more pronounced in the Assessment Monitoring wells. Except for GAMW-54 and GAMW-55, the shallow samples from the assessment wells are calcium-(bi)carbonate dominated and plot in a different location on the Piper plot than background, downgradient, and porewater samples. Shallow wells GAMW-54 and GAMW-55, along with all the deep Assessment Monitoring wells, are calcium-sulfate dominated and plot with background, downgradient, and porewater samples. The water types have remained generally unchanged between September 2018 and November 2019. Generally, this indicates that groundwater types are consistent. However, based on major ion chemistry, there are different water types on the site that are likely influenced by variable site geology.

- **Arsenic:** Arsenic concentrations in groundwater samples collected from downgradient monitoring and Assessment Monitoring wells between September 2016 to November 2019 ranged from non-detect (<0.005 mg/L) to 0.022 mg/L (Figure 4a-c). The highest measured arsenic concentration in groundwater at the CCR Unit (0.091 mg/L) was reported in a sample collected from background well GAMW-15 in September 2018 (Figure 4a). No downgradient monitoring well has ever exceeded the GWPS of 0.091 mg/L designated for the CCR Unit. Arsenic concentrations in groundwater appear to be stable or decreasing in all downgradient monitoring wells (Figure 4b). Arsenic concentrations in the CCR Unit porewater (GAPIEZ-06) ranged from 0.011 to 0.012 mg/L in August and October 2018 (Appendix A-2). Arsenic concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were an order of magnitude lower (<0.0010 and 0.0018 mg/L, respectively). Based on the observed pH and Eh conditions, arsenic predominately occurs as an oxidized arsenate ($As^{+5}$) species, with arsenic in only a small number of samples present as a reduced arsenite ($As^{+3}$) species (Figure 3a). Arsenite is less readily adsorbed than arsenate and is thus generally regarded to be more mobile in natural environments (Nordstrom 2014).

- **Boron:** Boron concentrations in downgradient groundwater samples collected between September 2016 to November 2019 ranged from 0.056 mg/L to 25 mg/L (Figure 5a-c). The highest boron concentration (25 mg/L) was measured in monitoring well GAMW-09B in September 2017. Two background wells (GAMW-07B and GAMW-15B), seven downgradient wells (GAMW-08B, GAMW-09, GAMW-09B, GAMW-16B, GAMW-17, GAMW-17B, and GAMW-18B) and two Assessment Monitoring wells (GAMW-54B and GAMW-55B) reported boron concentrations greater than the health-based standards (4 mg/L). Boron concentrations in porewater were between 7.4 mg/L and 13.8 mg/L. Based on pH conditions on the Site, boron in all wells occurs predominately in the form of protonated boric acid ($H_3BO_3$) (Figure 3b). Generally, boron concentrations in the background and downgradient wells have remained stable or has decreased. This is also the case for all assessment and boundary well except for GAMW-55B, where boron has increased slightly. GAMW-55B is a deep well and heavily influenced by bedrock.

- **Cobalt:** Cobalt concentrations ranged from non-detect (<0.001 mg/L) to 0.059 mg/L in groundwater samples collected between September 2016 to November 2019 at the CCR Unit (Figure 6a-c). GAMW-08 had the highest cobalt concentration of all monitoring wells (0.059 mg/L in November 2016) and generally reported a decreasing trend thereafter (Figure 6b). The second highest concentration (0.010 mg/L in June 2017 and October 2018) occurred in GAMW-07, a background well (Figure 6a). GAMW-08 is the only well on Site to have reported a historic cobalt level greater than the GWPS (0.010 mg/L). Cobalt in porewater ranged from below the laboratory reporting limit (<0.0010 mg/L) to 0.0022 mg/L. Cobalt in all wells occurs predominately as the divalent cation $Co^{+2}$, based on pH and Eh conditions (Figure 3c). Cobalt concentrations appear to be stable or decreasing in groundwater samples collected from the upgradient, downgradient, and Assessment Monitoring wells.
- **Lithium:** Lithium concentrations in groundwater ranged from non-detect (<0.008 mg/L) to 0.025 mg/L between September 2016 to November 2019 (Figure 7a-c). Two downgradient wells, GAMW-18B and GAMW-08, located directly downgradient of the MCWB, have historically had the highest lithium concentrations (Figure 7b). Lithium concentrations historically have not exceeded 0.040 mg/L, the health-based standard. Lithium levels in GAMW-08 appear generally consistent over time, and a trend cannot be determined for GAMW-18B, as the well was recently installed and fewer than four sampling events have been conducted. Lithium concentrations in groundwater at all other wells downgradient of the CCR Unit appear to be stable. Lithium was not detected above the laboratory reporting limit (0.008 mg/L) in the CCR Unit porewater (GAPIEZ-06). Lithium concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were <0.008 mg/L and 0.016 mg/L, respectively. Lithium predominately occurs as the monovalent cationic species $Li^{+}$ based on field pH and Eh conditions (Figure 3d).
- **Molybdenum:** Molybdenum concentrations in groundwater ranged from non-detect (<0.010 mg/L) to 0.18 mg/L (Figure 8a-c). Although GAMW-18 has reported historical levels of up to 0.18 mg/L, concentrations have been below 0.1 mg/L (the health-based standard) since August 2017. No other CCR Unit monitoring wells have reported concentrations exceeding 0.1 mg/L. The molybdenum concentration in porewater has ranged from 0.063 mg/L to 0.81 mg/L. Molybdenum is predominately present in the form of the divalent anionic molybdate ($MoO_4^{-2}$) species based on field-measured pH and Eh conditions (Figure 3e).
- **Iron:** Total (un-filtered) iron concentrations were variable, ranging from non-detect (<0.1 mg/L) to 13 mg/L between September 2018 and November 2019 (Appendix A-1). The highest concentration of 13 mg/L was observed in the groundwater sample collected from Assessment Monitoring well GAMW-56. No geographical trend is apparent; however, deeper “B wells” generally tended to have higher total iron contents. Ferric iron ($Fe^{+3}$) concentrations were higher than ferrous iron ($Fe^{+2}$) concentrations in all samples, except for those collected from wells GAMW-15, GAMW-55B, and GAMW-56.
- **Nutrients:** Total nitrogen (nitrate + nitrite) was measured in groundwater samples collected in October 2018 and was present at low levels (i.e. less than 2.8 mg/L). Nitrate concentrations were measured in samples collected in 2019 and concentrations ranged from below the detection limit (<0.05 mg/L) to 7.7 mg/L. The highest reported nitrate concentration was found in GAMW-08 in May 2019 (7.7 mg/L-N). The presence of low-level nitrate confirms oxidized conditions surround the CCR Unit. Phosphate concentrations exceeding 1 mg/L were detected in groundwater samples from GAMW-15 and GAMW-16. Phosphate concentrations were below detection in groundwater samples collected from 18 of the 25 wells between September 2018 and November 2019. No geographical or temporal trend is apparent in the phosphate concentrations related to the CCR Unit (Appendix A).

The monitoring data also indicate that sulfate generally occurs at the highest concentrations immediately downgradient of the CCR Unit and in background monitoring wells (Figure 9a-c). As identified in Figure 2a-c, considering major groundwater chemistry and sulfate, the CCR Unit is likely influencing groundwater quality in Assessment Monitoring wells GAMW-54/54B and GAMW-55/55B. However, while affected by the CCR Unit, these wells report low concentrations of arsenic, cobalt, lithium, and molybdenum below health-based standards or below detection limits. Boron concentrations were elevated above its GWPS in both upgradient and downgradient wells, suggesting elevated concentrations are naturally occurring or due to an alternate source at the Site.

### 3.1.2 Evaluation of Attenuation Rates

The results of the point decay analysis for groundwater at background and downgradient wells (including Assessment Monitoring wells) between September 2016 and November 2019 are provided in Table 6, as mean site attenuation rates. This evaluation reveals that, despite concentrations generally increasing in background wells over time (as indicated by positive point decay constants), boron, cobalt, lithium, and molybdenum concentrations in downgradient wells have decreased (negative point decay constants) over that same monitoring period. The mean downgradient decay rates can be used to estimate the number of years it would take for elevated groundwater concentrations to decrease to the GWPS. Maximum concentrations of boron, cobalt and molybdenum observed in downgradient monitoring wells over the period of monitoring would take approximately 41 years, 39 years, and 20 years, respectively, to attenuate to concentrations below GWPS (or health-based standard for boron) based on these decay rates. The durations required to achieve regulatory standards for arsenic and lithium were not calculated because there are no exceedances of the GWPS for these constituents.

The positive mean point decay rate for arsenic in downgradient monitoring wells indicates that, on average, concentrations are increasing. Given the low concentrations in the porewater samples (≤ 0.012 mg/L), this trend is unlikely to be caused by the CCR Unit. Low-level increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are driving the positive point decay rate, but the arsenic concentrations in these wells remain sufficiently low (≤ 0.005 mg/L) and are likely caused by natural variability. Although an increasing trend of arsenic at these wells currently may exist, it is unlikely this trend will continue given the potential for attenuation (e.g., through sorption and dilution) to maintain arsenic concentrations below the GWPS.

### 3.1.3 Mineralogical Controls in Groundwater and Porewater

The results of speciation modeling of groundwater data from background, downgradient, and Assessment Monitoring wells between September 2018 and November 2019 are provided in Table 5, including saturation indices for relevant minerals. Mineral saturation can play an important role in attenuation of metals, either directly by their removal through mineral precipitation, or indirectly by providing sorptive surfaces or opportunities for co-precipitation.

- **Iron-bearing minerals:** Ferrihydrite was indicated to be at equilibrium with groundwater or oversaturated in nearly all samples, indicating a strong potential for ongoing precipitation of solid-phase iron oxides. Only two samples from Assessment Monitoring well GAMW-53 (April 2019 and November 2019) were modeled to be undersaturated with respect to ferrihydrite. Thus, it is assumed that iron (hydr)oxides are prevalent in the Site aquifers.
- **Other minerals:** Nearly all groundwater samples, with the exception of samples from GAMW-07 and GAMW-52, were simulated to be in equilibrium or oversaturated with respect to barite ($BaSO_4$). Fluorite

($CaF_2$) equilibrium was indicated in wells GAMW-07B, GAMW-08/08B, GAMW-17, and GAMW-52B. Gypsum ($CaSO_4.2H_2O$) was modeled to be in equilibrium in seven wells (GAMW-07B, GAMW-08B, GAMW-15B, GAMW-16B, GAMW-18, GAMW-18B, and GAMW-55B), most of which were deeper "B-wells" nearer to bedrock. Calcite ($CaCO_3$) equilibrium was indicated in all wells except GAMW-53.

In summary, several mineral phases likely control groundwater composition at some or all wells: barite, calcite, fluorite, ferrihydrite, and gypsum. In the case of ferrihydrite, the dissolved concentrations of constituents of interest can be reduced through its ability to act as a substrate for adsorption.

## 3.2 Overburden Soil

### 3.2.1 Mineralogical Composition

Quantitative XRD with Rietveld refinement was used to identify and quantify minerals in five overburden soil samples collected during the drilling activities (Table 7). Three of the samples were collected from the Assessment Monitoring well's soil borings and two samples were collected from the downgradient soil boring (OW-9). These samples were obtained to better understand the mineralogical composition of the aquifer system and identify any minerals that would potentially influence attenuation of constituents of interest. In addition, and in contrast, the presence of certain minerals could also indicate a potential for naturally occurring release of metals into groundwater, for instance due to oxidation of sulfide minerals.

The mineralogical analysis identified the iron sulfide minerals pyrite and marcasite at low levels in three of the five overburden soil samples, at concentrations up to 0.6 wt.%. These minerals can oxidize in the presence of even trace amounts of dissolved oxygen, which would lead to the liberation of trace metals or metalloids known to associate with sulfide minerals (e.g., arsenic, cobalt, and molybdenum) into groundwater (Smith and Huyck 1997). In addition, the associated release of iron creates the potential for formation of minerals with the ability to sorb trace elements.

The presence of the oxidized iron mineral hematite ($Fe_2O_3$) at 0.3 to 0.6 wt.% in three of the five overburden soil samples in the presence of reduced iron sulfide minerals indicates a spectrum of oxidation occurring in overburden soil samples. As pyrite or marcasite is oxidized, intermediate amorphous iron phases, such as ferrihydrite, would likely occur first. Over time, crystallization would progress, forming iron oxide-oxyhydroxides such as hematite or goethite (FeOOH). Therefore, it is likely a range of iron solid phases is present in the overburden soil, and the potential exists over time for an increased presence of amorphous and crystallized iron oxides-oxyhydroxides with a strong affinity to attenuate certain metals and metalloids (Dzombak and Morel 1990).

The mineralogical analysis also identified the carbonate minerals calcite ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$) in all overburden soil samples, with combined concentrations between 9 and 16 wt.%. Carbonate minerals are known to adsorb cobalt (Brady et al. 2003) while sorption and uptake of arsenic are possible as well (e.g., Romero et al. 2004). Carbonate minerals can dissolve when exposed to sulfuric acid formed by oxidation of sulfide minerals and release associated trace metals and metalloids (Section 3.2.2) into groundwater. Iron can also be released as carbonate minerals dissolve and potentially form metal hydroxide minerals.

### 3.2.2 Chemical Composition and Sequential Extraction

Chemical analysis and sequential extraction were conducted to determine the chemical composition and the distribution of constituents of interest over various operationally defined fractions of the overburden soil. This testing was completed per Table 2 on nine overburden soil samples from eight monitoring well locations, two samples from the OW-9 borehole, and one sample from within the Drying Area (reported in Table 8). Soil samples

from soil borings that correspond to well locations were collected from within the screened depth (except SB-53B 25'-27' which was collected above the screened depth).

A description of the individual fractions determined by sequential extraction is presented in Section 2.2.2, footnote 1. Metals extracted in steps 1 through 5 are considered environmentally available, whereas metals extracted in steps 6 and 7 are present in refractory fractions and are not expected to be released under conditions typically encountered in aquifers (Tessier et al. 1979). The sum of metal concentrations from the sequential extraction steps is expressed as "SEP SUM" in Table 8 and does not represent an analytically determined value. The concentration measured by total metals analysis is referred to as "SEP Total" in Table 8. Boron was not included in the SEP analysis due to method limitations.

The results from the chemical analysis and sequential extraction can be summarized as follows:

- **Iron:** Iron was present in all twelve samples analyzed, varying from 3,400 milligram per kilogram (mg/kg) (DA-14) to 9,900 mg/kg (SB-54B). In all samples, the refractory sulfide and residual fractions accounted for the largest proportion of total iron and, as such, most of the iron is not environmentally available (Figure 10). The labile fraction in steps 1 through 5 can generally be considered representative of the amount of iron in the overburden that may be available as a sorbing medium. While not a constituent of interest, iron and its minerals commonly represent the most important reservoir for metal/metalloid attenuation in soils or overburden. The labile fraction calculated from sequential extraction, therefore, can be used as a proxy for determining the total number of adsorption sites available for attenuation of arsenic, boron, cobalt, and molybdenum in the environment.
- **Arsenic:** Total arsenic in the soil overburden samples ranged from 1.9 to 6.2 mg/kg while the environmentally-available fraction ranged from 0.44 mg/kg in SB-55B to 3.0 mg/kg in SB-53B, representing from 31% to 59% of total arsenic (Figure 11). The majority of arsenic was present in the refractory fraction, predominantly associated with sulfide minerals. The amorphous metal and metal hydroxide fractions hosted all arsenic that was environmentally available except in SB-52B, where the carbonate fraction represented 8.5% of total arsenic. The highest concentrations of environmentally-available arsenic occurred in sample SB-56B, and the lowest concentrations were encountered in samples DA-14, SB-53B and SB-55B. The Drying Area sample (DA-14) had the second lowest environmentally-available arsenic concentrations (0.45 mg/kg) of all samples analyzed. Arsenic in DA-14 predominantly occurred in the sulfide and insoluble fractions.
- **Cobalt:** Total cobalt in soil borings ranged from 2.5 mg/kg to 6.1 mg/kg while the environmentally-available fraction ranged from 1.1 mg/kg in OW-9 to 2.9 mg/kg in SB-53B, representing from 27% to 60% of total cobalt (Figure 12). Those samples downgradient of the CCR Unit had similar total cobalt in the environmentally-available fraction as the background samples. In all boring samples, cobalt was most abundant in the metal hydroxide, sulfide, and residual fractions. Cobalt was also present in the carbonate phase in the nine soil bore samples (5% to 14% of total). Cobalt in the carbonate phase is most likely sorbed onto or coprecipitated with the calcite that was indicated to be in equilibrium with groundwater in geochemical modeling. Cobalt was not detected in the exchangeable phase. DA-14 reported the lowest total and environmentally-available cobalt concentrations (0.87 mg/L and 0.39 mg/L, respectively) of all samples analyzed, predominantly in the metal hydroxide and sulfide fractions.
- **Lithium:** Total lithium ranged from 4.2 to 11 mg/kg while the environmentally-available fraction ranged from 0.5 mg/kg in DA-14 to 11.4 mg/kg in SB-18B, representing from 12% to 74% of total lithium (Figure 13). The

majority of lithium was present in either the organic or the refractory fraction. The organic, carbonate, and metal hydroxide fractions hosted all lithium that was environmentally available. The highest concentrations of environmentally-available lithium occurred in samples SB-18B, SB-54B, SB-55B and SB-56B, and the lowest amount was encountered in SB-53B. Lithium concentrations in DA-14 were generally lower than in background and downgradient monitoring wells, with the majority of the lithium present in the sulfide and residual fractions.

- **Molybdenum:** Total molybdenum in overburden ranged from 0.15 to 3.8 mg/kg while the environmentally-available fraction ranged from non-detect to 2.83 mg/kg, in SB-53B (25'-27'), and accounted for 100% of all molybdenum in SB-18B and SB-53B (30'-32') (Figure 14). Molybdenum was most commonly present in the amorphous and metal hydroxide fractions. Notably, in background boring SB-07B and in SB-08B, a downgradient boring in close proximity of the CCR Unit, molybdenum was non-detect in overburden soil samples. The soil boring with the highest total molybdenum content, SB-53B, is located further downgradient from the CCR Unit. The Drying Area sample (DA-14) had the highest concentrations (15 mg/kg) of all samples analyzed. Molybdenum in DA-14 was present predominantly in the exchangeable fraction.

In summary, no definitive trends were present for arsenic, cobalt, lithium or molybdenum that indicated a higher concentration immediately downgradient of the CCR Unit relative to background locations or locations further downgradient. Based on the above results, attenuation by adsorption of all four constituents of interest is likely occurring, with the carbonates, amorphous metal oxides, and metal hydroxide fractions accounting for the majority of the attenuation.

# 4.0 GROUNDWATER MODELING RESULTS

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. Details of the flow model development are presented in Appendix B. This model was utilized to inform the natural attenuation study by simulating travel times for particles released from the MCWB, as presented in Table 4.

# 5.0 GEOCHEMICAL MODELING RESULTS

## 5.1 Identification and Capacity of Attenuation Mechanisms

### 5.1.1 Adsorption to Iron and Aluminum Oxyhydroxides

The Hfo and Hao surface area and sorption site calculations for the minimum, mean, and maximum soil boring iron and aluminum concentrations are presented in Table 10. Adsorption modeling in PHREEQC revealed a large range of adsorption capacities expected for the different constituents at the site. Figure 15 displays the predicted trajectories of aqueous concentrations before and after adsorption onto Hfo and Hao in soils (minimum, mean and maximum Hfo and Hao), as additional arsenic, boron, cobalt, and molybdenum are titrated into solution. The bold lines display the geometric means for all groundwater scenarios within each soil scenario and the grey area represents the range for the 5$^{th}$ to 95$^{th}$ percentile of all soil scenarios. As mentioned in Section 2.4.3.1.2, lithium adsorption to iron and aluminum oxyhydroxides was not modeled due to a lack of available thermodynamic data.

The predicted trajectories are compared against the GWPS and porewater concentrations. On the plots, the further the predicted trajectories are to the right of the 1:1 line, the larger the amount of the constituent that has sorbed to Hfo and Hao surface sites in soils and is no longer predicted to reside in the aqueous phase. For boron, little to no adsorption is predicted by the model, so aqueous concentration before adsorption are almost identical to concentrations after adsorption. For arsenic, a large proportion is expected to adsorb, with a capacity to bring

average arsenic concentrations to below 0.01 mg/L when concentrations are at approximately 10 mg/L or lower prior to adsorption. At higher arsenic concentrations (> 10 mg/L), the relative sorption capacity is diminished as sorption sites are filled and aqueous concentrations after adsorption are predicted to increase above its GWPS. For cobalt and molybdenum, the trajectories run parallel to the 1:1 line, indicating that sorption capacity is directly proportional to the concentration before adsorption. The modeling results suggest that adsorption has the capacity to reduce cobalt concentrations below approximately 0.1 mg/L down to the GWPS of 0.01 mg/L and molybdenum concentrations below approximately 0.2 mg/L down to the GWPS of 0.1 mg/L. The 95$^{th}$ percentile of modeled trajectories show that a minority of pH and redox conditions at site were less favorable for attenuating cobalt or molybdenum, as seen by the proximity to the 1:1 line.

### 5.1.2 Co-precipitation

In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely due to co-precipitation with the dolomite or calcite identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also considered possible. However, per the SEP results, no arsenic was found to be associated with carbonate minerals. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

### 5.1.3 Physical Attenuation

Table 9 presents the predicted concentrations at Assessment Monitoring wells, assuming the minimum and maximum amount of dilution and dispersion downgradient of the CCR Unit (Section 4.0). The highest concentrations of arsenic, boron, cobalt, lithium, and molybdenum measured in porewater were “diluted” in the geochemical simulations with the maximum concentrations observed in side-gradient wells GAMW-52, GAMW-52B, GAMW-56, and GAMW-56B to provide a conservative estimate of dilution and dispersion.

For arsenic, cobalt, and lithium, the maximum concentrations in porewater were below the GWPS. Dilution and dispersion with groundwater from side-gradient wells generally resulted in a further decrease below the GWPS. At GAMW-56, arsenic and cobalt concentrations were elevated over those in porewater. Consequently, dilution/dispersion of porewater with water from GAMW-56 resulted in higher concentrations relative to porewater, though still below GWPS.

For boron the maximum porewater concentrations were elevated above the health-based standard (345%) and for molybdenum, the maximum porewater concentrations were elevated above the GWPS (810%). The 32 to 63 percent reduction in concentrations by dilution and dispersion alone was not sufficient to bring the maximum porewater concentrations below the relevant standards. For boron, concentrations in background monitoring well GAMW-15 were twice as high as those in porewater. Due to this background source, boron concentrations in side-gradient wells are also relatively high and limit the effectiveness of dilution to reduce boron concentrations downgradient of the CCR Unit. For molybdenum, concentrations in monitoring wells have been below GWPS since March 2018, indicating additional dilution/dispersion or other attenuating processes have reduced porewater concentrations between the CCR Unit and the monitoring wells. As a consequence, molybdenum concentrations will likely remain below the GWPS.

## 5.2 Long-Term Stability of Attenuated Constituents

The expected variations in dissolved concentration as a function of pH, Eh, and TDS are presented in Figures 16, 17, and 18, respectively. Results are presented along with GWPS values and the range of pH, Eh, or TDS values (5th percentile to 95th percentile) observed at the Site. Responses to changes in pH, Eh, and TDS vary widely by constituent. The results of the adsorption stability modeling for arsenic, boron, cobalt, and molybdenum can be summarized as follows:

- **Arsenic:** For the range of pH values observed at the site, greater than 95% of the arsenic is expected to sorb to Hfo and Hao (Figure 16a). At pH values below 6.0, a conversion of arsenate to arsenite is modeled to release the adsorbed arsenic into groundwater. For alkaline pH values between 8.0 and 10.0, there is a small amount of additional capacity for arsenic to adsorb. At extremely alkaline conditions (pH greater than 10.0), higher proportions of negatively-charged sorption sites on Hfo and Hao limit the effectiveness of sorption of anionic species, resulting in higher amounts of desorbed arsenic. Under reducing conditions (Eh less than -100 mV), arsenic is largely present as arsenite and sorption is limited (Figure 17a). Over intermediate redox conditions (Eh between 0 and 500 mV), adsorbed arsenic is relatively stable. Above 500 mV, arsenic is expected to desorb again. Under increasing TDS concentrations (Figure 18a), arsenic sorption declines as other anions compete with and replace arsenic from sorption surfaces. For arsenic, TDS concentrations at the Site could quadruple relative to observed values before aqueous concentrations increase above the GWPS.
- **Boron:** Based on the relatively small proportion of boron that can be adsorbed to Hfo and Hao surface sites, changes in pH, Eh, and TDS concentrations are modeled to have only a minor impact on aqueous concentrations, as evidenced by the horizontal trends in Figures 16b, 17b, and 18b.
- **Cobalt:** The pH response of cobalt (Figure 16c) is broadly similar to that of arsenic, with cobalt being nearly completely in dissolved form under acidic conditions but generally sorbed under alkaline conditions. Cobalt was generally modeled to be unresponsive to changes in redox conditions (Figure 17c), with little additional cobalt sorbing or desorbing over the range of tested Eh conditions. Cobalt was also not responsive to increases in TDS concentrations (Figure 18c), with sorption remaining relatively unchanged as TDS concentrations increased 4- to 40-fold above the commonly-observed range at the Site.
- **Molybdenum:** For molybdenum, lower pH values (more acidic conditions) were generally more favorable for adsorption (Figure 16d). At alkaline pH values (pH greater than 10), nearly all molybdenum is desorbed and present in the dissolved phase. Over the range of common Eh values at site (Figure 17d), molybdenum sorption is relatively stable. Highly reducing conditions are predicted to increase molybdenum adsorption and highly oxidizing conditions are predicted to reduce adsorption. Molybdenum adsorption is generally insensitive to increases in TDS concentrations (Figure 18d), with TDS concentrations up to 10,000 mg/L less than doubling the aqueous concentrations due to desorption.

# 6.0 TIER I EVALUATION

The potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum was evaluated in accordance with recommended practices and guidance promulgated by the USEPA and the ITRC (USEPA 2007a; USEPA 2007b; ITRC 2010). According to USEPA (USEPA 2007a), the purpose of the Tier 1 evaluation is to “Demonstrate that the groundwater plume is not expanding and that sorption of the contaminant onto aquifer solids is occurring where immobilization is the predominant attenuation process.” Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Plume Stability:** Based on the water quality monitoring data presented in this Assessment Monitoring, groundwater concentrations of arsenic, boron, cobalt, lithium, and molybdenum outside of the CCR Unit appear to be stable or decreasing. Evaluation of trend charts generally did not reveal increasing trends in wells downgradient of the CCR Unit (Figures 4 to 8), including for parameters such as boron and sulfate, which are considered common indicators of CCR leaching (Figures 5 and 10). These observations indicate that the distribution of arsenic, boron, cobalt, lithium, and molybdenum in the aquifer is stable.
- **Magnitude of Exceedances:** Arsenic has remained below the CCR Unit GWPS (0.091 mg/L) in all downgradient monitoring wells. Boron concentrations exceed the health-based standard (4 mg/L) in nine of the downgradient (Downgradient Monitoring and Assessment Monitoring) wells, but concentrations are generally within the range of background monitoring well concentrations, suggesting naturally-elevated levels or an alternative source of boron causing the concentrations in groundwater at the Site. The cobalt concentration in groundwater at GAMW-08, the only downgradient monitoring well exceeding the GWPS, has shown a decreasing trend since 2016. The most recent concentration of cobalt (0.011 mg/L in November 2019) was just 0.001 mg/L above the GWPS of 0.010 mg/L. No wells exceed the health-based lithium standard (0.04 mg/L). Molybdenum concentrations in all wells have been consistently below the health-based standard of 0.1 mg/L since August 2017, indicating a low likelihood of a future exceedances based on historical trends.
- **CCR Unit Porewater:** The CCR Unit at RMSGS was placed into service in 1976 and historical records are not available for ash additions or porewater concentrations over the CCR Unit's lifespan. However, based on recent porewater data, the arsenic concentration in the CCR Unit (0.011 mg/L to 0.018 mg/L) is well below the GWPS of 0.091 mg/L. Cobalt and lithium concentrations in porewater in the CCR Unit were low and only detected above their laboratory reporting limit in a single sample (0.0022 mg/L and 0.016 mg/L, respectively). This indicates that the CCR Unit is not a potential source for these metals. Boron concentrations in the porewater (8.3 mg/L to 13.8 mg/L) are elevated above the health-based standard of 4 mg/L but are below levels observed in the two deep background monitoring wells GAMW-07B (15-23 mg/L) and GAMW-15B (13-18 mg/L). Molybdenum in the CCR Unit was measured at concentrations up to 0.81 mg/L, above its GWPS. Even so, molybdenum concentrations in groundwater downgradient of the CCR Unit are currently below the GWPS.
- **Groundwater Chemistry:** The groundwater monitoring results and the findings of the geochemical modeling support the potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum. Equilibrium of groundwater with the mineral phase ferrihydrite was modeled to occur in all groundwater samples and calcite equilibrium was indicated in all downgradient monitoring wells except GAMW-53. This is consistent with the results from the sequential extraction analysis that indicate carbonate, amorphous, and metal hydroxide fractions sequester arsenic, boron, cobalt, lithium, and molybdenum.
- **Confirmation of Attenuation/Immobilization:** Based on both mineralogical and chemical analysis, it is evident that attenuation of arsenic, cobalt, lithium, and molybdenum by aquifer materials is occurring. Iron, capable of forming (hydr)oxide phases that facilitate metals attenuation (Dzombak and Morel 1990), was identified in all overburden samples. Mineralogical analysis confirmed iron was present as an oxide phase in the form of hematite in all overburden samples. Arsenic, cobalt, lithium, and molybdenum demonstrated a high degree of immobilization due to attenuation on carbonate, amorphous, and metal hydroxide fractions. This indicates that these phases have been and are scavenging or attenuating constituents that were once present in solution. Groundwater samples from Assessment Monitoring wells GAMW-53/53B, GAMW-

54/54B, GAMW-55/55B, and GAMW-56/56B report a similar major ion signature as groundwater in monitoring wells proximal to the CCR Unit. However, no arsenic, cobalt, lithium, or molybdenum has been detected in these wells above background levels. In addition, soil borings from these wells contained significant proportions of constituents attenuated in various phases, especially in the case of lithium. As a result, the groundwater concentrations of these constituents are maintained at low levels, demonstrating attenuation.

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered candidates for an MNA remedy application and were deemed to meet the criteria for Tier I MNA in accordance with USEPA guidance (USEPA 2007a,b).

# 7.0 TIER II EVALUATION

The purpose of the Tier II evaluation is to "Identify mechanisms and rates of the operative attenuation process." Based on this definition, the following modeling results and observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** PHREEQC modeling results show that adsorption is likely attenuating arsenic, cobalt and, to a lesser degree, molybdenum downgradient of the CCR Unit. This is concluded based on equilibration of site-specific groundwater compositions with the range of Hfo and Hao concentrations observed in SEP results of Site overburden soils. Minor amounts of boron are also expected to attenuate. The sorbing capacity of Hfo and Hao surface sites is partially dependent on the concentrations of the constituents of interest in groundwater. The titration modeling (Figure 15) shows how the soil's capacity to adsorb constituents increases if groundwater concentrations of arsenic, boron, cobalt, and molybdenum were to increase above current levels. In addition to metal oxyhydroxides, clay minerals and/or particular organics can also act as a substrate for attenuation (Goldberg et al. 1993; Goldberg and Forster 1996), but this mechanism was not included in the current evaluation.

  The findings from the modeling are supported by the results of the sequential extraction testing. The presence of arsenic, cobalt, lithium, and molybdenum in the amorphous and metal oxyhydroxide fractions of soils indicates that adsorption is occurring spatially across the monitored area downgradient of the CCR Unit.

- **Co-precipitation:** In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely the result of co-precipitation with dolomite or calcite, which were identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also possible. However, there was no arsenic associated with carbonate minerals as identified by SEP. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

- **Estimated Site Attenuation Rates:** Concentrations of boron, cobalt, lithium, and molybdenum are decreasing in downgradient monitoring wells, resulting in negative calculated point decay rates. A positive point decay rate for arsenic suggests that its concentrations are increasing, but low concentrations in porewater indicate that the trend does not imply an impact from the CCR Unit. Increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are

driving the positive point decay rate, but the arsenic concentrations in these wells are low (less than 0.005 mg/L) and are likely driven by natural variability. Using the mean decay rate, maximum concentrations of boron, cobalt and molybdenum observed in downgradient and Assessment monitoring wells would take approximate 41 years, 39 years, and 20 years, respectively, to attenuate to below GWPS. Arsenic and lithium concentrations in downgradient and Assessment Monitoring wells are already below the GWPS.

- **Advanced Groundwater Modeling:** Groundwater flow results indicate between 32% and 63% dilution and dispersion of groundwater at monitoring wells with upgradient and side-gradient water as it flows towards the Assessment Monitoring wells. This dilution and dispersion attenuate concentrations along the flow paths. Arsenic, cobalt, and lithium concentrations in porewater are already below GWPS in the available monitoring data (August 2018 to March 2020). Dilution and dispersion with groundwater from side-gradient Assessment Monitoring wells (GAMW-52/52B and GAMW-56/56B) would further reduce these concentrations relative to the GWPS. Boron and molybdenum concentrations are elevated above the health-based standards in porewater (and in background wells for boron). As such, while dilution and dispersion reduce concentrations by about 30% to 60%, this is insufficient to dilute porewater to such a degree that the resulting boron and molybdenum concentration decline to below the health-based standards. The concentrations of molybdenum measured in downgradient groundwater at Assessment Monitoring wells have remained below the GWPS, so additional physical and/or chemical attenuation is likely occurring between the CCR Unit and the Assessment Monitoring wells. Modeled groundwater velocities indicate that travel times between downgradient and Assessment Monitoring wells are between 4.5 and 31 years. The modeling results also indicate that groundwater would take between 27 and 130 years to travel from the downgradient monitoring wells to the property boundary (GAMW-46/46B).

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered to be candidates for an MNA remedy application and deemed to meet the criteria for Tier II MNA in accordance with USEPA guidance (USEPA 2007a and 2007b).

## 8.0 TIER III EVALUATION

According to USEPA (USEPA 2007a), the purpose of the Tier III evaluation is to eliminate sites for an MNA remedy where (1) “Capacity of the aquifer is insufficient to attenuate the COC mass to regulatory standards” and/or (2) “Stability of the immobilized COC is insufficient to prevent remobilization due to future changes in groundwater chemistry”. Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** For arsenic, titration modeling shows that groundwater concentrations could increase up to approximately 2.5 mg/L before exceeding the capacity of soils (95$^{th}$ percentile of scenarios) to attenuate arsenic below the GWPS (0.091 mg/L). Groundwater arsenic concentrations up to 10 mg/L are predicted to attenuate below the GWPS for the average soil capacity scenario. Similarly, cobalt concentrations in groundwater could increase up to approximately 0.02 mg/L before exceeding the capacity of soils (95$^{th}$ percentile of scenarios) to attenuate cobalt below the GWPS (0.01 mg/L). Under the average soil capacity scenario, the aquifer has the capacity to reduce cobalt concentrations as high as 0.1 mg/L to below the GWPS.

  For boron and molybdenum, modeling suggests that adsorption can reduce a portion of the dissolved load, but that there is not sufficient adsorption capacity alone to reduce the concentrations observed in porewater below the health-based standard. However, current molybdenum concentrations observed in downgradient

and Assessment Monitoring wells indicate that the combined long-term attenuation from sorption, dilution, and dispersion is sufficient to reduce concentrations below health-based standards. In addition to iron oxyhydroxides, molybdenum and boron (as well as arsenic and cobalt) are known to adsorb to other metal (hydr)oxides (e.g., manganese, aluminum), clay minerals and particulate organic matter, providing additional sorption capacity in the soils.

- **Stability Modeling for Adsorbed Constituents:** Stability modeling indicates that for the conditions (i.e. pH, Eh, and TDS ranges) determined in groundwater at the Site, adsorbed species of arsenic, boron, cobalt, and molybdenum are relatively stable and remain attenuated. The modeling results further suggest that the adsorption of arsenic, cobalt, and molybdenum could be reversed with sufficiently large fluctuations in pH and Eh conditions at the Site, but there is no historical basis to expect such occurrences. Based on the mineralogical test results for Site soils, carbonate minerals are widely distributed downgradient of the CCR Unit. Groundwater that is in contact with carbonate minerals is typically buffered against large fluctuations in pH. Total alkalinity concentrations in groundwater at the Site (generally between 50 and 410 mg $CaCO_3$/L) support the notion that the groundwater has significant buffering capacity.

  Modeling results also indicate that increasing TDS concentrations could result in an increase in aqueous concentrations of arsenic, cobalt, and molybdenum due to competition for sorption sites. However, the impact is predicted to be relatively minor over the range of TDS concentrations observed at the site. The maximum TDS concentration measured in porewater was 3,830 mg/L and even at those levels, there is sufficient attenuation capacity from the soils to maintain arsenic, boron, cobalt, and molybdenum concentrations below GWPS

# 9.0 CONCLUSIONS

Golder performed a supplemental Assessment Monitoring followed by an attenuation evaluation, which serve as the Tier I, II, and III evaluation of MNA feasibility at RMSGS for arsenic, boron, cobalt, lithium, and molybdenum with respect to the CCR Unit. This evaluation has been completed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and the ITRC (ITRC 2010). Based on the results of this evaluation, Golder makes the following assessment for the individual parameters:

- Arsenic: Physical and chemical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Arsenic is a candidate for MNA at the RMSGS Site.
- Boron: Physical attenuation of boron is occurring at the RMSGS based on substantial decreases of boron in assessment wells. However, the high levels of boron upgradient of the CCR impoundments make it difficult to determine if the evaluation of if MNA will be successful. An alternative or natural source of boron should be further investigated prior to making a MNA determination for boron based on current findings.
- Cobalt: Chemical and physical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Cobalt is a candidate for MNA at the RMSGS Site.
- Lithium: Physical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Lithium is a candidate for MNA at the RMSGS Site.
- Molybdenum: Physical and some chemical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Molybdenum is a candidate for MNA at the RMSGS Site.

Therefore, it is recommended that a Tier IV evaluation be completed to design a long-term monitoring plan and contingent remedy for arsenic, boron, cobalt, lithium, and molybdenum.

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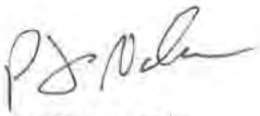
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# Signature Page

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# Tables

**Table 4: Summary of Travel Time Simulations and Attenuation Estimates**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Shallow Flow Paths | | | | Deep Flow Paths | | | |
|---|---|---|---|---|---|---|---|---|
| **Starting Well** | **GAMW-16** | **GAMW-18** | **GAMW-17B** | **GAMW-09B** | **GAMW-16B** | **GAMW-18B** | **GAMW-17B** | **GAMW-09B** |
| **Ending Well** | **GAMW-53** | **GAMW-55** | **GAMW-54B** | **GAMW-54B** | **GAMW-53B** | **GAMW-55B** | **GAMW-54B** | **GAMW-54B** |
| **Distance (ft)** | **1521** | **1964** | **1200** | **1714** | **1521** | **1964** | **1200** | **1714** |
| **Effective Porosity = 16%** | | | | | | | | |
| Travel Time (years) | 4.8 | 11.0 | 4.5 | 8.9 | 5.0 | 11.0 | 5.5 | 9.0 |
| Velocity (ft/year) | 317 | 179 | 267 | 193 | 304 | 179 | 218 | 190 |
| Time to Davis Ditch (years) | 5.5 | - | - | - | 6 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 27 | 49 | 41 | - | 28.5 | 45 | 41 |
| **Effective Porosity = 30%** | | | | | | | | |
| Travel Time (years) | 8.5 | 19.8 | 8.0 | 16.0 | 8.9 | 20.0 | 10.0 | 16.5 |
| Velocity (ft/year) | 179 | 99 | 150 | 107 | 171 | 98 | 120 | 104 |
| Time to Davis Ditch (years) | 10 | - | - | - | 9.9 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 49.8 | 79 | 75 | - | 51.5 | 80 | 76 |
| **Effective Porosity = 46%** | | | | | | | | |
| Travel Time (years) | 13.0 | 31.0 | 12.0 | 25.0 | 13.5 | 29.0 | 15.0 | 25.0 |
| Velocity (ft/year) | 117 | 63 | 100 | 69 | 113 | 68 | 80 | 69 |
| Time to Davis Ditch (years) | 15 | - | - | - | 15 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 76.8 | 122 | 117 | - | 77 | 130 | 120 |
| **Estimate of Dilution/Attenuation Along Flow Path** | | | | | | | | |
| Starting concentration (mg/L) | 9.7 | 13 | 12 | 12 | 9.7 | 13 | 12 | 12 |
| End concentration (mg/L) | 3.1 | 8.2 | 6.4 | 6.4 | 3.1 | 8.2 | 6.4 | 6.4 |
| End Concentration as % of starting concentration | 32% | 63% | 53% | 53% | 32% | 63% | 53% | 53% |
| Dilution/Attenuation along flow path | 68% | 37% | 47% | 47% | 68% | 37% | 47% | 47% |

**Notes:**
ft = feet
mg/L = milligrams per liter

Prepared by: GOL
Checked by: PJN
Reviewed by: RWB

**Table 5: Groundwater Geochemical Modeling Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAPIEZ06 08-2018 | GAPIEZ06 09-2018 | GAPIEZ06 10-2018 | DAPZ-02A 03-2020 | DAPZ-02B 03-2020 | GAMW04 10-2018 | GAMW04 04-2019 | GAMW04 11-2019 | GAMW07 10-2018 | GAMW07 05-2019 | GAMW07 11-2019 | GAMW07B 09-2018 | GAMW07B 10-2018 | GAMW07B 05-2019 | GAMW07B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -3.9 | -1.3 | -5.5 | -7.8 | -4.3 | 5.1 | -1.3 | -9.0 | -3.7 | -3.7 | **-10.8** | **82.8** | -6.8 | -7.0 | **-10.1** |
| **MINERAL PHASES - Saturation Indices** [a] | | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.3 | -2.3 | -1.1 | -3.2 | -2.6 | -2.9 | -3.1 | -2.4 | -3.8 | -2.3 | -2.1 | -1.5 | -3.2 | -2.4 | -2.8 |
| Ferrihydrite | $Fe(OH)_3$ | **2.1** | **2.1** | **3.1** | **0.5** | **2.2** | **2.9** | **1.4** | **0.5** | -6.6 | **1.9** | **0.4** | **3.6** | -1.6 | **4.2** | **-0.2** |
| Siderite | $FeCO_3$ | **-0.1** | **-0.1** | -0.8 | **-0.4** | -0.7 | -2.1 | **0.5** | -1.7 | -3.3 | -3.6 | -1.4 | **1.1** | -0.5 | -0.7 | **-0.3** |
| Melanterite | $FeSO_4 7H_2O$ | -4.9 | -5.0 | -7.2 | -4.5 | -5.1 | -6.1 | -4.0 | -6.5 | -6.7 | -8.3 | -6.5 | -6.8 | -4.4 | -5.3 | -4.5 |
| Anglesite | PbSO | -4.5 | -4.5 | -6.1 | -4.2 | -4.4 | -4.0 | -4.2 | -4.5 | -4.2 | -4.5 | -4.7 | -7.4 | -4.0 | -4.3 | -4.1 |
| Gypsum | $CaSO_4:2H_2O$ | -0.6 | -0.6 | -0.6 | -0.7 | -1.0 | **0.0** | **-0.4** | -0.7 | -0.6 | -0.7 | -0.7 | -2.5 | **-0.2** | **-0.2** | **-0.2** |
| Jarosite-H | $(H_3O)Fe_3(SO_4)_2(OH)_6$ | -7.1 | -6.9 | -11.4 | -7.6 | -5.6 | -3.6 | -8.9 | -10.7 | -26.4 | -6.7 | -12.2 | -10.2 | -15.0 | -0.7 | -12.1 |
| Jarosite-K | $KFe_3(SO_4)_2(OH)_6$ | **-0.4** | **-0.3** | -3.0 | -2.1 | **1.3** | **4.5** | -1.3 | -4.3 | -21.4 | **0.2** | -5.3 | -2.2 | -8.4 | **6.8** | -5.1 |
| Jarosite-Na | $NaFe_3(SO_4)_2(OH)_6$ | -2.5 | -2.4 | -4.9 | -5.0 | -1.8 | **1.6** | -3.0 | -6.7 | -24.5 | -3.0 | -8.6 | -4.3 | -10.6 | **4.5** | -7.6 |
| Calcite | $CaCO_3$ | **0.3** | **0.2** | **1.8** | -0.6 | **-0.4** | **0.0** | **0.1** | **0.1** | -1.2 | **0.2** | **0.4** | **1.3** | **-0.3** | **0.4** | **0.0** |
| Magnesite | $MgCO_3$ | -0.9 | -1.0 | **0.5** | -2.1 | -1.7 | -1.5 | -1.4 | -1.3 | -2.6 | -1.1 | -0.9 | **0.0** | -1.5 | -0.8 | -1.3 |
| Barite | BaSO | **0.7** | **0.6** | **0.7** | **1.0** | **0.9** | **0.9** | **1.1** | **0.9** | **0.9** | **0.9** | **0.7** | -1.2 | **1.2** | **1.1** | **1.0** |
| Witherite | $BaCO_3$ | -3.8 | -3.9 | -2.3 | -4.4 | -3.9 | -4.4 | -3.7 | -3.6 | -5.1 | -3.7 | -3.5 | -2.7 | -4.3 | -3.6 | -4.1 |
| Fluorite | $CaF_2$ | -1.0 | -0.8 | -1.0 | -2.0 | -2.4 | -2.3 | -1.5 | -2.1 | -1.1 | -0.8 | -1.0 | **0.8** | **-0.4** | -0.6 | -0.6 |
| CoCO3 | $CoCO_3$ | -4.2 | -4.4 | -2.9 | -4.3 | -4.2 | -4.1 | -4.2 | -4.3 | -4.3 | -3.1 | -3.0 | -3.2 | -5.0 | -4.2 | -4.6 |
| Cerrusite | $PbCO_3$ | -2.0 | -2.1 | -2.1 | -2.6 | -2.0 | -2.2 | -2.0 | -2.1 | -3.2 | -2.0 | -2.0 | -1.9 | -2.5 | -2.0 | -2.2 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.3 | -2.2 | -4.5 | -1.0 | -1.8 | -2.4 | -2.4 | -1.7 | **-0.3** | -1.8 | -2.1 | -3.2 | -1.6 | -2.4 | -2.0 |

**Notes:**
Charge balances errrors highlighted in **red** are greater than +/-10%
Non-detect values assumed equal to 1/2 analytical detection limit
Redox converted from field ORP to Eh by +200 mV
[a] Saturation indices greater than -0.5 are identified by bold type and grey shading
[b] pCO2(g) values presented at $10^{\wedge value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW08 10-2018 | GAMW08 05-2019 | GAMW08 11-2019 | GAMW08B 09-2018 | GAMW08B 10-2018 | GAMW08B 05-2019 | GAMW08B 11-2019 | GAMW09 10-2018 | GAMW09 05-2019 | GAMW09 11-2019 | GAMW09B 09-2018 | GAMW09B 10-2018 | GAMW09B 05-2019 | GAMW09B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -2.9 | -3.7 | -6.6 | -9.7 | **-12.2** | -8.3 | **-11.7** | -5.0 | -5.0 | -6.0 | -5.7 | -6.7 | -3.0 | -6.5 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.5 | -2.1 | -2.0 | -2.3 | -2.5 | -2.5 | -2.2 | -3.0 | -2.8 | -2.8 | -2.4 | -2.3 | -2.2 | -2.2 |
| Ferrihydrite | $Fe(OH)_3$ | **1.7** | **2.3** | **2.4** | **1.8** | **3.1** | **4.1** | **3.6** | **0.2** | **1.3** | **0.7** | **2.0** | **2.5** | **3.7** | **2.2** |
| Siderite | $FeCO_3$ | -1.8 | -2.2 | -2.1 | **0.2** | **0.1** | **-0.4** | **0.1** | -2.3 | -3.1 | -2.5 | **-0.2** | **-0.1** | **-0.2** | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -6.7 | -7.3 | -7.2 | -4.5 | -4.4 | -4.9 | -4.6 | -6.7 | -7.3 | -7.0 | -5.1 | -5.1 | -5.2 | -5.0 |
| Anglesite | PbSO | -4.6 | -4.8 | -4.8 | -4.4 | -4.2 | -4.2 | -4.4 | -4.3 | -4.2 | -4.3 | -4.5 | -4.6 | -4.7 | -4.7 |
| Gypsum | $CaSO :2H_2O$ | -0.7 | -0.6 | -0.5 | **-0.2** | **-0.2** | **-0.2** | **-0.2** | -0.7 | -0.6 | -0.8 | -0.8 | -0.7 | -0.8 | -0.9 |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -6.6 | -6.5 | -6.5 | -8.4 | -3.5 | -0.9 | -3.6 | -10.6 | -8.2 | -10.1 | -6.8 | -6.1 | -2.6 | -7.3 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | **0.0** | **0.9** | **1.0** | -1.3 | **3.4** | **6.2** | **4.0** | -4.3 | -1.3 | -3.7 | **-0.3** | **0.5** | **4.2** | -0.7 |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -2.9 | -2.1 | -1.9 | -3.1 | **1.4** | **4.3** | **2.0** | -7.1 | -4.2 | -6.5 | -2.2 | -1.5 | **2.1** | -2.9 |
| Calcite | $CaCO_3$ | **0.2** | **0.5** | **0.7** | **0.6** | **0.3** | **0.3** | **0.6** | **-0.3** | **-0.3** | **-0.4** | **0.0** | **0.3** | **0.2** | **0.2** |
| Magnesite | $MgCO_3$ | -1.2 | -0.7 | -0.6 | -0.9 | -1.1 | -1.2 | -0.8 | -2.0 | -1.8 | -2.0 | -1.0 | -0.8 | -0.8 | -0.8 |
| Barite | BaSO | **0.7** | **0.9** | **1.0** | **1.0** | **0.9** | **0.8** | **0.8** | **0.6** | **0.8** | **0.6** | **0.8** | **0.8** | **0.7** | **0.5** |
| Witherite | $BaCO_3$ | -3.7 | -3.3 | -3.2 | -3.6 | -4.0 | -4.0 | -3.7 | -4.3 | -4.2 | -4.3 | -3.7 | -3.6 | -3.6 | -3.7 |
| Fluorite | $CaF_2$ | **-0.4** | **-0.1** | **-0.2** | **-0.4** | **-0.5** | **-0.2** | **-0.3** | -1.9 | -1.9 | -1.9 | -0.5 | -0.6 | -0.6 | -0.6 |
| CoCO3 | $CoCO_3$ | -2.9 | -2.8 | -2.5 | -4.0 | -4.4 | -4.3 | -4.0 | -4.8 | -4.7 | -4.8 | -4.1 | -4.3 | -4.4 | -4.0 |
| Cerrusite | $PbCO_3$ | -2.2 | -1.9 | -1.9 | -2.0 | -2.1 | -2.1 | -1.9 | -2.4 | -2.2 | -2.3 | -2.1 | -2.0 | -2.0 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -1.5 | -1.8 | -2.0 | -2.6 | -2.3 | -2.5 | -2.7 | -1.7 | -2.1 | -2.0 | -2.1 | -2.2 | -2.2 | -2.4 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW15 10-2018 | GAMW15 05-2019 | GAMW15 11-2019 | GAMW15B 09-2018 | GAMW15B 10-2018 | GAMW15B 05-2019 | GAMW15B 11-2019 | GAMW16 10-2018 | GAMW16 05-2019 | GAMW16 11-2019 | GAMW16B 09-2018 | GAMW16B 10-2018 | GAMW16B 05-2019 | GAMW16B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | 0.4 | -4.5 | -7.1 | -5.7 | -3.8 | -5.0 | -5.3 | -0.7 | -7.5 | 8.2 | -3.0 | -2.7 | -4.4 | -8.7 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -4.3 | -2.6 | -2.3 | -2.0 | -3.0 | -2.5 | -2.3 | -2.3 | -2.2 | -4.1 | -1.8 | -2.7 | -2.4 | -2.1 |
| Ferrihydrite | $Fe(OH)_3$ | -6.2 | **2.7** | **2.5** | **3.3** | -2.6 | **3.8** | **1.1** | **0.0** | **3.3** | **4.1** | **4.1** | **0.5** | **4.2** | **3.8** |
| Siderite | $FeCO_3$ | -1.6 | **0.1** | **0.2** | **0.0** | -0.9 | -0.8 | **0.0** | **-0.3** | -0.7 | -3.0 | **0.6** | **-0.1** | **-0.1** | **0.5** |
| Melanterite | $FeSO\ 7H_2O$ | -4.7 | -4.4 | -4.9 | -5.1 | -5.0 | -5.2 | -4.8 | -5.3 | -5.6 | -6.2 | -4.8 | -4.6 | -4.8 | -4.5 |
| Anglesite | PbSO | -4.3 | -4.4 | -4.7 | -4.7 | -4.1 | -4.2 | -4.5 | -4.6 | -4.5 | -4.1 | -4.9 | -4.3 | -4.4 | -4.6 |
| Gypsum | $CaSO :2H_2O$ | -1.1 | -0.9 | -1.1 | -0.6 | -0.6 | **-0.3** | **-0.4** | -0.9 | -0.6 | -0.6 | **-0.4** | **-0.4** | **-0.3** | **-0.3** |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -23.5 | -4.2 | -5.9 | -4.8 | -18.1 | -1.4 | -10.2 | -13.0 | -3.6 | -2.5 | -2.9 | -9.9 | -0.7 | -3.0 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | -19.4 | **2.5** | **0.5** | **2.3** | -12.0 | **5.9** | -3.2 | -6.6 | **3.4** | **4.5** | **4.3** | -3.7 | **6.4** | **4.3** |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -21.9 | **-0.1** | -2.0 | **0.3** | -13.9 | **3.9** | -5.3 | -9.1 | **0.8** | **1.9** | **2.1** | -5.9 | **4.1** | **2.6** |
| Calcite | $CaCO_3$ | -2.1 | **-0.3** | **-0.1** | **0.6** | **-0.4** | **0.2** | **0.4** | **0.1** | **0.3** | -1.5 | **0.9** | **0.1** | **0.4** | **0.7** |
| Magnesite | $MgCO_3$ | -3.4 | -1.4 | -1.3 | -0.8 | -1.8 | -0.9 | -1.0 | -1.4 | -1.1 | -3.0 | **-0.5** | -1.4 | -0.9 | -0.7 |
| Barite | BaSO | **0.5** | **0.8** | **0.5** | **1.1** | **1.0** | **1.4** | **1.0** | **0.5** | **0.7** | **0.6** | **1.0** | **1.0** | **1.2** | **1.1** |
| Witherite | $BaCO_3$ | -5.8 | -4.0 | -3.8 | -3.1 | -4.2 | -3.5 | -3.5 | -3.9 | -3.7 | -5.6 | -3.0 | -3.9 | -3.4 | -3.2 |
| Fluorite | $CaF_2$ | -1.3 | -1.5 | -1.3 | -1.4 | -1.3 | -1.0 | -0.9 | -0.8 | -0.8 | -0.8 | -1.0 | -1.1 | -1.0 | -0.9 |
| CoCO3 | $CoCO_3$ | -5.5 | -3.6 | -3.6 | -4.0 | -4.8 | -4.3 | -4.1 | -4.1 | -4.0 | -5.8 | -3.6 | -4.5 | -4.2 | -3.9 |
| Cerrusite | $PbCO_3$ | -3.7 | -2.1 | -2.1 | -1.9 | -2.4 | -2.0 | -2.0 | -2.1 | -2.0 | -3.4 | -1.9 | -2.3 | -2.0 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | **0.1** | -1.9 | -2.1 | -2.6 | -1.5 | -2.2 | -2.4 | -2.0 | -2.2 | -4.8 | -2.7 | -1.7 | -2.3 | -2.6 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW17 10-2018 | GAMW17 05-2019 | GAMW17 11-2019 | GAMW17B 09-2018 | GAMW17B 10-2018 | GAMW17B 05-2019 | GAMW17B 11-2019 | GAMW18 10-2018 | GAMW18 04-2019 | GAMW18 11-2019 | GAMW18B 09-2018 | GAMW18B 10-2018 | GAMW18B 04-2019 | GAMW18B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | 0.8 | -0.5 | -6.6 | -3.6 | 1.1 | 0.6 | -4.3 | **-10.9** | -6.4 | -9.2 | -3.2 | **-10.4** | **-48.7** | **-10.9** |
| **MINERAL PHASES - Saturation Indices** [a] | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.8 | -2.2 | -1.9 | -2.0 | -2.2 | -2.3 | -2.0 | -3.0 | -3.0 | -2.5 | -2.0 | -2.9 | -4.7 | -2.1 |
| Ferrihydrite | $Fe(OH)_3$ | -2.9 | **2.5** | **2.9** | **3.3** | **0.1** | **3.6** | **4.3** | -0.7 | **1.7** | **0.9** | **2.8** | **0.6** | **2.1** | **2.2** |
| Siderite | $FeCO_3$ | -2.1 | -2.6 | -2.6 | **0.4** | **0.3** | **0.1** | **-0.1** | -2.5 | -2.9 | -1.8 | **0.6** | -0.5 | -5.1 | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -6.8 | -7.7 | -8.1 | -5.0 | -4.9 | -5.0 | -5.5 | -6.7 | -6.8 | -6.4 | -4.5 | -4.7 | -7.3 | -4.9 |
| Anglesite | PbSO | -4.5 | -4.8 | -5.0 | -4.9 | -4.8 | -4.8 | -4.9 | -4.3 | -4.1 | -4.3 | -4.6 | -4.1 | -3.7 | -4.6 |
| Gypsum | $CaSO :2H_2O$ | -0.8 | -1.0 | -1.1 | -0.9 | -0.9 | -1.0 | -0.9 | -0.6 | **-0.4** | **-0.3** | **-0.4** | **-0.5** | **-0.4** | -0.6 |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -19.9 | -6.7 | -6.3 | -4.5 | -13.3 | -2.1 | -1.6 | -12.0 | -5.3 | -9.3 | -5.6 | -8.8 | -5.3 | -7.6 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | -14.0 | **0.2** | **0.6** | **2.5** | -6.5 | **4.7** | **5.5** | -6.4 | **0.8** | -2.8 | **1.6** | -2.6 | **1.1** | -0.5 |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -16.7 | -2.4 | -2.1 | **0.2** | -8.8 | **1.8** | **2.9** | -9.0 | -1.7 | -5.3 | **-0.3** | -4.4 | -2.5 | -2.4 |
| Calcite | $CaCO_3$ | **-0.2** | **0.1** | **0.4** | **0.5** | **0.3** | **0.2** | **0.4** | **-0.4** | **-0.4** | **0.3** | **0.6** | **-0.3** | -2.1 | **0.4** |
| Magnesite | $MgCO_3$ | -1.4 | -0.8 | -0.7 | -0.9 | -1.0 | -0.9 | -0.7 | -2.2 | -2.1 | -1.5 | -0.6 | -1.5 | -4.6 | -0.7 |
| Barite | BaSO | **0.8** | **0.6** | **0.6** | **0.7** | **0.8** | **0.9** | **0.8** | **0.7** | **0.9** | **1.0** | **1.0** | **0.9** | **1.0** | **0.6** |
| Witherite | $BaCO_3$ | -4.0 | -3.6 | -3.3 | -3.2 | -3.4 | -3.3 | -3.2 | -4.5 | -4.5 | -3.8 | -3.3 | -4.3 | -6.0 | -3.7 |
| Fluorite | $CaF_2$ | **-0.5** | -0.6 | -0.6 | -1.1 | -1.3 | -1.3 | -1.3 | -3.3 | -2.9 | -2.3 | -1.2 | -1.3 | -0.9 | -1.0 |
| CoCO3 | $CoCO_3$ | -4.6 | -4.0 | -3.8 | -4.0 | -4.0 | -4.2 | -3.8 | -4.8 | -5.2 | -4.3 | -4.1 | -5.0 | -6.8 | -4.3 |
| Cerrusite | $PbCO_3$ | -2.4 | -2.0 | -2.0 | -2.0 | -2.0 | -2.1 | -2.0 | -2.5 | -2.4 | -2.1 | -2.0 | -2.3 | -3.8 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -1.6 | -2.4 | -2.6 | -2.3 | -2.1 | -1.7 | -2.4 | -1.2 | -1.5 | -1.8 | -2.4 | -1.5 | -3.9 | -2.4 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW52 09-2018 | GAMW52 10-2018 | GAMW52 05-2019 | GAMW52 11-2019 | GAMW52B 09-2018 | GAMW52B 10-2018 | GAMW52B 05-2019 | GAMW52B 11-2019 | GAMW53 09-2018 | GAMW53 10-2018 | GAMW53 04-2019 | GAMW53 11-2019 | GAMW53B 09-2018 | GAMW53B 10-2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -2.9 | 3.4 | 4.0 | -1.3 | -7.2 | 1.1 | -1.7 | -6.4 | 3.9 | 2.9 | -1.5 | 1.3 | -0.7 | -1.6 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -1.9 | -2.7 | -2.3 | -1.9 | -1.6 | -2.9 | -2.3 | -2.4 | -3.5 | -3.0 | -4.0 | -3.5 | -2.2 | -2.2 |
| Ferrihydrite | $Fe(OH)_3$ | **2.9** | **2.2** | **2.3** | **2.3** | **3.4** | **1.5** | **3.8** | **2.0** | **-0.1** | -1.9 | -0.8 | -1.1 | **1.1** | **1.3** |
| Siderite | $FeCO_3$ | -1.0 | -2.7 | -3.1 | -1.3 | **1.2** | **-0.1** | **-0.4** | **-0.1** | -1.4 | -1.1 | -2.9 | -2.3 | **0.1** | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -6.9 | -8.4 | -8.9 | -7.3 | -5.2 | -5.3 | -5.7 | -5.3 | -5.9 | -6.0 | -6.7 | -6.7 | -5.1 | -5.1 |
| Anglesite | PbSO | -5.4 | -5.3 | -5.5 | -5.5 | -5.9 | -4.9 | -5.0 | -4.8 | -4.4 | -4.6 | -4.5 | -4.7 | -4.8 | -4.7 |
| Gypsum | $CaSO :2H_2O$ | -1.6 | -2.0 | -2.3 | -1.7 | -1.2 | -1.2 | -1.3 | -1.1 | -2.0 | -1.9 | -2.4 | -2.3 | -0.8 | -0.7 |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -6.2 | -7.4 | -7.9 | -8.7 | -7.5 | -8.4 | -2.7 | -7.4 | -9.6 | -16.9 | -11.6 | -13.6 | -9.8 | -9.2 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | **0.3** | -1.3 | -1.7 | -2.0 | **0.1** | -1.9 | **4.2** | -0.7 | -5.0 | -11.7 | -6.6 | -8.6 | -3.6 | -2.8 |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -2.4 | -4.1 | -4.5 | -4.7 | -1.8 | -3.8 | **2.2** | -2.6 | -7.9 | -14.6 | -9.6 | -11.7 | -5.6 | -4.8 |
| Calcite | $CaCO_3$ | **0.2** | **-0.4** | **-0.4** | **0.2** | **1.1** | **0.0** | **0.1** | **0.1** | -1.7 | -1.1 | -2.6 | -2.0 | **0.3** | **0.3** |
| Magnesite | $MgCO_3$ | -1.1 | -1.6 | -1.5 | -1.0 | **-0.2** | -1.3 | -1.1 | -1.2 | -2.9 | -2.4 | -3.5 | -3.0 | -1.3 | -1.3 |
| Barite | BaSO | **0.0** | -0.6 | -0.8 | **-0.3** | **1.1** | **1.1** | **1.1** | **1.3** | **-0.3** | **-0.3** | **-0.3** | **-0.3** | **0.6** | **0.7** |
| Witherite | $BaCO_3$ | -3.5 | -4.3 | -4.3 | -3.7 | -1.9 | -3.1 | -2.8 | -2.9 | -5.3 | -4.8 | -5.9 | -5.3 | -3.5 | -3.5 |
| Fluorite | $CaF_2$ | -2.0 | -2.2 | -2.4 | -2.1 | **0.4** | -2.4 | -2.4 | -2.3 | -2.8 | -2.7 | -4.8 | -4.7 | -1.5 | -1.6 |
| CoCO3 | $CoCO_3$ | -3.7 | -4.4 | -4.2 | -3.8 | -3.2 | -4.5 | -4.0 | -4.1 | -5.1 | -4.6 | -5.9 | -5.4 | -4.0 | -4.0 |
| Cerrusite | $PbCO_3$ | -2.0 | -2.1 | -2.0 | -2.0 | -2.0 | -2.2 | -2.0 | -2.1 | -2.6 | -2.3 | -3.1 | -2.8 | -2.1 | -2.1 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.1 | -1.8 | -1.9 | -2.3 | -3.0 | -1.8 | -2.1 | -2.1 | -0.9 | -1.3 | -1.2 | -1.3 | -1.9 | -2.0 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW53B 04-2019 | GAMW53B 11-2019 | GAMW54 09-2018 | GAMW54 10-2018 | GAMW54 04-2019 | GAMW54 11-2019 | GAMW54B 09-2018 | GAMW54B 10-2018 | GAMW54B 05-2019 | GAMW54B 11-2019 | GAMW55 09-2018 | GAMW55 10-2018 | GAMW55B 09-2018 | GAMW55B 10-2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -2.8 | -2.7 | -1.7 | 2.0 | -3.0 | -3.0 | -1.5 | 1.8 | -6.0 | -3.8 | -1.3 | 0.7 | -6.0 | -2.6 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.1 | -2.1 | -3.3 | -1.7 | -2.8 | -2.3 | -2.7 | -1.2 | -2.4 | -2.4 | -2.8 | -2.5 | -2.6 | -2.5 |
| Ferrihydrite | $Fe(OH)_3$ | **4.1** | **3.3** | **1.5** | **-0.3** | **1.4** | **1.0** | **1.0** | **2.9** | **3.4** | **2.8** | **2.1** | **0.9** | **1.2** | **1.7** |
| Siderite | $FeCO_3$ | **-0.4** | **0.1** | -2.5 | -0.6 | -2.1 | -1.1 | **-0.1** | **1.5** | **0.1** | **0.1** | -1.2 | -1.4 | **-0.1** | **0.0** |
| Melanterite | $FeSO\ 7H_2O$ | -5.8 | -5.3 | -6.7 | -6.6 | -6.6 | -6.5 | -4.7 | -4.7 | -4.8 | -4.7 | -5.8 | -6.1 | -4.7 | -4.7 |
| Anglesite | PbSO | -4.9 | -4.9 | -4.5 | -5.4 | -4.5 | -5.1 | -4.3 | -5.8 | -4.5 | -4.5 | -4.4 | -4.5 | -4.4 | -4.4 |
| Gypsum | $CaSO :2H_2O$ | -0.9 | -1.0 | -1.3 | -1.4 | -1.2 | -1.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.5 | -0.5 | **-0.5** |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -1.4 | -4.2 | -4.8 | -17.1 | -7.5 | -10.3 | -8.3 | -9.7 | -2.4 | -3.8 | -4.3 | -9.0 | -7.9 | -6.8 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | **5.2** | **2.4** | **0.0** | -10.5 | -1.7 | -4.4 | -2.1 | -1.6 | **4.2** | **2.7** | **1.7** | -2.6 | -1.7 | **-0.4** |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | **3.0** | **0.2** | -2.4 | -12.9 | -4.1 | -7.0 | -4.0 | -3.6 | **2.2** | **0.7** | -0.9 | -5.2 | -3.6 | -2.3 |
| Calcite | $CaCO_3$ | **0.4** | **0.3** | -1.1 | **0.5** | -0.7 | **-0.2** | **-0.1** | **1.6** | **0.2** | **0.2** | **-0.1** | **0.1** | **0.1** | **0.2** |
| Magnesite | $MgCO_3$ | -1.1 | -1.2 | -2.5 | -0.8 | -1.8 | -1.5 | -1.5 | **0.2** | -1.1 | -1.1 | -1.7 | -1.4 | -1.4 | -1.2 |
| Barite | BaSO | **0.5** | **0.7** | **0.4** | **0.3** | **0.4** | **-0.1** | **1.1** | **1.1** | **1.1** | **1.1** | **1.0** | **0.9** | **1.3** | **1.2** |
| Witherite | $BaCO_3$ | -3.5 | -3.3 | -4.8 | -3.2 | -4.4 | -4.0 | -3.7 | -2.1 | -3.5 | -3.5 | -3.8 | -3.7 | -3.5 | -3.4 |
| Fluorite | $CaF_2$ | -1.5 | -1.3 | -2.6 | -2.6 | -2.7 | -2.2 | -1.7 | -1.5 | -1.4 | -1.3 | -1.4 | -1.5 | -2.0 | -2.1 |
| CoCO3 | $CoCO_3$ | -3.9 | -3.9 | -5.1 | -3.5 | -4.6 | -4.2 | -4.5 | -3.0 | -4.2 | -4.2 | -3.5 | -3.4 | -4.6 | -4.3 |
| Cerrusite | $PbCO_3$ | -2.0 | -2.1 | -2.8 | -2.0 | -2.2 | -2.1 | -2.3 | -2.0 | -2.1 | -2.1 | -2.4 | -2.2 | -2.3 | -2.2 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.0 | -2.2 | -1.0 | -2.7 | -1.6 | -1.7 | -1.6 | -3.5 | -1.9 | -1.8 | -1.4 | -1.7 | -1.7 | -1.9 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW55B 05-2019 | GAMW55B 11-2019 | GAMW55R 11-2019 | GAMW56 09-2018 | GAMW56 10-2018 | GAMW56 04-2019 | GAMW56 11-2019 | GAMW56B 09-2018 | GAMW56B 10-2018 | GAMW56B 04-2019 | GAMW56B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -5.4 | -6.2 | -5.5 | 4.4 | -1.6 | 61.8 | 3.5 | 0.7 | 2.6 | -13.1 | -4.8 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.4 | -2.2 | -2.3 | -2.4 | -2.0 | -2.7 | -2.2 | -2.3 | -2.3 | -2.3 | -2.3 |
| Ferrihydrite | $Fe(OH)_3$ | **3.0** | **2.0** | **1.4** | **1.5** | **2.5** | **2.9** | **1.7** | **1.2** | **2.0** | **3.7** | **1.7** |
| Siderite | $FeCO_3$ | **0.0** | **0.2** | -1.9 | **0.5** | **0.8** | -0.7 | **0.1** | **0.2** | **0.1** | **0.2** | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -4.8 | -4.8 | -6.9 | -5.1 | -5.1 | -5.9 | -5.6 | -5.0 | -5.2 | -4.8 | -4.9 |
| Anglesite | PbSO | -4.5 | -4.6 | -4.6 | -5.4 | -5.5 | -5.1 | -5.4 | -5.0 | -5.1 | -4.7 | -4.7 |
| Gypsum | $CaSO :2H_2O$ | -0.6 | -0.6 | -0.8 | -1.7 | -1.7 | -1.9 | -1.7 | -1.2 | -1.3 | -1.0 | -0.9 |
| Jarosite-H | $(H_3O)Fe_3(SO )_2(OH)_6$ | -3.6 | -7.1 | -8.6 | -8.3 | -6.6 | -4.3 | -8.7 | -8.8 | -6.6 | -1.5 | -7.8 |
| Jarosite-K | $KFe_3(SO )_2(OH)_6$ | **2.9** | **-0.5** | -1.9 | -2.5 | **-0.4** | **2.4** | -2.6 | -2.6 | **-0.4** | **4.6** | -1.2 |
| Jarosite-Na | $NaFe_3(SO )_2(OH)_6$ | **1.0** | -2.4 | -4.4 | -5.4 | -3.2 | **0.4** | -5.7 | -5.0 | -2.7 | **1.7** | -3.5 |
| Calcite | $CaCO_3$ | **0.2** | **0.4** | **0.2** | **-0.1** | **0.2** | -0.6 | **0.1** | **0.0** | **0.0** | **0.0** | **0.1** |
| Magnesite | $MgCO_3$ | -1.1 | -1.0 | -1.2 | -1.5 | -1.1 | -1.2 | -1.2 | -1.2 | -1.1 | -1.3 | -1.1 |
| Barite | BaSO | **1.0** | **1.0** | **0.6** | **0.0** | **0.0** | **-0.1** | **-0.1** | **0.6** | **0.4** | **0.8** | **0.9** |
| Witherite | $BaCO_3$ | -3.5 | -3.4 | -3.8 | -3.7 | -3.5 | -4.2 | -3.7 | -3.6 | -3.6 | -3.5 | -3.5 |
| Fluorite | $CaF_2$ | -2.0 | -2.0 | -1.3 | -0.8 | -1.0 | -1.7 | -1.2 | -1.7 | -1.9 | -1.7 | -1.7 |
| CoCO3 | $CoCO_3$ | -4.2 | -4.0 | -4.1 | -3.8 | -2.9 | -3.4 | -2.9 | -4.2 | -4.2 | -4.2 | -4.2 |
| Cerrusite | $PbCO_3$ | -2.1 | -2.1 | -2.1 | -2.2 | -2.0 | -2.2 | -2.1 | -2.1 | -2.1 | -2.0 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.0 | -2.1 | -2.0 | -1.2 | -1.6 | -1.6 | -1.6 | -1.4 | -1.3 | -1.6 | -1.8 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

Prepared by GOL
Checked by PJN
Reviewed by RV

**Table 6: Average Point Decay Rates in Background and Downgradient Wells**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Constituent | Units | Point Decay Constants (first-order decay) | |
|---|---|---|---|
| | | Background Wells | All Downgradient Wells (including Assessment Wells) |
| Arsenic | $yr^{-1}$ | -0.33 | **0.11** |
| Boron | $yr^{-1}$ | 0.04 | **-0.04** |
| Cobalt | $yr^{-1}$ | 0.36 | **-0.05** |
| Lithium | $yr^{-1}$ | 0.20 | **-0.06** |
| Molybdenum | $yr^{-1}$ | 0.28 | **-0.03** |

**Notes:**
$yr^{-1}$ = rate per year

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

**Table 7: Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Mineral | Mineral Formula | OW-9 18-20' (wt %) | OW-9 10-12' (wt %) | SB-52B-35'-37' (wt %) | SB-54B-30'-32' (wt %) | SB-56B-30'-32' (wt %) |
|---|---|---|---|---|---|---|
| Quartz | $SiO_2$ | 69 | 60 | 53 | 61 | 72 |
| Pyrite | $FeS_2$ | - | - | 0.39 | 0.10 | 0.12 |
| Marcasite | $FeS_2$ | - | - | 0.22 | - | - |
| Muscovite | $KAl_2(AlSi_3O_{10})(OH)_2$ | 3.6 | 3.5 | 7.8 | 1.7 | 1.3 |
| Biotite | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | - | - | 1.1 | 0.57 | 0.16 |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | - | - | 2.6 | 1.0 | 1.1 |
| Microcline | $KAlSi_3O_8$ | 5.2 | 9.1 | 9.2 | 7.5 | 6.6 |
| Orthoclase | $KAlSi_3O_8$ | - | - | 2.2 | 0.65 | 0.57 |
| Hematite | $Fe_2O_3$ | - | - | 0.26 | 0.44 | 0.57 |
| Dolomite | $CaMg(CO_3)_2$ | 6.5 | 9.8 | 7.9 | 9.6 | 5.3 |
| Calcite | $CaCO_3$ | 4.8 | 3.6 | 4.7 | 5.8 | 3.9 |
| Albite | $NaAlSi_3O_8$ | 8.3 | 11 | 7.3 | 9.1 | 6.4 |
| Epidote | $Ca_2(Al,Fe)Al_2O(SiO_4)(Si_2O_7)(OH)$ | 1.6 | 1.5 | 2.8 | 2.1 | 1.9 |
| Anatase | $TiO_2$ | - | - | - | - | - |
| Cancrinite | $Na_6Ca(CO_3)(AlSiO_4)_6 \cdot 2H_2O$ | 0.87 | 1.7 | - | - | - |
| TOTAL | | 100 | 100 | 100 | 100 | 100 |

**Notes:**

wt % = percent by weight of each mineral

Non-detect minerals within a sample are represented with "-"

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Aluminum | Total Metal Result | 1900 | 3100 J+ | 2200 J+ | 1100 | 1300 | 3200 | 1500 | 1400 | 2000 | 2200 | 1600 |
| Aluminum | SEP Step 1 | 52 U | 48 U | 47 U | 47 U | 51 U | 44 U | 48 U | 44 U | 49 U | 48 U | 49 U |
| Aluminum | SEP Step 2 | 15 J | 63 J | 16 J | 35 UJ | 38 UJ | 8.8 J | 11 J | 33 UJ | 12 J | 36 UJ | 5.9 J |
| Aluminum | SEP Step 3 | 44 | 540 | 60 | 15 | 31 | 33 | 75 | 30 | 34 | 23 | 29 |
| Aluminum | SEP Step 4 | 300 | 1600 | 280 | 160 | 130 | 110 | 130 | 100 | 130 | 100 | 360 |
| Aluminum | SEP Step 5 | 200 UJ | 80 J | 180 U | 170 U | 190 UJ | 28 J | 31 J | 34 J | 180 UJ | 180 UJ | 180 UJ |
| Aluminum | SEP Step 6 | 1000 | 1600 | 840 | 520 | 1100 | 1200 | 750 | 820 | 1400 | 1200 | 1300 |
| Aluminum | SEP Step 7 | 22000 | 11000 | 23000 | 15000 | 23000 | 25000 | 16000 | 19000 | 23000 | 21000 | 25000 |
| Aluminum | SEP SUM | 23000 | 15000 | 24000 | 16000 | 24000 | 26000 | 17000 | 20000 | 24000 | 22000 | 27000 |
| Aluminum | SEP TOTAL | 25000 | 21000 | 29000 | 19000 | 23000 | 28000 | 18000 | 20000 | 29000 | 31000 | 23000 |
| Antimony | Total Metal Result | 7.7 U | 18 U | 17 U | 17 U | 7 U | 6.3 UJ | 6.9 UJ | 6.6 UJ | 7 U | 7 U | 7 U |
| Antimony | SEP Step 1 | 16 U | 14 U | 14 U | 14 U | 15 U | 13 U | 14 U | 13 U | 15 U | 14 U | 15 U |
| Antimony | SEP Step 2 | 12 U | 11 U | 11 U | 10 U | 12 U | 10 U | 11 U | 10 U | 11 U | 11 U | 11 U |
| Antimony | SEP Step 3 | 3.9 U | 3.6 U | 3.5 U | 3.5 U | 3.8 U | 3.3 U | 3.6 U | 3.3 U | 3.7 U | 3.6 U | 3.6 U |
| Antimony | SEP Step 4 | 3.9 U | 3.6 U | 3.5 U | 3.5 U | 3.8 U | 3.3 U | 3.6 U | 3.3 U | 3.7 U | 3.6 U | 3.6 U |
| Antimony | SEP Step 5 | 59 U | 54 U | 53 U | 52 U | 58 U | 50 U | 53 U | 50 U | 55 U | 54 U | 55 U |
| Antimony | SEP Step 6 | 3.9 U | 3.6 U | 3.5 U | 3.5 U | 3.8 U | 3.3 U | 3.6 U | 3.3 U | 3.7 U | 3.6 U | 3.6 U |
| Antimony | SEP Step 7 | 0.45 J | 3.6 U | 3.5 U | 3.5 U | 0.54 J | 3.3 U | 3.6 U | 0.16 J | 0.29 J | 3.6 U | 0.3 J |
| Antimony | SEP SUM | 0.45 J | 3 U | 3 U | 3 U | 0.54 J | 3 U | 3 U | 0.16 J | 0.29 J | 3 U | 0.3 J |
| Antimony | SEP TOTAL | 0.53 J | 3.6 U | 3.5 U | 3.5 U | 0.27 J | 3.3 U | 3.6 J | 3.3 U | 0.33 J | 3.6 U | 0.29 J |
| Arsenic | Total Metal Result | 1.7 J | 0.62 J | 1.7 J | 0.69 J | 1.9 J | 5.4 J | 5 | 1.3 J | 2.3 | 2 J | 5 |
| Arsenic | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Arsenic | SEP Step 2 | 2 U | 1.8 UJ | 1.8 U | 1.7 U | 1.9 U | 0.46 J | 1.8 U | 1.7 U | 1.8 UJ | 1.8 UJ | 1.8 UJ |
| Arsenic | SEP Step 3 | 0.37 J | 0.45 J | 0.43 J | 0.17 J | 0.27 J | 0.83 | 0.83 | 0.44 J | 0.45 J | 0.37 J | 1.9 |
| Arsenic | SEP Step 4 | 0.69 | 0.6 U | 0.94 | 0.73 | 0.66 | 0.71 J+ | 0.59 U | 0.56 U | 0.68 | 0.5 J | 1.1 |
| Arsenic | SEP Step 5 | 9.8 U | 9 U | 8.8 U | 8.7 U | 9.6 U | 8.3 UJ | 8.9 UJ | 8.3 UJ | 9.1 U | 9 U | 9.1 U |
| Arsenic | SEP Step 6 | 1.2 | 0.3 J | 0.56 J | 0.54 J | 1.7 | 2.2 | 1.6 | 0.89 | 1.8 | 1.4 | 3.8 |
| Arsenic | SEP Step 7 | 1.3 U | 0.7 | 0.39 J | 0.34 J | 1.3 U | 1.2 | 1 | 0.88 | 1.2 U | 0.6 U | 1.2 U |
| Arsenic | SEP SUM | 2.2 | 1.4 | 2.3 | 1.8 | 2.6 | 5.4 | 4 | 2.7 | 2.9 | 2.7 | 7.3 |
| Arsenic | SEP TOTAL | 2.1 | 2.2 | 1.9 | 3 | 3.1 | 5.4 J | 5.6 | 2.5 | 4.7 | 3.9 | 6.2 |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Barium | Total Metal Result | 6.9 J+ | 7.3 J+ | 13 | 4.1 | 4.3 J+ | 8.4 J+ | 4.6 J+ | 4.3 J+ | 6.2 | 6.1 | 6.1 |
| Barium | SEP Step 1 | 13 U | 1.1 J | 0.58 J | 12 U | 13 U | 11 U | 12 U | 11 U | 12 U | 12 U | 12 U |
| Barium | SEP Step 2 | 0.5 J | 1.7 J | 0.62 J | 8.7 UJ | 0.46 J | 0.52 J | 0.54 J | 0.54 J | 0.56 J | 0.44 J | 0.96 J |
| Barium | SEP Step 3 | 3.3 U | 3.6 | 2.9 U | 2.9 U | 3.2 U | 2.8 U | 3 U | 2.8 U | 3 U | 3 U | 3 U |
| Barium | SEP Step 4 | 2.2 J | 2.6 J | 5.3 | 1.6 J | 1.4 J | 2.4 J | 0.97 J | 1.1 J | 2.2 J | 1.9 J | 2.2 J |
| Barium | SEP Step 5 | 49 UJ | 45 UJ | 44 UJ | 44 UJ | 48 UJ | 42 UJ | 45 UJ | 42 UJ | 46 UJ | 45 UJ | 46 UJ |
| Barium | SEP Step 6 | 2.3 J | 2.2 J | 2.2 J | 1.2 J | 1.9 J | 2 J | 1.6 J | 1.5 J+ | 2.3 J | 2 J | 2.4 J |
| Barium | SEP Step 7 | 250 | 230 | 350 | 220 | 220 | 250 J | 190 | 220 | 230 | 190 | 260 |
| Barium | SEP SUM | 250 | 240 | 360 | 220 | 230 | 250 | 190 | 220 | 240 | 190 | 260 |
| Barium | SEP TOTAL | 270 | 300 | 390 | 210 | 190 | 200 | 170 | 200 | 220 | 200 | 230 |
| Beryllium | Total Metal Result | 1.3 U | 0.053 J | 0.12 J | 0.064 J | 1.2 U | 0.19 J | 1.1 U | 1.1 U | 1.2 U | 1.2 U | 1.2 U |
| Beryllium | SEP Step 1 | 1.3 U | 1.2 U | 1.2 U | 1.2 U | 1.3 U | 1.1 U | 1.2 U | 1.1 U | 1.2 U | 1.2 U | 1.2 U |
| Beryllium | SEP Step 2 | 0.98 UJ | 0.9 UJ | 0.88 UJ | 0.87 UJ | 0.96 UJ | 0.83 UJ | 0.89 UJ | 0.83 UJ | 0.91 UJ | 0.9 UJ | 0.91 UJ |
| Beryllium | SEP Step 3 | 0.33 U | 0.026 J | 0.021 | 0.29 U | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.3 U | 0.3 U | 0.3 U |
| Beryllium | SEP Step 4 | 0.33 U | 0.026 J | 0.024 J | 0.02 J | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.3 U | 0.3 U | 0.03 J |
| Beryllium | SEP Step 5 | 4.9 UJ | 4.5 UJ | 4.4 UJ | 4.4 UJ | 4.8 UJ | 4.2 UJ | 4.5 UJ | 4.2 UJ | 4.6 UJ | 4.5 UJ | 4.6 UJ |
| Beryllium | SEP Step 6 | 0.045 J | 0.024 J | 0.036 J | 0.027 J | 0.039 J | 0.042 J | 0.026 J | 0.027 J | 0.045 J | 0.037 J | 0.067 J |
| Beryllium | SEP Step 7 | 0.29 J | 0.21 J | 0.39 | 0.24 J | 0.31 J | 0.35 | 0.23 J | 0.28 | 0.3 | 0.25 J | 0.46 |
| Beryllium | SEP SUM | 0.34 | 0.29 | 0.47 | 0.28 | 0.35 | 0.39 | 0.25 | 0.31 | 0.34 | 0.29 | 0.56 |
| Beryllium | SEP TOTAL | 0.37 | 0.3 | 0.41 | 0.28 J | 0.26 J | 0.35 | 0.25 J | 0.27 J | 0.33 | 0.27 J | 0.33 |
| Boron | Total Metal Result | 26 U | 5.5 | 7.4 | 3.6 | 23 U | 21 U | 23 U | 22 U | 23 U | 23 U | 23 U |
| Cadmium | Total Metal Result | 0.64 U | 0.24 U | 0.11 J | 0.072 J | 0.59 U | 0.53 U | 0.57 U | 0.55 U | 0.58 U | 0.58 U | 0.3 J |
| Cadmium | SEP Step 1 | 1.3 U | 1.2 U | 1.2 U | 1.2 U | 1.3 U | 1.1 U | 1.2 U | 1.1 U | 1.2 U | 1.2 U | 1.2 U |
| Cadmium | SEP Step 2 | 0.98 U | 0.9 U | 0.88 U | 0.87 U | 0.96 U | 0.83 U | 0.89 U | 0.83 U | 0.91 U | 0.9 U | 0.91 U |
| Cadmium | SEP Step 3 | 0.33 U | 0.3 UJ | 0.29 UJ | 0.29 UJ | 0.32 U | 0.28 UJ | 0.3 UJ | 0.28 UJ | 0.3 UJ | 0.3 UJ | 0.3 UJ |
| Cadmium | SEP Step 4 | 0.077 J | 0.059 J | 0.09 J | 0.083 J | 0.076 J | 0.086 J | 0.08 J | 0.076 J | 0.069 J | 0.065 J | 0.059 J |
| Cadmium | SEP Step 5 | 4.9 U | 4.5 U | 4.4 U | 4.4 U | 4.8 U | 4.2 U | 4.5 U | 4.2 U | 4.6 U | 4.5 U | 4.6 U |
| Cadmium | SEP Step 6 | 0.33 U | 0.3 U | 0.29 U | 0.29 U | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.026 J | 0.013 J | 0.3 U |
| Cadmium | SEP Step 7 | 0.33 U | 0.3 U | 0.29 U | 0.29 U | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.3 U | 0.3 U | 0.3 U |
| Cadmium | SEP SUM | 0.077 J | 0.11 J | 0.09 J | 0.083 J | 0.076 J | 0.086 J | 0.08 J | 0.076 J | 0.095 J | 0.077 J | 0.059 J |
| Cadmium | SEP TOTAL | 0.015 J | 0.3 U | 0.29 U | 0.29 U | 0.065 J | 0.28 U | 0.3 U | 0.28 U | 0.18 J | 0.12 J | 0.058 J |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Chromium | Total Metal Result | 4.3 | 2.9 | 4.4 | 2.5 | 2.8 | 8.2 J | 5.1 | 3.4 | 5 | 6 | 3.2 |
| Chromium | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Chromium | SEP Step 2 | 2 UJ | 1.8 U | 0.28 J | 1.7 U | 1.9 UJ | 0.37 J | 0.37 J | 1.7 U | 0.31 J | 1.8 U | 1.8 U |
| Chromium | SEP Step 3 | 0.29 J | 0.37 J | 0.52 J | 0.16 J | 0.17 J | 1.1 | 0.97 | 0.27 J | 1.1 | 0.14 J | 0.19 J |
| Chromium | SEP Step 4 | 1.2 | 1.1 | 0.94 | 0.57 J | 0.55 J | 0.68 | 0.58 J | 0.51 J | 0.73 | 0.6 | 1 |
| Chromium | SEP Step 5 | 9.8 U | 9 UJ | 1.5 J | 1.3 J | 9.6 U | 8.3 U | 8.9 U | 8.3 U | 9.1 U | 9 U | 9.1 U |
| Chromium | SEP Step 6 | 2.5 | 0.99 | 2.1 | 1.7 | 3.1 | 3.5 | 2.2 | 2.2 | 3.7 | 3.3 | 3 |
| Chromium | SEP Step 7 | 5.5 | 3.7 | 7.3 | 5.2 | 7.2 | 9 | 5 | 7.3 | 8.5 | 6.7 | 13 |
| Chromium | SEP SUM | 9.4 | 8.1 | 13 | 8.8 | 11 | 15 | 9.1 | 10 | 14 | 11 | 17 |
| Chromium | SEP TOTAL | 9.5 | 6.9 | 11 | 8.3 | 8.8 | 16 J | 10 | 8.7 | 17 | 13 | 9.2 |
| Cobalt | Total Metal Result | 3.5 J | 1.1 | 1.8 | 2.2 | 2.9 J | 5.2 J | 5.7 | 2.6 J | 5.7 J | 3.9 J | 3 J |
| Cobalt | SEP Step 1 | 13 U | 12 U | 12 U | 12 U | 13 U | 11 U | 12 U | 11 U | 12 U | 12 U | 12 U |
| Cobalt | SEP Step 2 | 0.54 J | 9 U | 8.8 U | 8.7 U | 0.35 J | 0.44 J | 0.63 J | 0.38 J | 0.62 J | 0.41 J | 0.26 J |
| Cobalt | SEP Step 3 | 0.55 J | 0.1 J | 0.27 J | 0.19 J | 0.37 J | 0.45 J | 1.2 J | 0.53 J | 0.47 J | 0.39 J | 0.37 J |
| Cobalt | SEP Step 4 | 0.83 J | 0.29 J | 0.87 J | 1.2 J | 0.97 J | 0.71 J | 1.1 J | 0.66 J | 1.6 J | 0.91 J | 0.76 J |
| Cobalt | SEP Step 5 | 49 UJ | 45 UJ | 44 UJ | 44 UJ | 48 UJ | 42 UJ | 45 UJ | 42 UJ | 46 UJ | 45 UJ | 46 UJ |
| Cobalt | SEP Step 6 | 1.3 J | 0.3 J | 0.66 J | 0.68 J | 1.8 J | 2.1 J | 1.5 J | 0.97 J | 2.5 J | 1.5 J | 2.9 J |
| Cobalt | SEP Step 7 | 0.8 J | 3 U | 0.69 J | 0.69 J | 1.1 J | 0.82 J | 0.44 J | 0.43 J | 1.5 J | 0.8 J | 0.81 J |
| Cobalt | SEP SUM | 4 | 0.69 J | 2.5 | 2.8 | 4.6 | 4.5 | 4.8 | 3 | 6.7 | 4 | 5.1 |
| Cobalt | SEP TOTAL | 4.2 J | 0.87 J | 2.5 J | 3.2 | 4.8 J | 4.7 J | 5.2 J | 3.2 | 6.1 | 4.3 | 4.5 J |
| Iron | Total Metal Result | 4900 | 1500 | 4400 | 2600 | 3400 | 6800 | 7900 | 3700 | 5800 | 5900 | 5600 |
| Iron | SEP Step 1 | 26 U | 24 U | 23 U | 23 U | 26 U | 22 U | 24 U | 22 U | 24 U | 24 U | 24 U |
| Iron | SEP Step 2 | 260 J | 31 J | 61 J | 29 J | 190 J | 130 J | 200 J | 99 J | 280 J | 160 J | 140 J |
| Iron | SEP Step 3 | 950 | 280 | 710 | 150 | 600 | 590 | 2600 | 470 | 740 | 700 | 1200 |
| Iron | SEP Step 4 | 1100 | 770 | 1700 | 1100 | 1000 | 1200 | 1100 | 830 | 1400 | 1500 | 1400 |
| Iron | SEP Step 5 | 98 UJ | 90 UJ | 88 UJ | 87 UJ | 96 UJ | 83 UJ | 89 UJ | 83 UJ | 91 UJ | 90 UJ | 91 UJ |
| Iron | SEP Step 6 | 2600 | 870 | 2100 | 1500 | 2800 | 3300 | 2600 | 2000 | 3800 | 3300 | 4600 |
| Iron | SEP Step 7 | 1800 | 1300 | 2400 | 2000 | 2900 | 2500 | 2000 | 2100 | 3700 | 2400 | 3100 |
| Iron | SEP SUM | 6700 | 3200 | 7100 | 4700 | 7600 | 7700 | 8500 | 5500 | 9900 | 8100 | 10000 |
| Iron | SEP TOTAL | 6300 | 3400 | 7500 | 5500 | 7000 | 8400 | 8700 | 5700 | 9900 | 8600 | 6800 |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Lead | Total Metal Result | 4.4 | 1.4 | 3.1 | 1.8 | 2.9 | 6.6 J | 3.2 | 2.4 | 4.2 | 3.7 | 3.5 |
| Lead | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Lead | SEP Step 2 | 1.9 J | 1.8 U | 1.8 U | 1.7 U | 0.92 J | 0.85 J | 1.8 U | 0.66 J | 0.86 J | 0.82 J | 0.75 J |
| Lead | SEP Step 3 | 0.66 UJ | 0.61 J | 0.59 UJ | 0.58 UJ | 0.64 UJ | 0.55 UJ | 0.59 UJ | 0.56 UJ | 0.61 UJ | 0.6 UJ | 0.61 UJ |
| Lead | SEP Step 4 | 1.2 | 0.65 | 1.7 | 1.2 | 1.4 | 2.3 | 1.8 | 1.5 | 2.3 | 1.8 | 2 |
| Lead | SEP Step 5 | 9.8 UJ | 9 UJ | 8.8 UJ | 8.7 UJ | 9.6 UJ | 8.3 UJ | 8.9 UJ | 8.3 UJ | 9.1 UJ | 9 UJ | 9.1 UJ |
| Lead | SEP Step 6 | 1.1 | 0.67 | 0.67 | 0.35 J | 0.78 | 1.8 | 1.1 | 0.72 | 1.6 | 1.3 | 3.4 |
| Lead | SEP Step 7 | 3.2 | 3.1 | 5.3 | 3.2 | 3.5 | 3.3 | 2.5 | 2.6 | 2.8 | 4.7 | 2.9 |
| Lead | SEP SUM | 7.4 | 5 | 7.7 | 4.8 | 6.6 | 8.2 | 5.3 | 5.5 | 7.5 | 8.6 | 9.1 |
| Lead | SEP TOTAL | 7 | 5.7 | 7.4 | 5.6 | 5 | 7.5 J | 4.9 | 5.1 | 6.7 | 5.6 | 6.2 |
| Lithium | Total Metal Result | 4.6 J | 1.4 J | 3.6 J | 2.2 J | 3.3 J | 6.6 J+ | 3.1 J+ | 3.4 J+ | 5.4 J | 5.2 J | 3.5 J |
| Lithium | SEP Step 1 | 13 U | 12 U | 12 U | 12 U | 13 U | 11 U | 12 U | 11 U | 12 U | 12 U | 12 U |
| Lithium | SEP Step 2 | 9.8 U | 9 U | 8.8 U | 8.7 U | 9.6 U | 8.3 U | 8.9 U | 8.3 U | 0.71 J | 0.72 J | 9.1 U |
| Lithium | SEP Step 3 | 3.3 U | 3 U | 2.9 U | 2.9 U | 3.2 U | 2.8 U | 3 U | 2.8 U | 3 U | 3 U | 3 U |
| Lithium | SEP Step 4 | 0.78 J | 0.5 J | 0.81 J | 0.55 J | 0.62 J | 1 J | 0.64 J | 0.71 J | 1.1 J | 1 J | 1.3 J |
| Lithium | SEP Step 5 | 49 U | 45 U | 44 U | 44 U | 48 U | 42 U | 45 U | 42 U | 46 U | 45 U | 46 U |
| Lithium | SEP Step 6 | 2.3 J | 1.1 J | 1.8 J | 1.2 J | 2.2 J | 3 | 1.7 J | 1.9 J | 3.5 | 2.9 J | 2.8 J |
| Lithium | SEP Step 7 | 4.4 | 2.5 J | 3.4 | 2.1 J | 3.8 | 6.1 | 2.6 J | 3.1 | 5.6 | 4.2 | 7.1 |
| Lithium | SEP SUM | 12 | 4.1 | 6 | 3.8 | 11 | 14 | 7.8 | 5.7 | 19 | 18 | 19 |
| Lithium | SEP TOTAL | 8 | 4.2 | 6.8 | 5.4 | 7.5 | 10 | 6 | 7.5 | 11 | 10 | 7.2 |
| Molybdenum | Total Metal Result | 5.1 U | 6.3 | 1.1 U | 1.1 U | 4.7 U | 3.8 J | 4 J | 4.4 U | 0.88 J | 4.7 U | 2.1 J |
| Molybdenum | SEP Step 1 | 10 U | 13 | 9.4 U | 9.3 U | 10 U | 8.9 U | 9.5 U | 8.9 U | 9.8 U | 9.6 U | 9.7 U |
| Molybdenum | SEP Step 2 | 7.9 U | 0.51 J | 7 U | 7 U | 7.7 U | 6.7 U | 7.1 U | 6.7 U | 7.3 U | 7.2 U | 7.3 U |
| Molybdenum | SEP Step 3 | 2.6 U | 1.2 J | 2.3 U | 2.3 U | 2.6 U | 0.51 J | 2.2 J | 0.27 J | 0.59 J | 2.4 U | 0.5 J |
| Molybdenum | SEP Step 4 | 2.6 U | 1.3 J | 2.3 U | 2.3 U | 2.6 U | 0.39 J | 0.63 J | 0.24 J | 0.53 J | 2.4 U | 0.36 J |
| Molybdenum | SEP Step 5 | 39 U | 36 U | 35 U | 35 U | 38 U | 33 U | 36 U | 33 U | 37 U | 36 U | 1.7 J |
| Molybdenum | SEP Step 6 | 2.6 U | 0.13 J | 2.3 U | 2.3 U | 2.6 U | 0.21 J | 0.13 J | 2.2 U | 0.18 J | 0.2 J | 1.5 J |
| Molybdenum | SEP Step 7 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 0.16 J |
| Molybdenum | SEP SUM | 2 U | 16 | 2 U | 2 U | 2 U | 1.1 J | 3 | 0.51 J | 1.3 J | 0.2 J | 4.3 |
| Molybdenum | SEP TOTAL | 0.94 J | 15 | 0.22 J | 0.15 J | 0.54 J | 2.4 | 3.8 | 0.67 J | 2.4 | 0.48 J | 2.4 |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Selenium | Total Metal Result | 1.9 U | 4.8 U | 4.6 U | 4.6 U | 0.53 J | 1.6 U | 0.51 J | 0.74 J | 0.68 J | 0.65 J | 1.8 U |
| Selenium | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Selenium | SEP Step 2 | 2 U | 1.8 U | 1.8 U | 1.7 U | 1.9 U | 1.7 U | 1.8 U | 1.7 U | 1.8 UJ | 1.8 UJ | 1.8 UJ |
| Selenium | SEP Step 3 | 0.66 U | 0.6 U | 0.22 J | 0.58 U | 0.64 U | 0.55 U | 0.59 U | 0.56 U | 0.61 U | 0.6 U | 0.61 U |
| Selenium | SEP Step 4 | 1.1 J | 0.6 UJ | 0.6 J+ | 0.75 J+ | 1.3 J | 0.64 J | 0.59 UJ | 0.56 UJ | 0.71 J | 0.6 UJ | 0.59 J |
| Selenium | SEP Step 5 | 9.8 U | 9 U | 8.8 U | 8.7 U | 9.6 U | 8.3 U | 3.3 J | 8.3 U | 9.1 U | 9 U | 9.1 U |
| Selenium | SEP Step 6 | 0.66 U | 0.6 U | 0.59 U | 0.58 U | 0.64 U | 0.55 U | 0.59 U | 0.56 U | 0.61 U | 0.6 U | 0.61 U |
| Selenium | SEP Step 7 | 1.3 U | 0.6 U | 0.59 U | 0.58 U | 1.3 U | 1.1 U | 0.59 U | 0.56 U | 0.74 J | 0.6 U | 1.2 U |
| Selenium | SEP SUM | 2.7 | 0.5 U | 0.82 | 0.75 | 2.5 | 0.64 | 3.3 | 0.5 U | 1.5 | 0.5 U | 0.59 |
| Selenium | SEP TOTAL | 1.3 U | 1.2 U | 0.59 U | 0.58 U | 1.3 U | 1.1 U | 1.2 U | 0.56 U | 0.61 U | 0.24 J | 1.2 U |
| Thallium | Total Metal Result | 4.5 U | 7.2 U | 6.9 U | 6.8 U | 4.1 U | 3.7 u | 4 U | 3.9 U | 4.1 U | 4.1 U | 4.1 U |
| Thallium | SEP Step 1 | 9.2 U | 8.4 U | 8.2 U | 8.2 U | 8.9 U | 7.8 U | 8.3 U | 7.8 U | 8.5 U | 8.4 U | 8.5 U |
| Thallium | SEP Step 2 | 6.9 U | 6.3 U | 6.2 U | 6.1 U | 6.7 U | 5.8 U | 6.2 U | 5.8 U | 6.4 U | 6.3 U | 6.4 U |
| Thallium | SEP Step 3 | 2.3 U | 2.1 U | 2.1 U | 2 U | 2.2 U | 1.9 U | 2.1 U | 1.9 U | 2.1 U | 2.1 U | 2.1 U |
| Thallium | SEP Step 4 | 2.3 U | 2.1 U | 2.1 UJ | 2 UJ | 2.2 U | 1.9 U | 2.1 U | 1.9 U | 2.1 U | 2.1 U | 2.1 U |
| Thallium | SEP Step 5 | 34 UJ | 31 UJ | 31 UJ | 31 UJ | 34 UJ | 29 UJ | 31 UJ | 29 UJ | 32 UJ | 32 UJ | 32 UJ |
| Thallium | SEP Step 6 | 2.3 U | 2.1 U | 2.1 U | 2 U | 2.2 U | 1.9 U | 2.1 U | 1.9 U | 2.1 U | 2.1 U | 2.1 U |
| Thallium | SEP Step 7 | 0.48 J | 2.1 U | 0.62 J | 0.56 J | 1.1 J | 3.9 U | 2.1 U | 1.9 U | 0.97 J | 0.74 J | 1.3 J |
| Thallium | SEP SUM | 0.48 J | 1.8 U | 0.62 J | 0.56 J | 1.4 J | 1.8 U | 1.8 U | 1.8 U | 0.97 J | 0.74 J | 1.3 J |
| Thallium | SEP TOTAL | 0.87 J | 4.2 U | 0.58 J | 0.47 J | 0.9 J | 3.9 U | 4.2 U | 1.9 U | 0.88 J | 0.85 J | 1.3 J |

Notes:
All results displayed in milligram per kilogram (mg/kg).
ft bgs = feet below ground surface
SEP: Sequential Extraction Procedure
Step 1 - Exchangeable Phase: This extraction includes trace elements that are reversibly adsorbed to soil minerals, amorphous solids, and organic material by electrostatic forces.
Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.
Step 3 - Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g. iron).
Step 4 - Metal Hydroxide Phase: This extraction targets trace elements bound to hydroxides of iron, manganese, and/or aluminum.
Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.
Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.
Step 7 - Residual Fraction: Trace elements remaining in the soil after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.
U= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
UJ= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit, the quantitation limit is considered estimated.
J= The analyte was positively identified. The associated numerical value is the approximate concentration.
J+= The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample and biased high.
Total Metal Results are the results of the 6010C analysis

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

**Table 9: Predicted Range of COI Concentrations in Assessment Wells Assuming Only Dilution and Dispersion**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Constituent | Units | Site-Specific Groundwater Protection Standard[2] | Health-Based Standard | Maximimum concentration observed in Porewater | Maximum concentration at side-gradient Assessment Wells: | | | | Concentration at Assessment Wells assuming 32%[3] dilution of porewater with maximum concentration measured at: | | | | Concentration at Assessment Wells assuming 63%[4] dilution of porewater with maximum concentration measured at: | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | GAMW-52 | GAMW-52B | GAMW-56 | GAMW-56B | GAMW-52 | GAMW-52B | GAMW-56 | GAMW-56B | GAMW-52 | GAMW-52B | GAMW-56 | GAMW-56B |
| Arsenic | mg/L | 0.091 | 0.010 | 0.012 | 0.0025 | 0.0016 | 0.022 | 0.0025 | 0.0090 | 0.0087 | 0.015 | 0.0090 | 0.0060 | 0.0054 | 0.018 | 0.0060 |
| Boron[1] | mg/L | - | 4.0 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Cobalt | mg/L | 0.010 | 0.0060 | 0.0022 | 0.00058 | 0.00050 | 0.0084 | 0.00050 | 0.0017 | 0.0017 | 0.0042 | 0.0017 | 0.0012 | 0.0011 | 0.0061 | 0.0011 |
| Lithium | mg/L | 0.040 | 0.040 | 0.016 | 0.0062 | 0.0071 | 0.0053 | 0.0062 | 0.013 | 0.013 | 0.013 | 0.013 | 0.0098 | 0.010 | 0.0093 | 0.0098 |
| Molybdenum | mg/L | 0.10 | 0.10 | 0.81 | 0.0064 | 0.015 | 0.013 | 0.0064 | 0.55 | 0.56 | 0.55 | 0.55 | 0.30 | 0.31 | 0.31 | 0.30 |
| Arsenic | Percentage relative to Groundwater Protection Standard | 100% | - | 13% | 3% | 2% | 24% | 3% | 10% | 10% | 17% | 10% | 7% | 6% | 20% | 7% |
| Boron | | 100% | - | 345% | 80% | 33% | 7% | 80% | 260% | 245% | 237% | 260% | 178% | 148% | 132% | 178% |
| Cobalt | | 100% | - | 22% | 6% | 5% | 84% | 5% | 17% | 17% | 42% | 17% | 12% | 11% | 61% | 11% |
| Lithium | | 100% | - | 40% | 16% | 18% | 13% | 16% | 32% | 33% | 31% | 32% | 25% | 26% | 23% | 25% |
| Molybdenum | | 100% | - | 810% | 6% | 15% | 13% | 6% | 553% | 556% | 555% | 553% | 304% | 309% | 308% | 304% |

**Notes:**
(1) Boron does not have a groundwater protection standard, results are compated to the health-based standard
(2) The groundwater protection standard is equal to the higher of the background tolerance limit and the relevant health-based standard
(3) 32% dilution was minimum dilution predicted in Table 8
(4) 63% dilution was maximum dilution predicted in Table 8
ft = feet
mg/L = milligrams per liter

Prepared by GOL
Checked by PJN
Reviewed by RV

**Table 10: Sorption Site and Surface Area Calculations**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Units | Minimum | Mean | Maximum |
|---|---|---|---|---|
| **Ferrihydrite** | | | | |
| Amorphous Iron (Step 3 SEP) + Metal Hydroxide Iron (Step 4 SEP) | Sample Name | SB-18B-32/34 | Mean of all samples | SB-53B-25-27 |
| | ppm of Fe | 1278 | 2006 | 3787 |
| | millimoles of Fe | 22.9 | 35.9 | 67.8 |
| | moles of Fe | 0.0229 | 0.0359 | 0.0678 |
| Specific Surface Area | $m^2/g$ | 600 | | |
| Surface Site Concentration | moles weak sites/ mole of Fe | 0.2 | | |
| Surface Sites | moles of weak sites | 0.00458 | 0.00719 | 0.01356 |
| Mass of Ferrihydrite | g | 2.03 | 3.19 | 6.03 |
| Gibbsite | | | | |
| Amorphous Aluminum (Step 3 SEP) + Metal Hydroxide Aluminum (Step 4 SEP) | Sample Name | SB-53B-30-32 | Mean of all samples | OW-9-10-12 |
| | ppm of Al | 130 | 221 | 408 |
| | millimoles of Al | 4.8 | 8.2 | 15.1 |
| | moles of Al | 0.0048 | 0.0082 | 0.0151 |
| Specific Surface Area | $m^2/g$ | 32 | | |
| Surface Site Concentration | moles weak sites/ mole of Al | 0.41 | | |
| Surface Sites | moles of weak sites | 0.00198 | 0.00335 | 0.00619 |
| Mass of Gibbsite | g | 0.38 | 0.64 | 1.18 |

**Notes:**
ppm = parts per million
$m^2/g$ = meters squared per gram
g = grams

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

# Figures




LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Downgradient Boring Location
- Porewater Sample Location
- CCR Source Material Sample Location
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. SATELLITE IMAGERY OBTAINED FROM ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY.

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

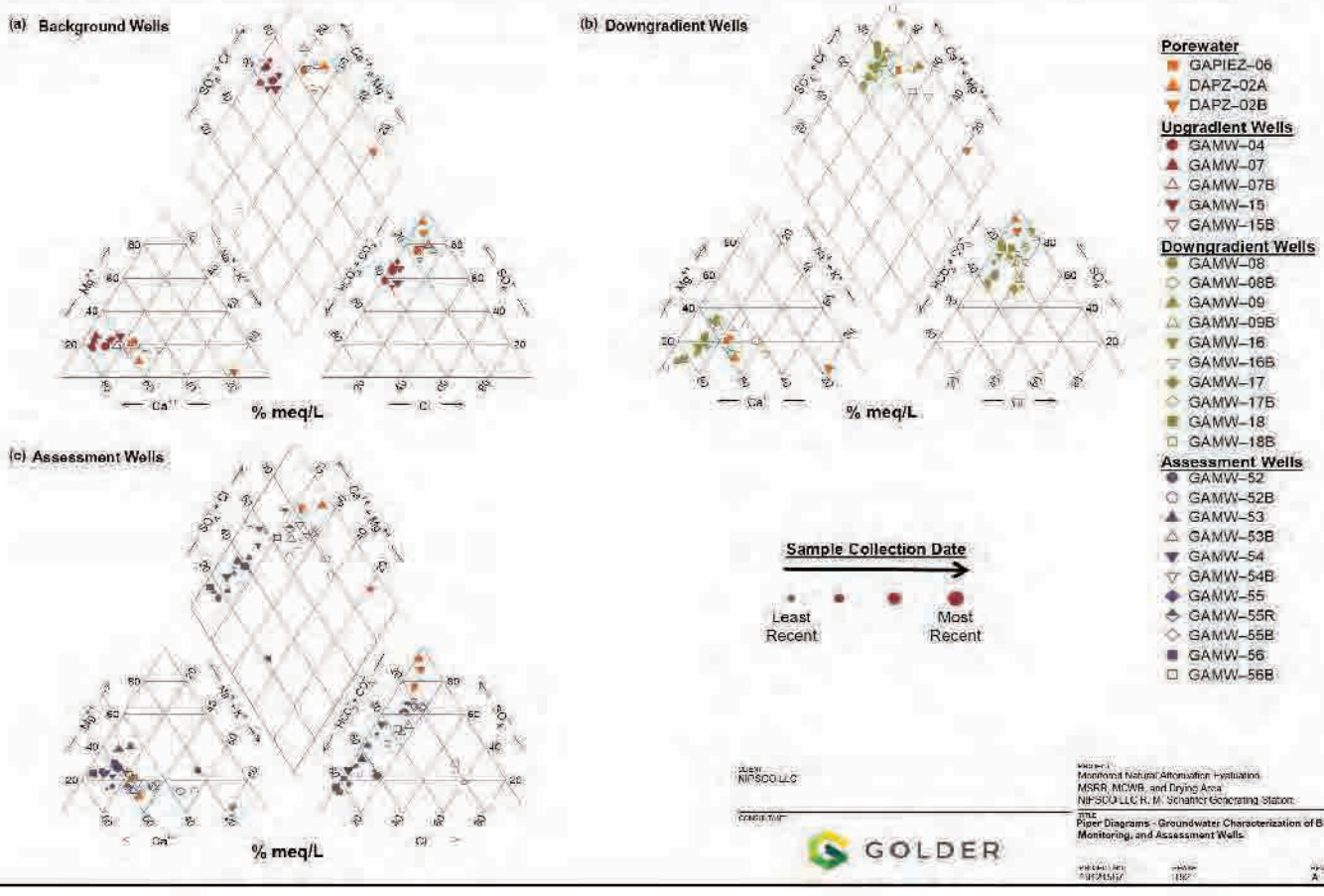
MONITORED NATURAL ATTENUATION EVALUATION
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

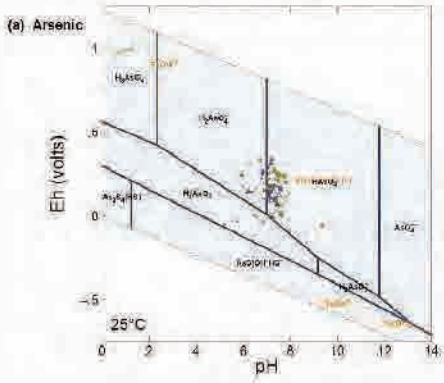
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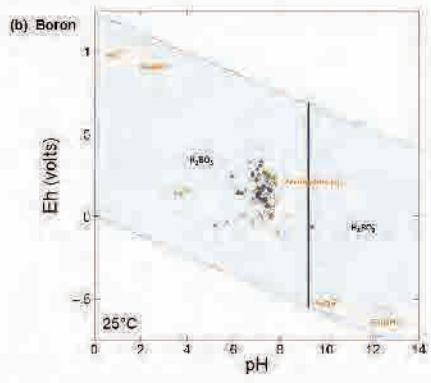
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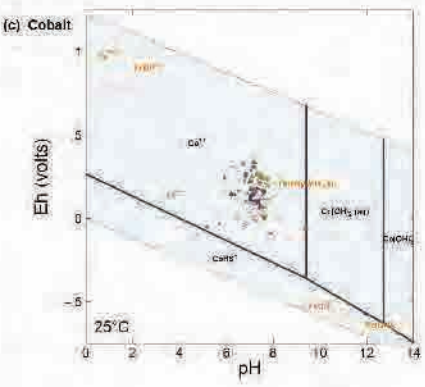
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| PREPARED | SJB |
| REVIEWED | EAP |
| APPROVED | AMH |

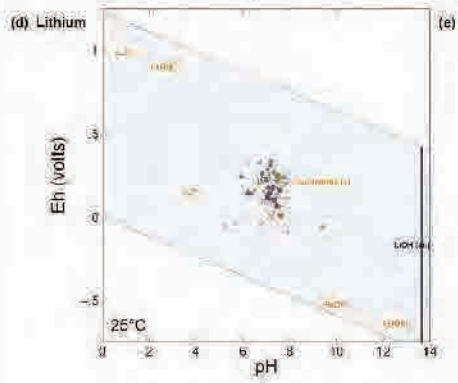
PROJECT NO. 19101587 | CONTROL A | REV. 0 | FIGURE 1

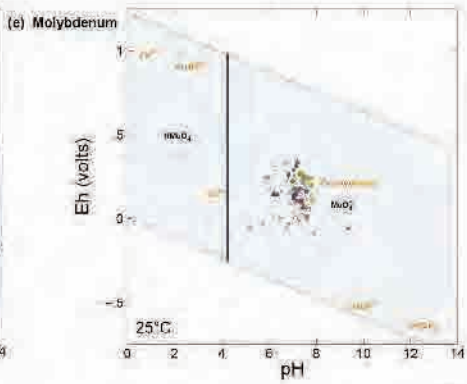

(a) Background Wells
(b) Downgradient Wells
(c) Assessment Wells
% meq/L
% meq/L
% meq/L
Porewater
GAPIEZ-06
DAPZ-02A
DAPZ-02B
Upgradient Wells
GAMW-04
GAMW-07
GAMW-07B
GAMW-15
GAMW-15B
Downgradient Wells
GAMW-08
GAMW-08B
GAMW-09
GAMW-09B
GAMW-16
GAMW-16B
GAMW-17
GAMW-17B
GAMW-18
GAMW-18B
Assessment Wells
GAMW-52
GAMW-52B
GAMW-53
GAMW-53B
GAMW-54
GAMW-54B
GAMW-55
GAMW-55R
GAMW-55B
GAMW-56
GAMW-56B
Sample Collection Date
Least Recent
Most Recent
NIPSCO LLC
GOLDER
Monitored Natural Attenuation Evaluation
MSRR, MCWR, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Piper Diagrams - Groundwater Characterization of Background, Monitoring, and Assessment Wells
A
2a-c




**Porewater**
- GAPIEZ–06
- DAPZ–02A
- DAPZ–02B

**Upgradient Wells**
- GAMW–04
- GAMW–07
- GAMW–07B
- GAMW–15
- GAMW–15B

**Downgradient Wells**
- GAMW–08
- GAMW–08B
- GAMW–09
- GAMW–09B
- GAMW–16
- GAMW–16B
- GAMW–17
- GAMW–17B
- GAMW–18
- GAMW–18B

**Assessment Wells**
- GAMW–52
- GAMW–52B
- GAMW–53
- GAMW–53B
- GAMW–54
- GAMW–54B
- GAMW–55
- GAMW–55R
- GAMW–55B
- GAMW–56
- GAMW–56B

**Sample Collection Date**

Least Recent → Most Recent

CLIENT
NRG/SCO LLC

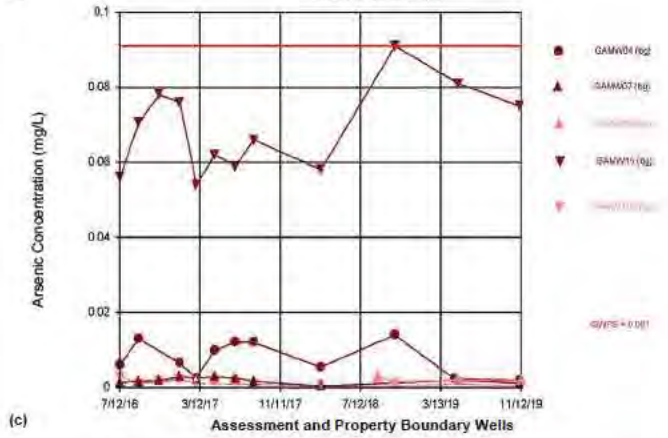
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Monitored Natural Attenuation Evaluation
MGWR, MGWR, and Drying Area
NRG/SCO LLC/ R. M. Schahfer Generating Station

TITLE
Pourbaix Diagrams For Arsenic, Boron, Cobalt, Lithium, and Molybdenum

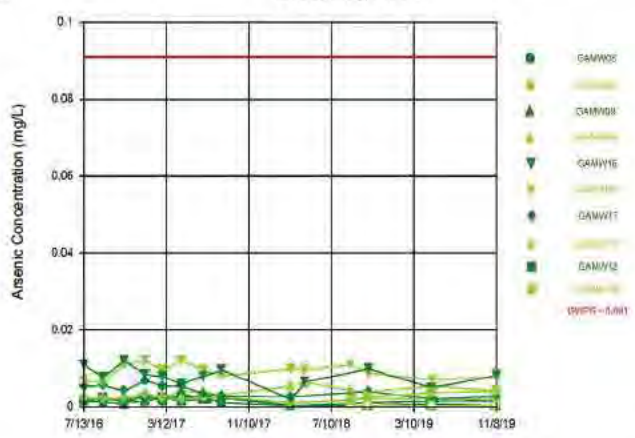
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PROJECT NO. 1912165 | REV. 0 | FIG. A | 3a-e

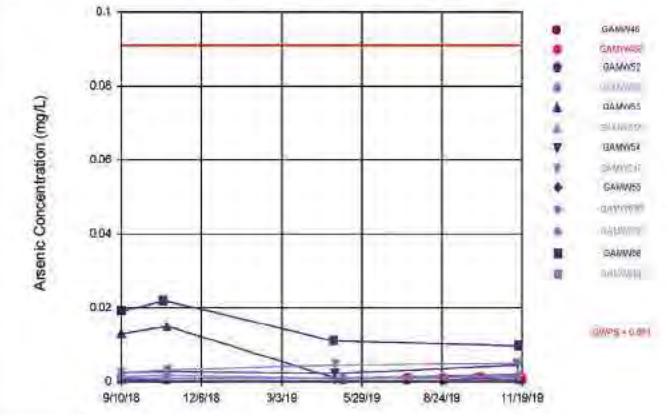
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit.

CLIENT
NIPSCO LLC

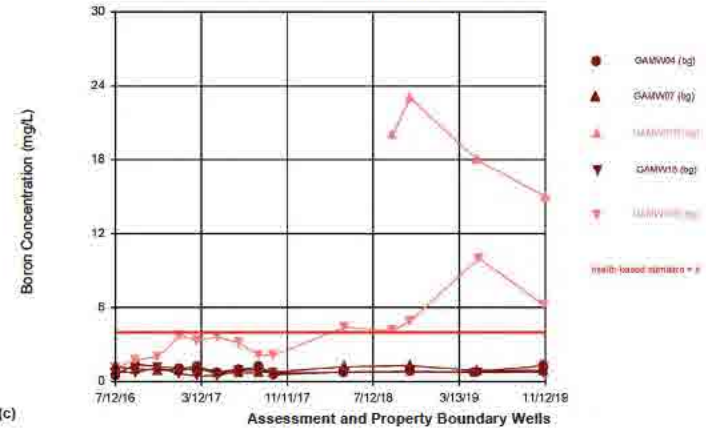
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

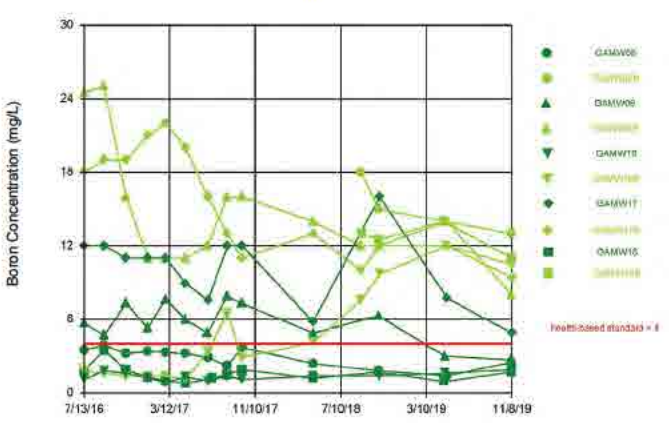
TITLE
Arsenic Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 4a-c |

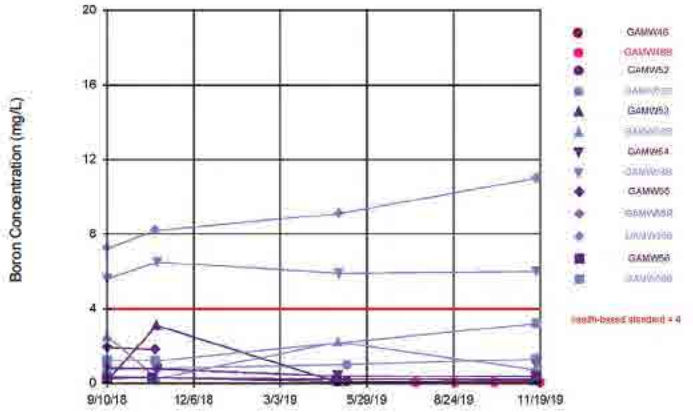
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

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NIPSCO LLC

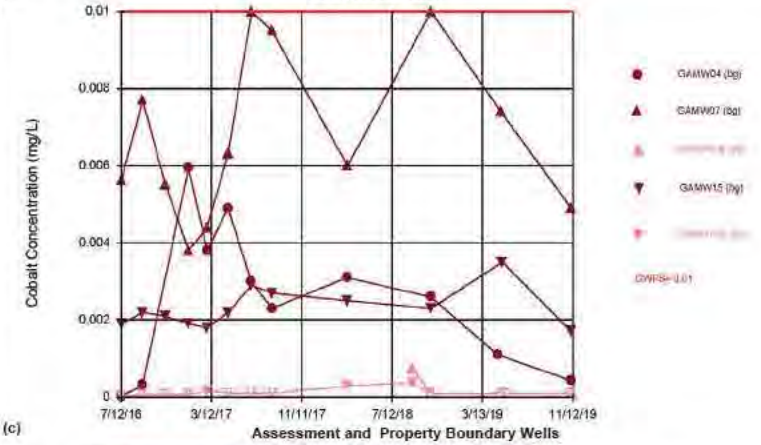
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

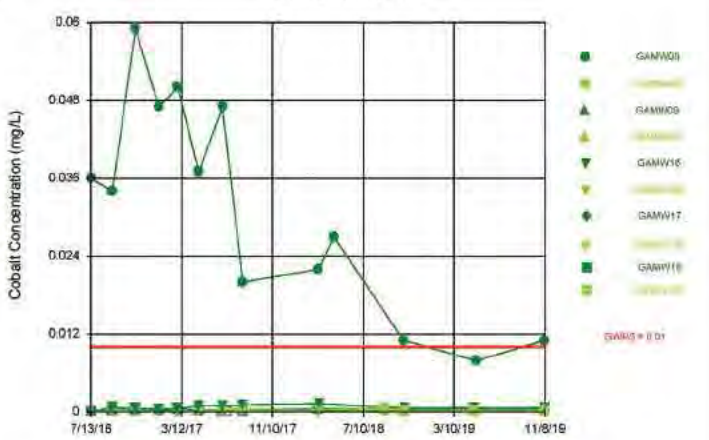
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Boron Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
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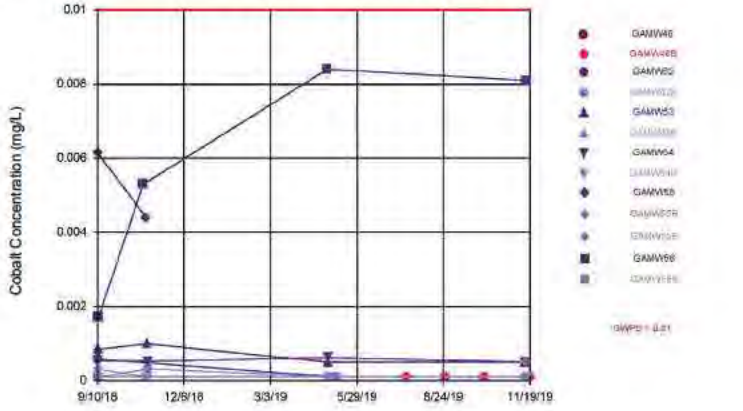
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

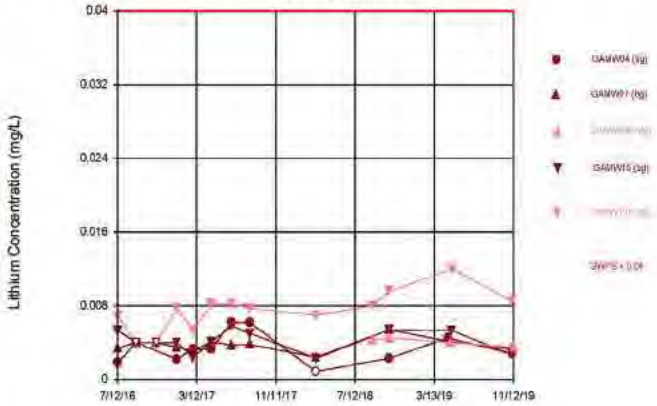
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

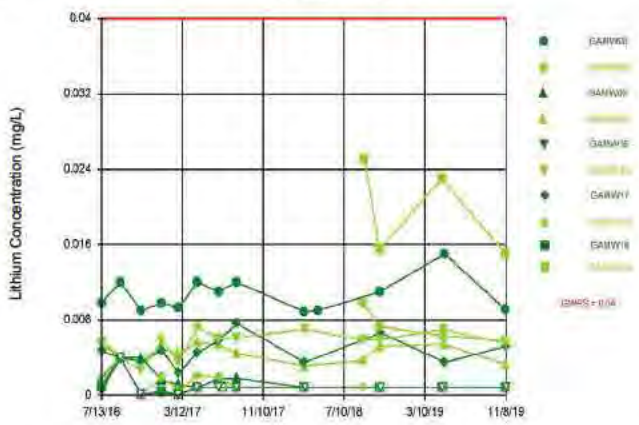
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Cobalt Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

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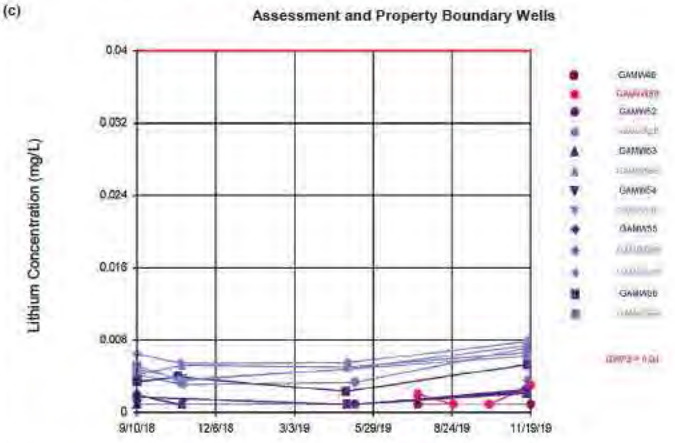
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

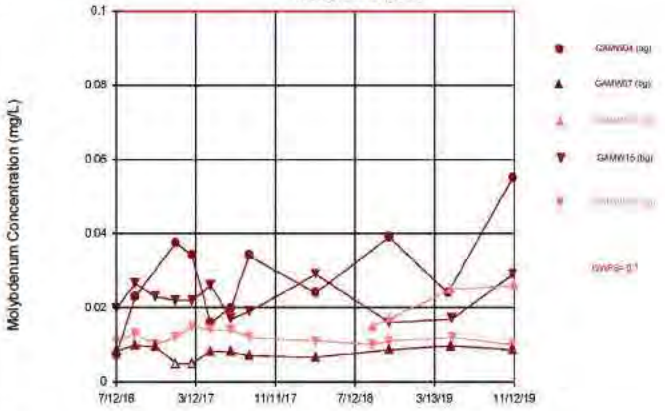
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Lithium Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 7a-c |

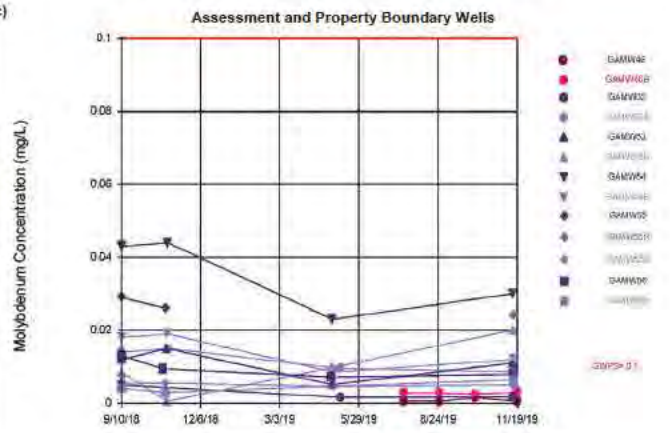
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

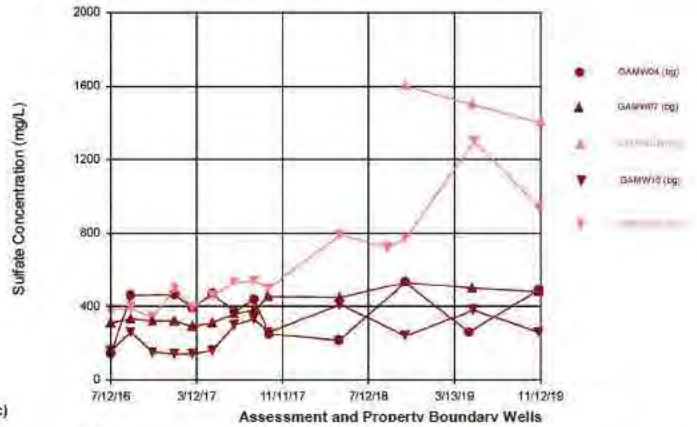
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

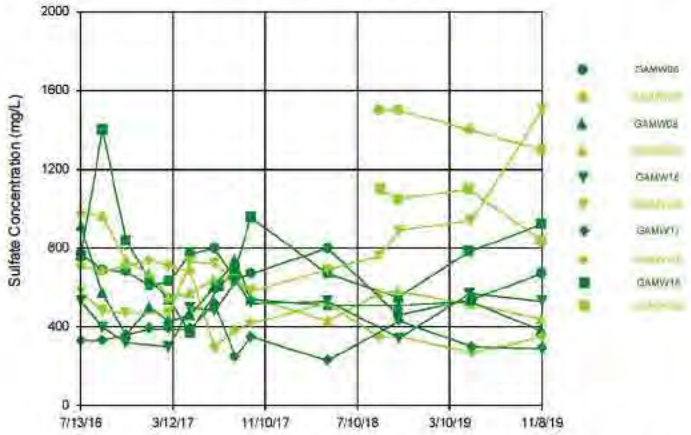
TITLE
**Molybdenum Time Series for Background, Monitoring, and Assessment and Property Boundary Wells**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 8a-c |

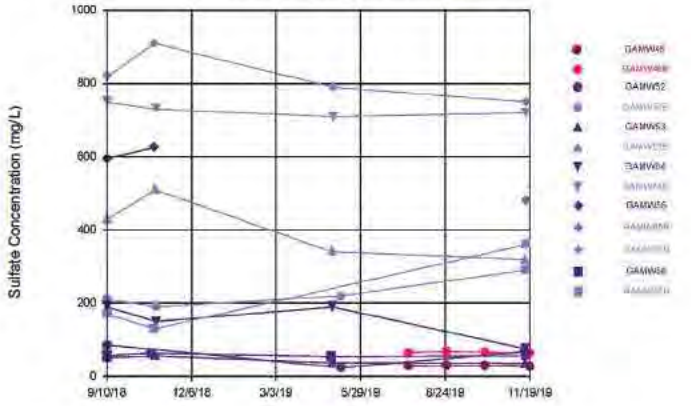
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

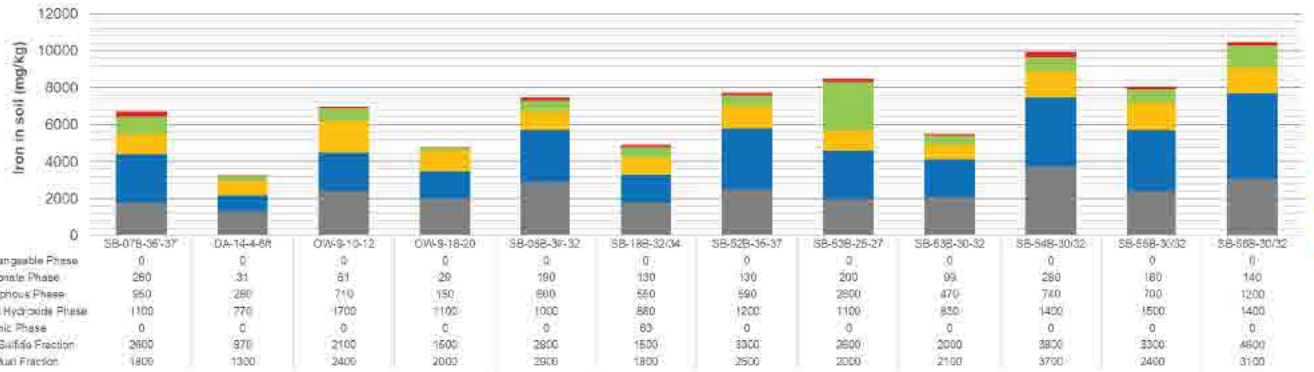
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

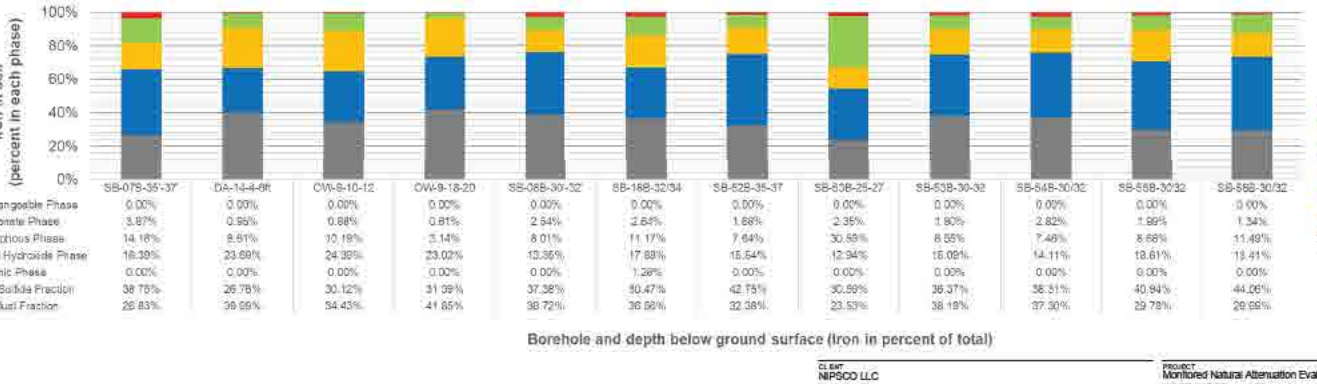
TITLE
Sulfate Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 192 | A | 9a-c |




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 260 | 31 | 61 | 29 | 190 | 130 | 130 | 200 | 99 | 280 | 180 | 140 |
| Amorphous Phase | 950 | 280 | 710 | 150 | 660 | 550 | 590 | 2800 | 470 | 740 | 700 | 1200 |
| Metal Hydroxide Phase | 1100 | 770 | 1700 | 1100 | 1000 | 880 | 1200 | 1100 | 850 | 1400 | 1500 | 1400 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 63 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 2600 | 970 | 2100 | 1500 | 2800 | 1500 | 3300 | 2600 | 2000 | 3800 | 3300 | 4600 |
| Residual Fraction | 1800 | 1300 | 2400 | 2000 | 2900 | 1800 | 2500 | 2000 | 2100 | 3700 | 2400 | 3100 |

**Borehole and depth below ground surface (Iron in mg/kg soil)**




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 3.87% | 0.95% | 0.88% | 0.81% | 2.54% | 2.64% | 1.68% | 2.35% | 1.80% | 2.82% | 1.99% | 1.34% |
| Amorphous Phase | 14.16% | 8.61% | 10.19% | 3.14% | 8.81% | 11.17% | 7.64% | 32.93% | 8.55% | 7.46% | 8.68% | 11.49% |
| Metal Hydroxide Phase | 16.39% | 23.69% | 24.39% | 23.02% | 13.36% | 17.88% | 15.54% | 12.94% | 15.09% | 14.11% | 18.61% | 13.41% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.28% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 38.75% | 29.78% | 30.12% | 31.39% | 37.38% | 30.47% | 42.75% | 30.59% | 36.37% | 38.31% | 40.94% | 44.06% |
| Residual Fraction | 26.83% | 39.99% | 34.43% | 41.65% | 38.72% | 36.56% | 32.38% | 27.53% | 38.19% | 37.30% | 29.79% | 29.69% |

**Borehole and depth below ground surface (Iron in percent of total)**

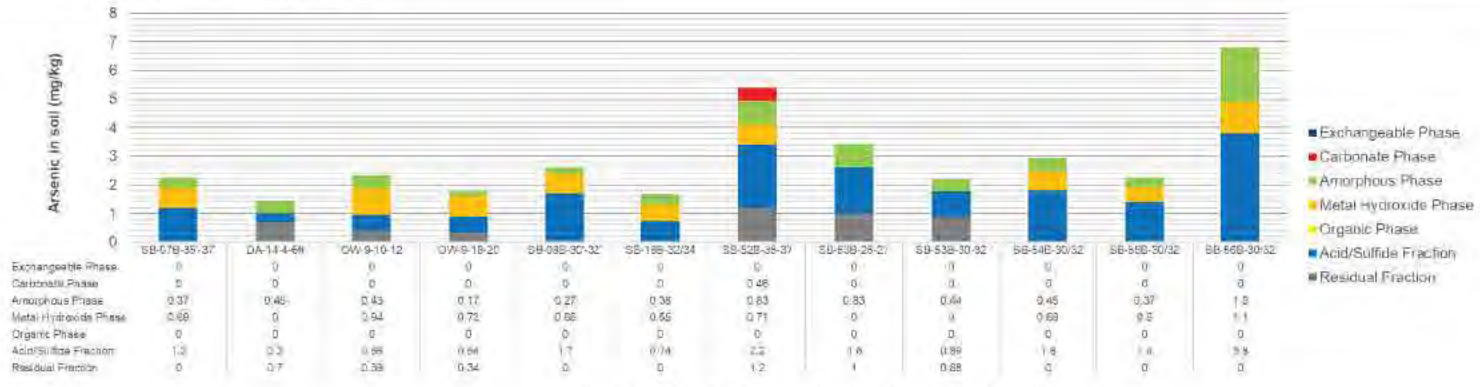
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

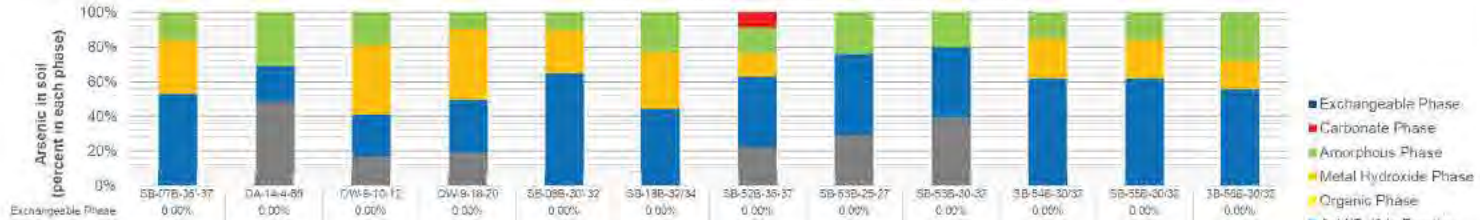
TITLE
Iron Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 192 | A | 10 |




| | SB-07B-35/37 | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30/32 | SB-18B-32/34 | SB-52B-35/37 | SB-53B-25/27 | SB-53B-30/32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0.46 | 0 | 0 | 0 | 0 | 0 |
| Amorphous Phase | 0.37 | 0.46 | 0.43 | 0.17 | 0.27 | 0.38 | 0.83 | 0.83 | 0.64 | 0.45 | 0.37 | 1.9 |
| Metal Hydroxide Phase | 0.69 | 0 | 0.94 | 0.72 | 0.66 | 0.55 | 0.71 | 0 | 0 | 0.69 | 0.5 | 1.1 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 1.2 | 0.3 | 0.88 | 0.84 | 1.7 | 0.74 | 2.2 | 1.6 | 0.89 | 1.8 | 1.4 | 3.5 |
| Residual Fraction | 0 | 0.7 | 0.39 | 0.34 | 0 | 0 | 1.2 | 1 | 0.88 | 0 | 0 | 0 |

Borehole and depth below ground surface (Arsenic in mg/kg soil)




| | SB-07B-35/37 | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30/32 | SB-18B-32/34 | SB-52B-35/37 | SB-53B-25/27 | SB-53B-30/32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 8.52% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 16.37% | 31.03% | 18.53% | 9.55% | 10.27% | 22.75% | 15.37% | 24.20% | 19.91% | 16.36% | 16.30% | 27.94% |
| Metal Hydroxide Phase | 30.53% | 0.00% | 40.52% | 41.01% | 25.10% | 32.93% | 13.15% | 0.00% | 0.00% | 25.21% | 22.03% | 16.18% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 53.10% | 20.69% | 24.14% | 30.34% | 64.64% | 44.31% | 40.74% | 46.65% | 40.27% | 61.43% | 61.67% | 55.88% |
| Residual Fraction | 0.00% | 48.28% | 18.81% | 19.10% | 0.00% | 0.00% | 22.22% | 29.15% | 39.82% | 0.00% | 0.00% | 0.00% |

Borehole and depth below ground surface (Arsenic in percent of total)

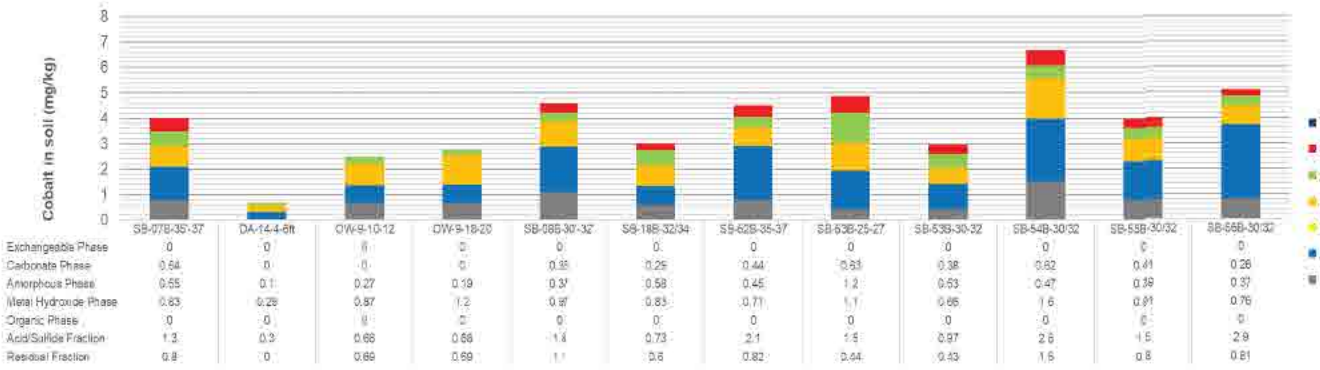
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

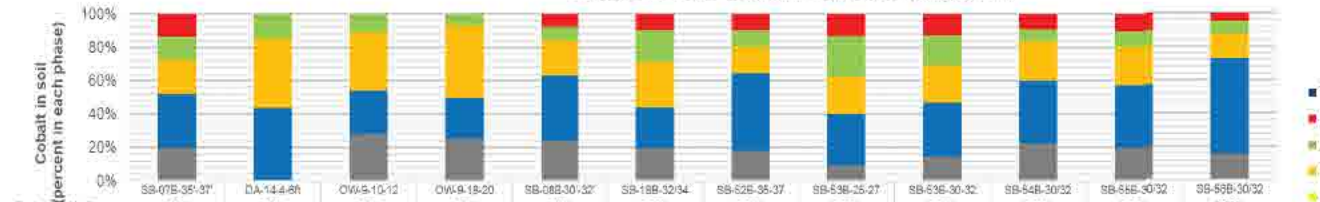
TITLE
Arsenic Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 11 |




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32' | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-55B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0.64 | 0 | 0 | 0 | 0.35 | 0.25 | 0.44 | 0.83 | 0.38 | 0.62 | 0.41 | 0.26 |
| Amorphous Phase | 0.55 | 0.1 | 0.27 | 0.19 | 0.3' | 0.58 | 0.45 | 1.2 | 0.53 | 0.47 | 0.39 | 0.37 |
| Metal Hydroxide Phase | 0.83 | 0.29 | 0.87 | 1.2 | 0.9' | 0.83 | 0.71 | 1.1 | 0.66 | 1.6 | 0.91 | 0.76 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 1.3 | 0.3 | 0.68 | 0.56 | 1.4 | 0.73 | 2.1 | 1.5 | 0.97 | 2.6 | 1.5 | 2.9 |
| Residual Fraction | 0.8 | 0 | 0.69 | 0.69 | 1.1 | 0.6 | 0.82 | 0.64 | 0.43 | 1.5 | 0.8 | 0.81 |

Borehole and depth below ground surface (Cobalt in mg/kg soil)




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32' | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-55B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 13.43% | 0.00% | 0.60% | 0.60% | 7.65% | 9.57% | 9.75% | 12.94% | 12.79% | 9.27% | 10.22% | 6.10% |
| Amorphous Phase | 13.68% | 14.49% | 10.84% | 6.88% | 8.06% | 19.14% | 9.96% | 24.64% | 17.85% | 7.03% | 9.73% | 7.25% |
| Metal Hydroxide Phase | 20.85% | 42.03% | 34.94% | 43.48% | 21.13% | 27.39% | 15.71% | 22.59% | 22.22% | 23.92% | 22.69% | 14.90% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 32.34% | 43.48% | 26.51% | 24.64% | 39.22% | 24.09% | 46.48% | 30.80% | 32.66% | 37.37% | 37.41% | 56.86% |
| Residual Fraction | 19.90% | 0.00% | 27.71% | 25.00% | 23.97% | 18.80% | 18.14% | 9.03% | 14.48% | 22.42% | 19.95% | 15.88% |

Borehole and depth below ground surface (Cobalt in percent of total)

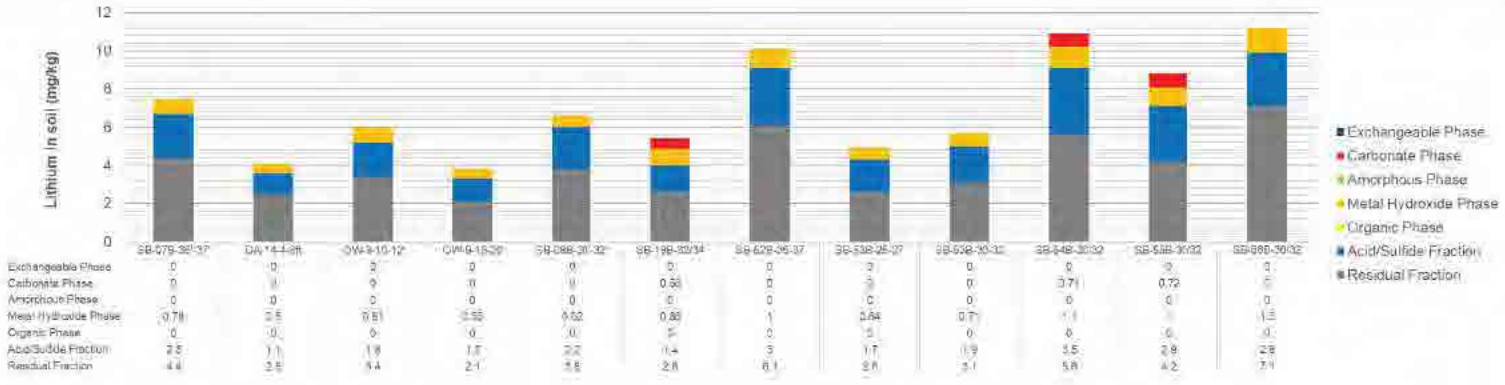
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

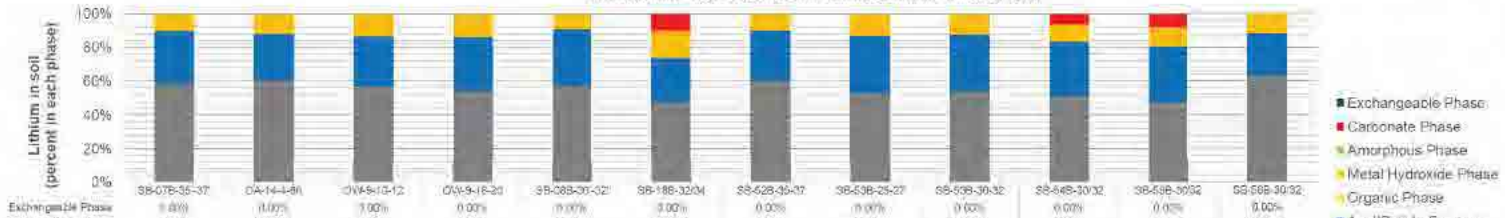
TITLE
Cobalt Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 192 | A | 12 |




| | SB-07B-35-37 | DA-14-4-6ft | OW9-10-12 | OW9-18-20 | SB-08B-30-32 | SB-19B-32/34 | SB-62B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-64B-30/32 | SB-59B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0 | 0 | 0 | 0 | 0.56 | 0 | 0 | 0 | 0.71 | 0.72 | 0 |
| Amorphous Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Metal Hydroxide Phase | 0.78 | 0.5 | 0.51 | 0.55 | 0.52 | 0.89 | 1 | 0.84 | 0.71 | 1.1 | 1 | 1.3 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 2.8 | 1.1 | 1.8 | 1.5 | 2.2 | 1.4 | 3 | 1.7 | 1.9 | 3.5 | 2.8 | 2.8 |
| Residual Fraction | 4.4 | 2.5 | 3.4 | 2.1 | 3.8 | 2.8 | 6.1 | 2.8 | 3.1 | 5.8 | 4.2 | 3.1 |

Borehole and depth below ground surface (Lithium in mg/kg soil)




| | SB-07B-35-37 | DA-14-4-6ft | OW9-10-12 | OW9-18-20 | SB-08B-30-32 | SB-19B-32/34 | SB-62B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-64B-30/32 | SB-59B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 10.33% | 0.00% | 0.00% | 0.00% | 6.51% | 8.16% | 0.00% |
| Amorphous Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Metal Hydroxide Phase | 10.43% | 12.20% | 13.48% | 14.29% | 9.37% | 16.67% | 9.90% | 12.86% | 12.43% | 10.09% | 11.34% | 11.61% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 30.75% | 26.83% | 25.35% | 31.17% | 32.23% | 25.83% | 29.70% | 34.41% | 33.21% | 32.08% | 32.68% | 29.00% |
| Residual Fraction | 58.82% | 60.98% | 56.67% | 54.55% | 57.40% | 47.07% | 60.40% | 52.63% | 54.29% | 51.33% | 47.02% | 59.39% |

Borehole and depth below ground surface (Lithium in percent of total)

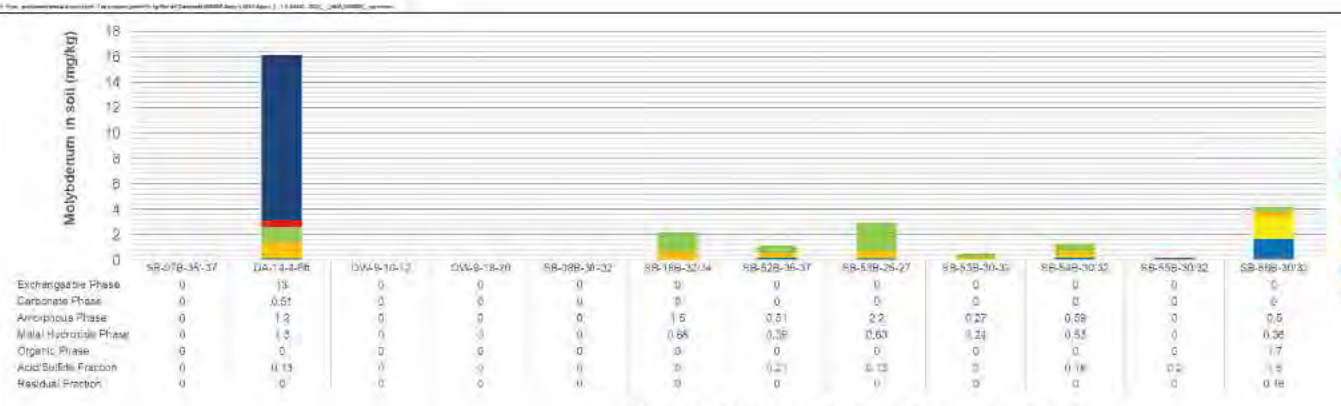
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

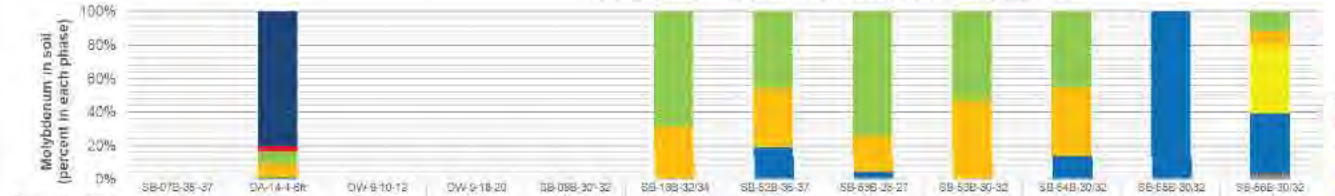
TITLE
Lithium Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 13 |




| | SB-07B-35-37 | DA-14-4-5R | OW-9-10-12 | OW-9-18-20 | SB-09B-30-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0.51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amorphous Phase | 0 | 1.2 | 0 | 0 | 0 | 1.5 | 0.51 | 2.2 | 0.27 | 0.89 | 0 | 0.5 |
| Metal Hydroxide Phase | 0 | 1.5 | 0 | 0 | 0 | 0.68 | 0.39 | 0.63 | 0.24 | 0.53 | 0 | 0.36 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 |
| Acid/Sulfide Fraction | 0 | 0.13 | 0 | 0 | 0 | 0 | 0.21 | 0.13 | 0 | 0.19 | 0.2 | 1.5 |
| Residual Fraction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 |

Borehole and depth below ground surface (Molybdenum in mg/kg soil)




| | SB-07B-35-37 | DA-14-4-5R | OW-9-10-12 | OW-9-18-20 | SB-09B-30-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 80.65% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 3.16% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 0.00% | 7.43% | 0.00% | 0.00% | 0.00% | 68.81% | 45.95% | 74.32% | 52.94% | 45.39% | 0.00% | 11.65% |
| Metal Hydroxide Phase | 0.00% | 9.05% | 0.00% | 0.00% | 0.00% | 31.19% | 35.14% | 21.28% | 47.06% | 40.77% | 0.00% | 8.53% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 40.28% |
| Acid/Sulfide Fraction | 0.00% | 0.81% | 0.00% | 0.00% | 0.00% | 0.00% | 18.92% | 4.39% | 0.00% | 13.85% | 100.00% | 35.85% |
| Residual Fraction | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 3.79% |

Borehole and depth below ground surface (Molybdenum in percent of total)

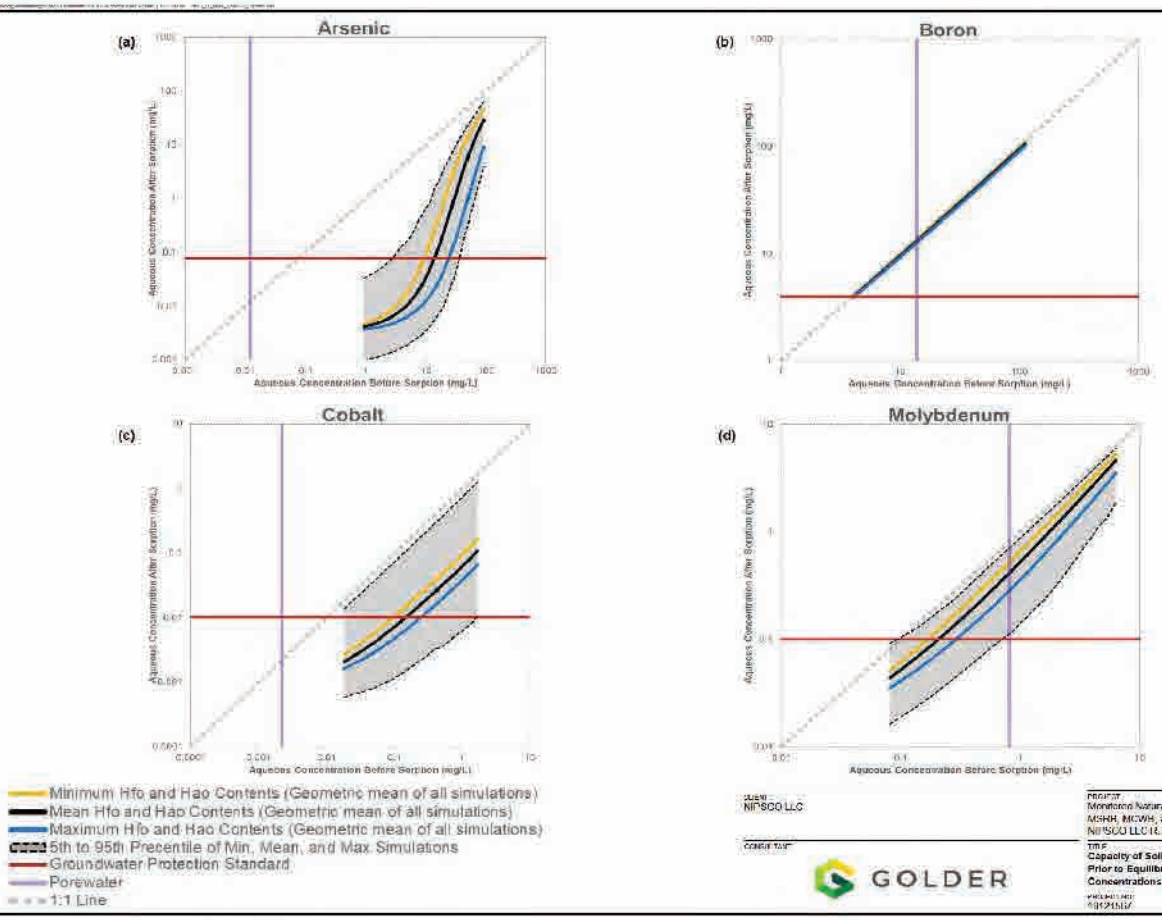
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Molybdenum Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 14 |



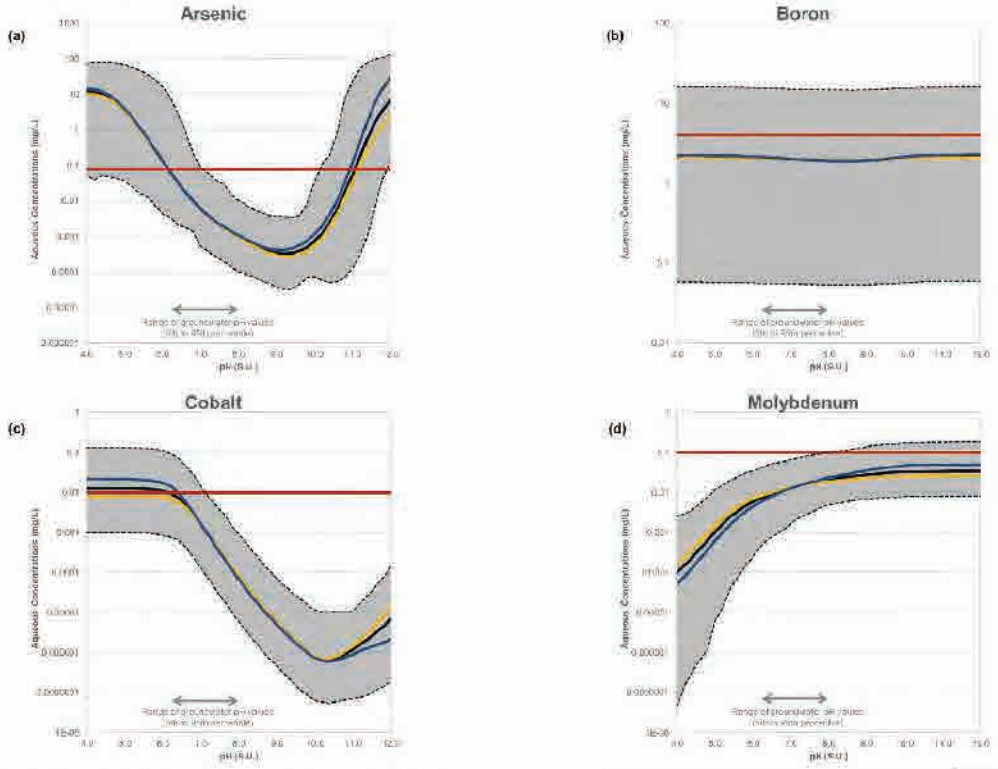

CLIENT
NRGCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWH, MCWH, and Haying Area
NRGCO LLC R. M. Schahfer Generating Station

TITLE
Capacity of Soils to Adsorb Constituents: Aqueous Concentrations Prior to Equilibrating with Hfo and Hao versus Aqueous Concentrations After Equilibrating

PROJECT NO. 19121557 | PHASE 150 | REV. A | FIGURE 15




Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IBCWF, and Haying Area
NIPSCO LLC R. M. Schahfer Generating Station

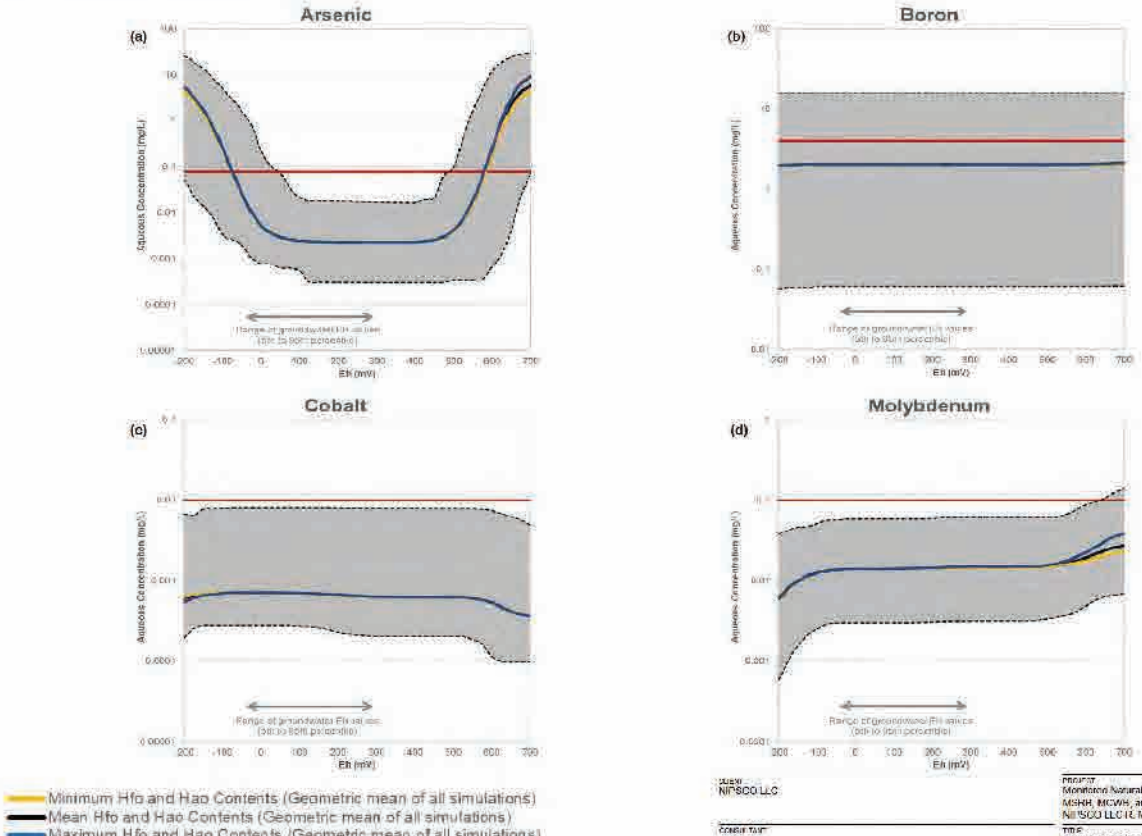
TITLE
Stability of Adsorbed Constituents Versus pH

PROJECT NO.
19121567

PHASE
150

REV.
A

FIGURE
16




CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IBCWF, and Haying Area
NIPSCO LLC R. M. Schahfer Generating Station

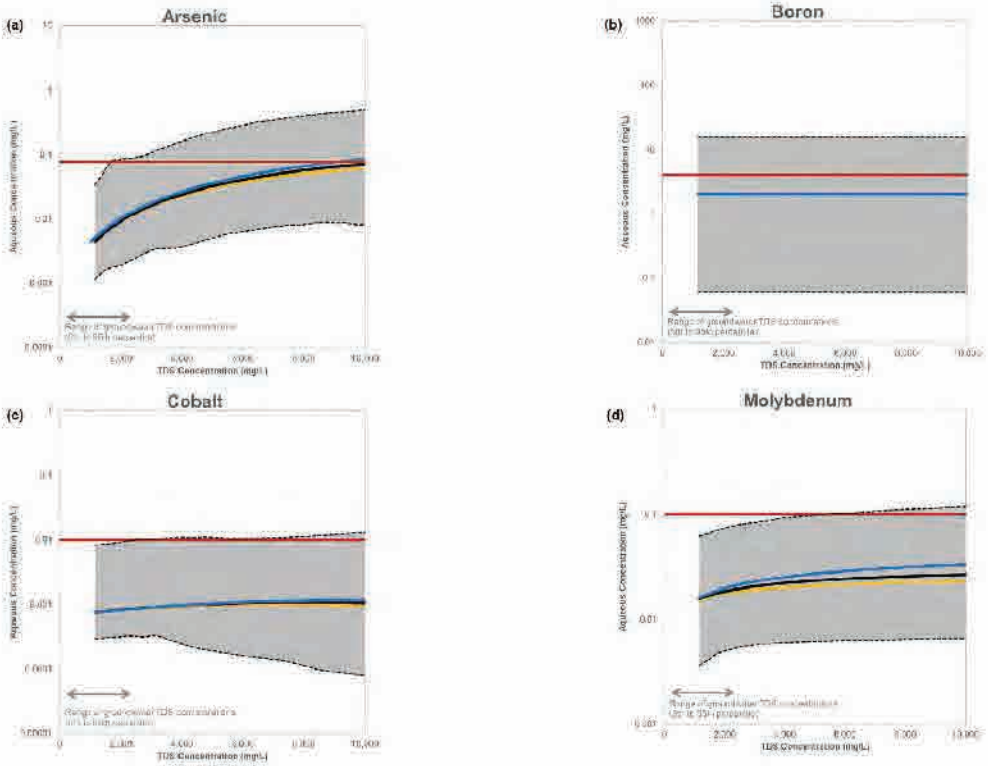
TITLE
Stability of Adsorbed Constituents Versus Eh

PROJECT NO.
1912150

PHASE
150

REV.
A

FIGURE
17




CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, MCWF, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Stability of Adsorbed Constituents Versus TDS

PROJECT NO.
1912150

PHASE
150

REV.
A

FIGURE
18

APPENDIX A

# Groundwater and Porewater Monitoring Data

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW04 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-12 | 2016-09-08 | 2016-11-09 | 2017-01-10 | | 2017-03-01 | 2017-04-26 | 2017-06-28 | 2017-08-22 | 2017-10-04 | 2018-03-13 | | 2018-04-20 | | 2018-10-25 | 2019-04-23 | 2019-11-07 |
| Samp e Type | | N | N | N | FD | N | N | N | N | N | N | FD | N | FD | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.48 | 1.4 | 2.4 | 1.1 | 1 | 1.2 | 0.74 | 0.92 | 1.2 | 0.54 | | | 0.74 | 0.72 | 0.78 | 0.74 | 1 3 |
| Ca cium | mg/L | 110 | 230 | 300 | 270 | 240 | 230 | 220 | 200 | 200 | 140 | | | 140 | 140 | 210 | 130 | 190 |
| Ch oride | mg/L | 2.2 | 27 | 69 | 13 | 14 | 13 | 5.4 | 12 | 13 | 4.5 | | | 3.7 J | 4.4 | 10 | 3.7 | 9 5 |
| Fluoride | mg/L | 0.92 J | 0 2 J | 10 U | 0.19 J | 0.17 J | 5 U | 5 U | 0.19 J | 0.21 J | 0.24 J | 0.15 J | 5 U | 5 U | 0.17 J- | 0.26 | 0.16 J | 0.23 |
| pH | SU | 7.22 | 6.83 | 6.75 | | 6.93 | 7 01 | 6.76 | 6.88 | 7.21 | 7.28 | | 6.95 | | 7 2 | 6.39 | 7 | 7.14 |
| Su fate | mg/L | 140 J- | 460 | 480 | 460 | 470 | 390 | 470 | 370 | 440 | 250 | | | 220 | 210 | 530 | 260 | 490 |
| Total Dissolved Solids | mg/L | 420 | 990 | 1400 | 1000 | 1000 | 890 | 870 | 880 | 920 | 610 | | | 580 J | 580 | 980 | 600 | 900 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.00027 J | 0.002 U | 0.00057 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | | | 0.002 U | 0.00065 J | 0.00092 J |
| Arsenic | mg/L | 0 0059 | 0.013 | 0.0052 | 0.0058 | 0.0072 | 0.005 U | 0.0099 | 0.012 | 0.012 | | 0.004 J | 0.0054 | | | 0.014 | 0.0023 J | 0.0018 J |
| Barium | mg/L | 0.041 | 0.077 | 0.11 | 0.095 | 0.079 | 0.089 | 0.069 | 0.084 | 0.09 | | 0.11 | 0.077 | | | 0.074 | 0.068 | 0.066 |
| Beryllium | mg/L | 0 00027 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.00048 J | 0.00053 J | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.00036 J | 0.00036 J | 0.0052 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.0011 J | 0.0012 J | | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00031 J | 0.00064 J | 0.0061 | 0.0058 | 0.0038 | 0.0049 | 0.003 | 0.0023 | | 0.0028 | 0.0031 | | | 0.0026 | 0.0011 | 0.00043 J |
| Fluoride | mg/L | 0.92 J | 0 2 J | 10 U | 0.19 J | 0.17 J | 5 U | 5 U | 0.19 J | 0.21 J | 0.24 J | 0.15 J | 5 U | 5 U | 0.17 J- | 0.26 | 0.16 J | 0.23 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0018 J | 0.008 U | 0.008 U | 0.0021 J | 0.0023 J | 0.0033 J | 0.0033 J | 0.0062 J | 0.0062 J | | 0.008 U | 0 008 U | | | 0.0023 J | 0.0045 J | 0.0028 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | 0.0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0075 J | 0.023 | 0.073 | 0.037 | 0.038 | 0.034 | 0.016 | 0 02 | 0.034 | | 0.0048 J | 0.024 | | | 0.039 | 0.024 | 0.055 |
| Radium Total | pci/L | 5 U | 0.583 | 0.697 | 0.804 | 0.515 U | 0.362 U | 0.379 U | 0.364 U | 0.352 U | | 1.35 J | 0.778 J | | | 0.473 | 0.591 | |
| Radium-226 | pci/L | 1 U | 0.138 U | 0.346 U | 0.301 U | 0.242 U | 0.121 U | 0.117 U | 0.119 J | 0.118 | | 0.177 | 0.0881 | | | 0.306 | 0.311 U | |
| Radium-228 | pci/L | 1 U | 0.498 U | 0.495 U | 0.677 J | 0.515 U | 0.362 U | 0.379 U | 0.364 U | 0.352 U | | 1.17 J | 0.69 J | | | 0.462 U | 0.405 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.00064 J | 0.0017 J | 0.0021 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.001 J | 0.001 J | | | 0.005 U | 0.0013 J | 0.0052 |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | | 230 | 190 | 270 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | | 6.9 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | | 3.1 J | | |
| Iron | mg/L | | | | | | | | | | | | | | | | 2.3 | 0.083 J |
| Magnesium | mg/L | | | | | | | | | | | | | | | 31 | 18 | 31 |
| Manganese | mg/L | | | | | | | | | | | | | | | | 0.012 J- | 0.0078 J |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | 0.39 | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | | 0.9 | 0.31 U | 0.31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | | 3.3 J | 3.1 J | 3.2 J |
| Sodium | mg/L | | | | | | | | | | | | | | | 13 | 12 | 36 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.09 | 0.58 | 0.37 | | 1.82 | 1.47 | 0.12 | 0.3 | 0.52 | 0.09 | | 0.66 | | 2 3 | 0.15 | 7.08 | 2.55 |
| Oxidation Reduction Potent al | mV | 59.6 | -24 | -6.9 | | -31.7 | 14 | -57.8 | -45 | -27 | -105.8 | | -181.8 | | -81 2 | -58.1 | 19 | -60.7 |
| Eh | mV | 259.6 | 176.0 | 193.1 | | 168.3 | 214.0 | 142.2 | 155.0 | 173.0 | 94.2 | | 18.2 | | 118.8 | 141.9 | 219.0 | 139.3 |
| pH | SU | 7.22 | 6.83 | 6.75 | | 6.93 | 7.01 | 6.76 | 6.88 | 7.21 | 7.28 | | 6.95 | | 7 2 | 6.39 | 7 | 7.14 |
| Spec f c Conductance | uS/cm | 595 | 1345 | 1681 | | 1109 | 910 | 1137 | 911 | 1153 | 813 | | 562 | | 770 | 1311 | 549 | 866 |
| Temperature | deg C | 13 | 17.3 | 16.3 | | 10.5 | 8 05 | 10.2 | 13.1 | 15.9 | 16.1 | | 7.55 | | 3 5 | 15.5 | 4.2 | 13.2 |
| Turb dity | NTU | 4.04 | 1.48 | 2.21 | | 2.28 | 4 26 | 4 04 | 4.88 | 1.65 | 0.51 | | 4.92 | | 3.12 | 1.92 | 4.48 | 1.38 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW07 | | | | | | | | | | | | | | | GAMW07B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-12 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-06-29 | 2017-08-23 | 2017-10-03 | | 2018-03-15 | 2018-04-23 | 2018-10-26 | 2019-05-02 | 2019-11-08 | 2018-09-06 | 2018-10-26 | 2019-05-02 | 2019-11-12 |
| Samp e Type | | N | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.2 | 1 | 0.91 | 0.91 | 1 | 0.68 | 0.67 | 0.68 | 0.71 | 0.72 | | 1.2 | 1.3 | 0.85 | 0.85 | 20 | 23 | 18 | 15 |
| Ca cium | mg/L | 170 | 190 | 200 | 170 | 170 | 190 | 220 | 190 | 220 | 220 | | 210 | 230 | 220 | 180 | 370 | 430 | 380 | 400 |
| Ch oride | mg/L | 7.8 | 6.6 | 5.3 | 6 | 7 6 | 2.8 | 3 J | 3.2 J | 3 J | 3 6 J | | 4.7 J | 6 3 | 6 5 | 4.8 | 10 U | 250 | 170 | 150 |
| Fluoride | mg/L | 0.72 J | 0.91 J | 0.8 J | 0.85 J | 0.66 J | 0.76 J | 0.79 J | 0.66 J | 1.1 J | 0.93 J | 0.58 J | 0.57 J | 0.73 | 0.97 | 0.88 | 10 U | 1.5 | 1.3 | 1.2 |
| pH | SU | 7.03 | 7.27 | 7.04 | 7.15 | 7.2 | 7.17 | 6.57 | 7.2 | | 7.1 | 7.28 | 7.35 | 5.71 | 7.2 | 7.44 | 8.29 | 6.78 | 7.58 | 7.13 |
| Su fate | mg/L | 310 J- | 330 | 320 | 320 | 290 | 310 | 360 | 380 | 460 | 450 | | 450 | 530 | 500 | 480 | 10 U | 1600 | 1500 | 1400 |
| Total Dissolved Solids | mg/L | 770 | 830 | 840 | 750 | 710 | 810 | 970 | 910 | 970 | 1000 | | 900 | 970 | 1100 | 940 | 2700 | 2600 | 920 | 2300 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 00035 J | 0.00039 J | 0.00035 J | 0.00028 J | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0013 J | 0.0016 J | 0.0018 J | 0.0028 J | 0.005 U | 0.0028 J | 0 0025 J | 0.0016 J | | | 0.005 U | | 0.0012 J | 0.0019 J | 0.0011 J | 0.0028 J | 0.0015 J | 0.0019 J | 0.0017 J |
| Barium | mg/L | 0.052 | 0.055 | 0.056 | 0.042 | 0.05 | 0.05 | 0.059 | 0.059 | | | 0.056 | | 0.064 | 0 053 | 0.043 | 0.072 | 0.063 | 0.053 | 0.043 |
| Beryllium | mg/L | 0 00011 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 0003 J | 0.00022 J | | | 0.001 U | | 0.00047 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.00047 J | 0.00046 J | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0 0056 | 0.0077 | 0.0055 | 0.0038 | 0.0044 | 0.0063 | 0.01 | 0.0095 | | | 0.006 | | 0.01 | 0.0074 | 0.0049 | 0.00074 J | 0 001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.72 J | 0.91 J | 0.8 J | 0.85 J | 0.66 J | 0.76 J | 0.79 J | 0.66 J | 1.1 J | 0.93 J | 0.58 J | 0.57 J | 0.73 | 0.97 | 0.88 | 10 U | 1.5 | 1.3 | 1.2 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.0007 J | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0034 J | 0.008 U | 0.008 U | 0.0035 J | 0.0031 J | 0.0041 J | 0 0037 J | 0.0038 J | | | 0.0024 J | | 0.0054 J | 0.0041 J | 0.0033 J | 0.0043 J | 0.0045 J | 0.004 J | 0.0035 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0.0084 J | 0.0098 J | 0.0095 J | 0.01 U | 0.01 U | 0.0083 J | 0 0081 J | 0.007 J | | | 0.0066 J | | 0.0087 J | 0.0097 J | 0.0087 J | 0.015 | 0.017 | 0.025 | 0.026 |
| Radium Total | pci/L | 1 59 | 0.696 | 0.548 | 0.412 U | 0.42 U | 0.371 U | 0.45 | 0.588 | | | 0.749 J | | 0.823 J | 0.37 U | | 2.63 | 2 6 J | 2.31 | |
| Radium-226 | pci/L | 0.667 J | 0.289 | 0.374 | 0.237 U | 0.186 | 0.155 | 0.232 J | 0.3 | | | 0.163 | | 0.483 J | 0.305 U | | 1.16 | 1.56 J | 1.17 | |
| Radium-228 | pci/L | 0.923 | 0.406 | 0.462 U | 0.412 U | 0.42 U | 0.371 U | 0 262 U | 0.413 U | | | 0.585 J | | 0.365 U | 0.37 U | | 1.47 | 1.04 | 1 14 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.003 J | 0.003 J | 0.005 U | 0.008 | 0.0054 | 0.005 | | | 0.0028 J | | 0.0016 J | 0.0045 J | 0 0019 J | 0.0012 J | 0 005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0 00011 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | | 0.001 U | | 0.00024 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | 180 | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | 5 U | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | 5 U | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 260 | 270 | 250 | 180 | 180 | 170 | 170 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 0.035 J | | | 6.7 J | 6.8 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 0.05 UJ | | | 0.1 R | 1.1 J | | |
| Iron | mg/L | | | | | | | | | | | | | | 0.067 J | 0.09 J | | | 5.3 | 5.5 |
| Magnesium | mg/L | | | | | | | | | | | | | 39 | 41 | 38 | 72 | 87 | 73 | 72 |
| Manganese | mg/L | | | | | | | | | | | | | | 0.46 | 0.61 | | | 0.46 | 0.49 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 3.3 | 1.6 | 0.05 R | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | 0.05 R | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.53 | | | | 0.049 J | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 0.31 U | 0.31 U | 0.31 U | 0.031 U | 0.31 U | 0.31 U | 0.31 U |
| Potassium | mg/L | | | | | | | | | | | | | 6.6 | 5.5 | 6.5 | 12 | 13 | 13 | 13 |
| Sodium | mg/L | | | | | | | | | | | | | 14 | 14 | 9.9 | 290 | 240 | 230 | 120 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.6 | 1.81 | 0.59 | 0.52 | 0.51 | 1.96 | 1.02 | 0 84 | | 0.48 | 0.8 | 3.52 | 2.64 | 0.81 | 0.38 | 0.13 | 0.67 | 0.19 | 0.2 |
| Oxidation Reduction Potential | mV | 111.2 | 64.2 | -6.4 | 71.3 | 65.3 | 76.9 | 291.1 | 8.5 | | 95.4 | -55 | -98.7 | -233.3 | 135.1 | -131.8 | -197.6 | -230.2 | 34.9 | -196.7 |
| Eh | mV | 311.2 | 264.2 | 193.6 | 271.3 | 265.3 | 276.9 | 491.1 | 208.5 | | 295.4 | 145.0 | 101.3 | -33.3 | 335 1 | 68.2 | 2.4 | -30.2 | 234.9 | 3.3 |
| pH | SU | 7.03 | 7.27 | 7.04 | 7.15 | 7.2 | 7.17 | 6.57 | 7.2 | | 7.1 | 7.28 | 7.35 | 5.71 | 7.2 | 7.44 | 8.29 | 6.78 | 7.58 | 7.13 |
| Spec f c Conductance | uS/cm | 966 | 1072 | 1106 | 928 | 832 | 1121 | 1151 | 1157 | | 1273 | 760 | 1060 | 1240 | 975 | 828 | 5178 | 3237 | 2357 | 1686 |
| Temperature | deg C | 14.4 | 19.2 | 16.7 | 12.9 | 10.63 | 11.8 | 14.6 | 16.5 | | 18 | 10 | 10 | 16.95 | 10.3 | 15.3 | 15.03 | 13.86 | 12.4 | 12.9 |
| Turb dity | NTU | 4.6 | 4.51 | 1.26 | 3.2 | 4.76 | 2.17 | 2.87 | 0.9 | | 0.49 | 1.3 | 1.75 | 1.08 | 2.72 | 4.58 | 4.48 | 3.01 | 2.86 | 1.11 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW08 | | | | | | | | | | | | | | GAMW08B | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-04 | 2018-03-14 | 2018-04-23 | 2018-10-26 | 2019-05-08 | 2019-11-07 | 2018-09-07 | | 2018-10-26 | | 2019-05-03 | 2019-11-07 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | FD | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 3.5 | 3.9 | 3.2 | 3.4 | 3 3 | 3.2 | 2.9 | 2.2 | 3.7 | | 2.4 | 1.8 | 1.4 | 2 5 | | 18 | | 15 | 14 | 13 |
| Ca cium | mg/L | 310 | 310 | 300 | 260 | 270 | 310 | 340 | 270 | 290 | | 360 | 230 | 250 | 280 | | 380 | | 370 | 350 | 340 |
| Ch oride | mg/L | 88 | 71 | 89 | 99 | 110 | 86 | 83 | 39 | 87 | | 64 | 56 | 49 | 66 | | 240 | | 180 | 160 | 180 |
| Fluoride | mg/L | 1 J | 1 2 J | 0.73 J | 0.87 J | 0.94 J | 0.92 J | 1.3 J | 2 J | 0.68 J | 1 2 J | 1.3 J- | 1.6 | 2 2 | 1.9 | | 1.6 J | | 1.5 | 1.9 | 1.7 |
| pH | SU | 6.92 | 7.03 | 6.85 | 7.02 | 7.09 | 6.93 | 7 | 7 27 | 6 89 | 7.41 | 7.41 | 6.99 | 7.37 | 7.5 | | 7.7 | | 7.45 | 7.57 | 7.85 |
| Su fate | mg/L | 770 J- | 690 | 680 | 610 | 630 | 770 | 800 | 640 | 670 | | 800 | 460 | 540 | 670 | | 1500 | | 1500 | 1400 | 1300 |
| Total Dissolved Solids | mg/L | 1600 | 1500 | 1600 | 1300 | 1400 | 1700 | 2000 | 1400 | 1500 | | 1700 | 1100 | 1300 | 1300 | | 1900 J | | 2300 | 2300 | 2200 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 00073 J | 0.00069 J | 0.0014 J | 0.00041 J | 0.00043 J | 0 002 U | 0.00059 J | 0.00075 J | | 0.002 U | | 0.00082 J | 0.00076 J | 0.00077 J | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0018 J | 0.0019 J | 0.0018 J | 0.0027 J | 0.0016 J | 0.0031 J | 0 0027 J | 0.0023 J | | 0.005 U | | 0.0011 J | 0.0015 J | 0.0016 J | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U |
| Barium | mg/L | 0.068 | 0.065 | 0.065 | 0.05 | 0 055 | 0.064 | 0.074 | 0.077 | | 0.066 | 0.069 | 0.053 | 0.058 | 0.066 | | 0.042 | | 0.03 | 0 025 | 0 023 |
| Beryllium | mg/L | 0 00017 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.0004 J | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 7.4E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.00037 J | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.00029 J | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.036 | 0.034 | 0.059 | 0.047 | 0.05 | 0.037 | 0.047 | 0.02 | | 0.022 | 0.027 | 0.011 | 0.0079 | 0.011 | | 0.00066 J | | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 1 J | 1 2 J | 0.73 J | 0.87 J | 0.94 J | 0.92 J | 1.3 J | 2 J | 0.68 J | 1 2 J | 1.3 J- | 1.6 | 2 2 | 1.9 | | 1.6 J | | 1.5 | 1.9 | 1.7 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0 0098 | 0.012 | 0.009 | 0.0098 | 0.0093 | 0.012 | 0.011 | 0.012 | | 0 0089 | 0 009 | 0.011 | 0.015 | 0.0091 | | 0.0098 | | 0.0073 J | 0.0063 J | 0.0058 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.034 | 0.036 | 0.024 | 0.02 | 0 019 | 0.038 | 0.049 | 0.083 | | 0.058 | 0.058 | 0.059 | 0.08 | 0.068 | | 0.037 | | 0.039 | 0 057 | 0 044 |
| Radium Total | pci/L | 1 07 | 1 08 | 1.09 | 0.581 | 0.777 | 0.632 | 1.11 | 0.762 | | 1.13 J | 0.99 | 1 J | 0.473 | | | 1.67 J | | 1 02 J | 0 704 | |
| Radium-226 | pci/L | 0.501 J | 0.469 | 0.557 | 0.375 | 0 368 | 0.383 | 0 613 J | 0.591 | | 0.267 | 0.437 | 0.582 J | 0.312 U | | | 1.09 J | | 0.596 J | 0.438 | |
| Radium-228 | pci/L | 1 U | 0.609 | 0.533 | 0.43 U | 0.423 U | 0 365 U | 0.499 | 0.341 U | | 0.865 J | 0.552 | 0.423 | 0.456 U | | | 0.579 | | 0.454 U | 0.518 U | |
| Selenium | mg/L | 0.005 U | 0.0065 | 0.0033 J | 0.0014 J | 0.0032 J | 0.011 | 0.0088 | 0.0081 | | 0.024 | 0.022 | 0.0021 J | 0.016 | 0.0036 J | | 0 0014 J | | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.00045 J | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | 160 | 160 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | 350 | 380 | 380 | 160 | 160 | 160 | 160 | 130 | 160 |
| Ferr c Iron | mg/L | | | | | | | | | | | | 0.083 J | | | 6.1 J | 6.9 J | 6 5 | 6.2 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | 0.05 UJ | | | 0.1 R | 0.1 R | 0.79 J | 0.98 J | | |
| Iron | mg/L | | | | | | | | | | | | | 0.2 U | 0.2 U | | | | | 5.6 | 5.1 |
| Magnesium | mg/L | | | | | | | | | | | | 44 | 53 | 56 | 58 | 66 | 63 | 62 | 45 | 42 |
| Manganese | mg/L | | | | | | | | | | | | | 0.22 | 0.37 | | | | | 0.49 | 0.45 |
| Nitrate as N | mg/L | | | | | | | | | | | | | 7.7 | 0.25 | 0 05 R | 0.05 R | | | 0.075 J | 0.43 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | 0 05 R | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | 0.06 | | | | | 0.05 U | 0 05 U | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | 0.31 U | 0.15 J | 0.11 J- | 0.028 J | 0.031 U | 0.31 U | 0 31 U | 0.31 U | 0.19 J- |
| Potassium | mg/L | | | | | | | | | | | | 12 | 13 | 12 | 5.6 | 6.4 | 5 5 | 5.5 | 5.6 | 5.3 |
| Sodium | mg/L | | | | | | | | | | | | 45 | 45 | 51 | 260 | 300 | 200 | 200 | 240 | 200 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 1.9 | 0.38 | 1.62 | 1.27 | 0.96 | 0.63 | 1.96 | 0.93 | 0 21 | 0.97 | 5.09 | 0.21 | 0.44 | 4.2 | | 0.42 | | 0.12 | 0.13 | 2.61 |
| Oxidation Reduction Potential | mV | 159.7 | 64.6 | -8 | 58.4 | 49.9 | 60.4 | 242.5 | 61.9 | -15.9 | 110.1 | -106.4 | 27.7 | 62.2 | 44.1 | | -185.5 | | -67 | 7.9 | -67 |
| Eh | mV | 359.7 | 264.6 | 192.0 | 258.4 | 249.9 | 260.4 | 442.5 | 261.9 | 184.1 | 310.1 | 93.6 | 227.7 | 262.2 | 244.1 | | 14.5 | 200.0 | 133.0 | 207.9 | 133.0 |
| pH | SU | 6.92 | 7.03 | 6.85 | 7.02 | 7.09 | 6.93 | 7 | 7.27 | 6 89 | 7.41 | 7.41 | 6.99 | 7.37 | 7.5 | | 7.7 | | 7.45 | 7.57 | 7.85 |
| Spec f c Conductance | uS/cm | 1925 | 1807 | 1664 | 1517 | 1494 | 2098 | 1834 | 1713 | 1840 | 1121 | 1732 | 1440 | 1102 | 1322 | | 2538 | | 2375 | 2190 | 1896 |
| Temperature | deg C | 15 5 | 18.78 | 17.75 | 12.2 | 10.06 | 11.1 | 15.8 | 18.5 | 18.3 | 9.6 | 10.2 | 17.2 | 11 | 10.84 | | 14.6 | | 14.5 | 12.8 | 8.05 |
| Turb dity | NTU | 2.3 | 3.22 | 0.58 | 1.26 | 1.56 | 1.1 | 2.41 | 0 68 | 4 38 | 1.11 | 1.54 | 1.4 | 1.81 | 0.31 | | 3.4 | | 1.63 | 1.72 | 2.89 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW09 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | | 2017-04-26 | | 2017-06-28 | 2017-08-23 | 2017-10-03 | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-05-02 | | 2019-11-07 |
| Samp e Type | | N | N | N | N | FD | N | FD | N | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 5.7 | 4.7 | 7.3 | 5.3 | 7.7 | 7.6 | 5.9 | 6.1 | 4.9 | 7.9 | 7.3 | | 4.9 | 6.3 | 3 | 3 | 2.7 |
| Ca cium | mg/L | 320 | 240 | 210 | 210 | 200 | 200 | 220 | 240 | 270 | 280 | 220 | | 220 | 220 | 200 | 200 | 150 |
| Ch oride | mg/L | 63 | 55 | 58 | 58 | 75 | 73 | 71 | 67 | 53 | 39 | 64 | | 58 | 82 | 46 | 46 | 39 |
| Fluoride | mg/L | 0.15 J | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0 16 J | 0.13 J | 0.18 J | 2 J | 0.21 J | 5 U | 0.26 J- | 0.28 | 0.27 | 0 27 | 0.33 |
| pH | SU | 7.27 | 7.25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7.31 | 7.3 | 7.28 | 6.87 | 6 88 | | 7.1 | 7.06 |
| Su fate | mg/L | 910 J- | 570 | 360 | 500 | 440 | 420 | 460 | 460 | 600 | 740 | 540 | | 510 | 510 J- | 530 | 530 | 380 |
| Total Dissolved Solids | mg/L | 1500 | 1100 | 880 | 980 | 1000 | 990 | 1000 | 960 | 1300 | 1400 | 1100 | | 930 | 1100 | 970 | 980 | 770 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0015 J | 0.0013 J | 0.00076 J | 0.0031 J | 0.005 U | 0 005 U | 0.0028 J | 0.0029 J | 0.002 J | 0.0027 J | | 0 005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Barium | mg/L | 0.059 | 0.043 | 0.036 | 0.039 | 0.035 | 0.037 | 0.039 | 0.042 | 0 047 | 0.054 | | 0.041 | 0.039 | 0.039 | 0.041 | 0.041 | 0.036 |
| Beryllium | mg/L | 0 00012 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00036 J | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.00092 J | 0.00058 J | 0.00052 J | 0.00049 J |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.00033 J | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0 0036 | 0.002 U | 0.00062 J | 0.0013 J | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.0011 J | 0.0015 J | | 0 0016 J | | 0.002 U | 0.0012 J | 0.0012 J | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00018 J | 0.0002 J | 0.0002 J | 0.001 U | 0 001 U | 0.00029 J | 0.00025 J | 0.001 U | 0.001 U | | 0 001 U | | 0.00038 J | 0.00049 J | 0.00055 J | 0.00035 J |
| Fluoride | mg/L | 0.15 J | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0 16 J | 0.13 J | 0.18 J | 2 J | 0.21 J | 5 U | 0.26 J- | 0.28 | 0.27 | 0 27 | 0.33 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0019 J | 0.008 U | 0.008 U | 0.0016 J | 0.0011 J | 0 0012 J | 0.008 U | 0 008 U | 0.0017 J | 0.0018 J | | 0 008 U | | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.02 | 0.017 | 0.029 | 0.023 | 0.027 | 0.027 | 0.021 | 0.021 | 0 028 | 0 032 | | 0.025 | 0.035 | 0.04 | 0.043 | 0.043 | 0.035 |
| Radium Total | pci/L | 1.5 | 0.568 | 0.477 U | 0.467 U | 0.55 | 0.469 | 0.593 | 0.414 | 0 707 | 0 803 | | 1.45 J | 0.096 | 0.679 | 0.505 | 0.427 U | |
| Radium-226 | pci/L | 0.506 J | 0.231 | 0.397 U | 0.257 | 0.134 | 0.166 | 0.194 | 0.205 | 0.255 J | 0 357 | | 0.188 | 0.204 | 0.446 | 0.33 | 0.355 U | |
| Radium-228 | pci/L | 0.994 | 0.349 U | 0.477 U | 0.467 U | 0.427 U | 0.432 U | 0.398 | 0.36 U | 0.452 | 0.446 | | 1.26 J | -0.108 | 0.361 U | 0.428 U | 0.427 U | |
| Selenium | mg/L | 0.014 | 0.0091 | 0.0049 J | 0.011 | 0.014 | 0.014 | 0.019 | 0.02 | 0 013 | 0 027 | | 0.0082 | 0.011 | 0 0098 | 0.012 | 0.012 | 0.0077 |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | 150 | 110 | 100 | 110 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | 0.042 J | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | 0.05 UJ | | | |
| Iron | mg/L | | | | | | | | | | | | | | | 0.027 J | 0.038 J | 0.037 J |
| Magnesium | mg/L | | | | | | | | | | | | | | 21 | 21 | 19 | 16 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.011 J | 0.013 J | 0.0083 J |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | 5 6 | 5.6 | 7.1 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 1.4 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | 0.31 U | 0.31 U | 0.31 U | 0.31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | 9 | 7 2 | 7.1 | 5.6 |
| Sodium | mg/L | | | | | | | | | | | | | | 38 | 35 | 33 | 28 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 3.59 | 6.69 | 1.98 | 6.1 | | 3.41 | | 3.92 | 5.27 | 3.24 | 5.98 | 6.71 | 5.43 | 0 22 | | 5.82 | 5.54 |
| Oxidation Reduction Potential | mV | -1.4 | 75.7 | 27.6 | 236 | | 90.5 | | 152.6 | 280.8 | 58.9 | 139.5 | -116.3 | -90.8 | -48.8 | | 53.6 | -25.7 |
| Eh | mV | 198.6 | 275.7 | 227.6 | 436.0 | | 290.5 | | 352.6 | 480.8 | 258.9 | 339.5 | 83.7 | 109.2 | 151.2 | | 253.6 | 174 3 |
| pH | SU | 7.27 | 7.25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7.31 | 7 3 | 7.28 | 6.87 | 6 88 | | 7.1 | 7.06 |
| Spec f c Conductance | uS/cm | 1671 | 736 | 1110 | 822 | | 1041 | | 1209 | 702 | 1542 | 1331 | 600 | 1156 | 1274 | | 888 | 685 |
| Temperature | deg C | 14.4 | 18.4 | 16.9 | 11.9 | | 10.75 | | 11.9 | 14.7 | 17.2 | 18.2 | 10.2 | 10.6 | 17.9 | | 11.4 | 15.9 |
| Turb dity | NTU | 1.59 | 3.92 | 1.15 | 1.34 | | 3.12 | | 1.88 | 1.91 | 0.91 | 0.39 | 0.82 | 2.44 | 2.41 | | 3.41 | 1.55 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW09B | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-06-28 | 2017-08-23 | | 2017-10-03 | 2018-03-14 | 2018-04-23 | 2018-09-06 | 2018-10-26 | 2019-05-08 | | 2019-11-07 |
| Samp e Type | | FD | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 24 | 25 | 25 | 16 | 11 | 11 | 11 | 12 | 16 | 16 | 16 | | 14 | 12 | 12 | | 14 | 8 |
| Ca cium | mg/L | 260 | 280 | 270 | 190 | 200 | 170 | 170 | 180 | 180 | 180 | 160 | | 160 | 150 | 180 | | 150 | 150 |
| Ch oride | mg/L | 210 | 180 | 190 | 130 | 110 | 120 | 130 | 150 | 170 | 160 | 140 | | 150 | 180 | 150 | | 140 | 110 |
| Fluoride | mg/L | 0.54 J | 0.55 J | 0.67 J | 0.68 J | 0.1 J | 1.3 J | 1.2 J | 1.4 J | 1.2 J | 0.37 J | 1.5 J | 1.4 J | 1.6 J | 1.8 J | 1.6 | | 1.6 | 1.5 |
| pH | SU | | 7.08 | 7.15 | 6.96 | 7.36 | 7.44 | 7 29 | 7.36 | | 7.46 | 7.36 | 7.56 | 7.43 | 7 32 | 7.46 | | 7.49 | 7.56 |
| Su fate | mg/L | 970 J- | 1000 J- | 960 | 740 | 670 J | 550 | 570 | 640 | 630 | 650 | 550 | | 430 | 570 | 580 | | 520 | 440 |
| Total Dissolved Solids | mg/L | 2100 | 2000 | 2100 | 1700 | 1300 | 1200 | 1200 | 1500 | 1500 | 1500 | 1300 | | 990 | 1300 | 1200 | | 1200 | 990 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0024 J | 0.0026 J | 0.002 J | 0.0014 J | 0 0027 J | 0.005 U | 0.004 J | 0.004 J | 0.0031 J | 0.0031 J | | 0.0054 | 0.0064 | 0.0044 J | 0 004 J | | 0.0057 | 0.0042 J |
| Barium | mg/L | 0 069 | 0.071 | 0.076 | 0.062 | 0.048 | 0.04 | 0.046 | 0.055 | 0.062 | 0.058 | | 0.045 | 0.04 | 0.049 | 0.047 | | 0.041 | 0 029 |
| Beryllium | mg/L | 0.00012 J | 9.1E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.00027 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| Chromium | mg/L | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0 001 U | 0 001 U | 0.00069 J | 0.00028 J | 0.00045 J | 0.001 U | 0 00028 J | 0 00045 J | 0.00041 J | 0.00041 J | | 0 001 U | | 0.00058 J | 0.00028 J | | 0.00025 J | 0.001 U |
| Fluoride | mg/L | 0.54 J | 0.55 J | 0.67 J | 0.68 J | 0.1 J | 1.3 J | 1.2 J | 1.4 J | 1.2 J | 0.37 J | 1.5 J | 1.4 J | 1.6 J | 1.8 J | 1.6 | | 1.6 | 1.5 |
| Lead | mg/L | 0 001 U | 0 001 U | 0.001 U | 0.00017 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0055 J | 0.0065 J | 0.008 U | 0.008 U | 0 0049 J | 0.0045 J | 0.0056 J | 0.0054 J | 0.0047 J | 0.0042 J | | 0.0031 J | | 0.0037 J | 0.0052 J | | 0.0055 J | 0.0033 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.01 U | 0.0079 J | 0.0075 J | 0.0097 J | 0.013 | 0.015 | 0.015 | 0.013 | 0.0094 J | 0.01 | | 0.014 | 0.012 | 0.01 | 0.011 | | 0.012 | 0.0096 J |
| Radium Total | pci/L | 1.12 | 1.86 | 1.65 | 1.14 | 0.453 | 1.09 | 0.774 | 1 85 | 1.01 | 1.27 | | 1.18 J | 0.868 | 1.04 | 1.24 J | | 1.01 | |
| Radium-226 | pci/L | 0.809 J | 0.947 J | 0.907 | 0.579 | 0.476 | 0.585 | 0.316 | 0.781 J | 0.585 | 0.709 | | 0.482 | 0.301 | 0.653 | 0.69 J | | 0.449 | |
| Radium-228 | pci/L | 1 U | 0.913 | 0.743 | 0.559 | 0.41 U | 0.508 | 0.458 | 1 07 | 0.422 | 0.563 | | 0.699 J | 0.567 | 0.386 | 0.546 | | 0.564 | |
| Selenium | mg/L | 0 005 U | 0 005 U | 0.005 U | 0.005 U | 0.002 J | 0.005 U | 0.0014 J | 0.001 J | 0.0015 J | 0.0016 J | | 0 005 U | | 0.002 J | 0.0019 J | | 0.005 U | 0.0011 J |
| Thallium | mg/L | 0.0003 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.0002 J | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | 190 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | 190 | 200 | 200 | 200 | 170 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | 2.5 J | 2.1 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | 0.1 R | 0.55 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | | | 3 2 | 3.2 | 3 |
| Magnesium | mg/L | | | | | | | | | | | | | | 57 | 60 | 64 | 63 | 54 |
| Manganese | mg/L | | | | | | | | | | | | | | | | 1 2 | 1.2 | 1 2 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 0.05 R | | 0.1 U | 0.1 U | 0.12 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | 0.077 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | 0.09 | 0.31 U | 0.31 U | 0.31 U | 0.31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | 4 J | 3.8 J | 4 J | 4 J | 2.4 J |
| Sodium | mg/L | | | | | | | | | | | | | | 150 | 94 | 110 | 110 | 46 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | | 0.44 | 1.06 | 0.43 | 0.38 | 0.44 | 0 61 | 0.71 | | 0.57 | 0.45 | 0.1 | 0.04 | 0 61 | 0.28 | | 0.04 | 0.35 |
| Oxidation Reduction Potential | mV | | -57.7 | 67.3 | -76.4 | -100.1 | -80.6 | -102.6 | 68 2 | | 19.7 | -46 8 | -121.6 | -130.5 | -100.5 | -101 1 | | -16.8 | -131.8 |
| Eh | mV | | 142.3 | 267.3 | 123 6 | 99.9 | 119.4 | 97.4 | 268.2 | | 219.7 | 153 2 | 78.4 | 69.5 | 99 5 | 98.9 | | 183.2 | 68.2 |
| pH | SU | | 7.08 | 7.15 | 6.96 | 7.36 | 7.44 | 7 29 | 7.36 | | 7.46 | 7.36 | 7.56 | 7.43 | 7 32 | 7.46 | | 7.49 | 7.56 |
| Spec f c Conductance | uS/cm | | 2356 | 2435 | 2088 | 1559 | 1352 | 1592 | 1561 | | 1922 | 1722 | 1053 | 1301 | 1556 | 1693 | | 1165 | 9.24 |
| Temperature | deg C | | 14.1 | 14.7 | 15.1 | 13.6 | 13.45 | 14.5 | 14 8 | | 15.5 | 16 | 14 | 14.4 | 16.1 | 16 | | 14.2 | 14.4 |
| Turb dity | NTU | | 3.48 | 4.29 | 2.17 | 0.99 | 2.58 | 1 88 | 1.69 | | 2.54 | 1.96 | 4.18 | 4.11 | 2.96 | 1.39 | | 4.7 | 3.36 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW15 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-03 | 2018-03-15 | 2018-04-24 | 2018-10-26 | 2019-05-06 | 2019-11-08 |
| Samp e Type | | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0 75 | 0.45 J | 1 J | 1.1 | 0.6 | 0.44 | 0.45 | 0 87 | 0.91 | 0.66 | | 0.72 | 0.76 | 0.71 | 0.73 |
| Ca cium | mg/L | 100 | 130 | 120 | 100 | 82 | 81 | 95 | 160 | 150 | 77 | | 170 | 120 | 140 | 100 |
| Ch oride | mg/L | 28 | 31 | 31 | 27 | 28 | 27 | 27 | 27 | 25 | 19 | | 24 | 21 | 22 | 28 |
| Fluoride | mg/L | 1.2 J | 0.85 J | 0.85 J | 0 74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.93 J | 0.67 J | 0.76 J | 0.69 | 0.52 | 0.73 |
| pH | SU | 6.88 | | 6.98 | 6.83 | 6.96 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7 34 |
| Su fate | mg/L | 160 J- | 260 | 260 | 150 | 140 | 140 | 160 | 300 | 330 | 260 | | 410 | 240 | 380 | 260 |
| Total Dissolved Solids | mg/L | 570 | 660 | 630 | 520 | 400 | 400 | 420 | 780 | 750 | 660 | | 790 | 5900 | 740 | 640 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.00041 J | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.056 | 0.072 | 0 069 | 0.078 | 0.076 | 0.054 | 0.062 | 0.059 | 0.066 | | 0 058 | | 0.091 | 0.081 | 0.075 |
| Barium | mg/L | 0.044 | 0.053 | 0 053 | 0.039 | 0.032 | 0.031 | 0.034 | 0.054 | 0.058 | | 0.047 | | 0.046 | 0.047 | 0.037 |
| Beryllium | mg/L | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0 002 U | 0.002 U | 0.00027 J | 0.00028 J | 0.00029 J | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0 0019 | 0.0022 | 0.0022 | 0.0021 | 0.0019 | 0.0018 | 0.0022 | 0 0029 | 0.0027 | | 0.0025 | | 0.0023 | 0.0035 | 0.0017 |
| Fluoride | mg/L | 1.2 J | 0.85 J | 0.85 J | 0.74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.93 J | 0.67 J | 0.76 J | 0.69 | 0.52 | 0.73 |
| Lead | mg/L | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0053 J | 0 008 U | 0.008 U | 0.008 U | 0.004 J | 0.0024 J | 0.0041 J | 0.0058 J | 0.005 J | | 0.0023 J | | 0 0054 J | 0.0053 J | 0.0027 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0 02 | 0.027 | 0 026 | 0.023 | 0.022 | 0.022 | 0.026 | 0.017 | 0.019 | | 0 029 | | 0.016 | 0.017 | 0.029 |
| Radium Total | pci/L | 5 U | 0.479 | 0 513 | 0.646 U | 0.555 J | 0.339 U | 0.463 U | 0.335 | 0.342 U | | 0.657 J | | 0.858 J | 0.476 U | |
| Radium-226 | pci/L | 1 U | 0.202 | 0.145 | 0.337 U | 0.38 | 0.127 U | 0.1 | 0.0965 J | 0.104 | | 0.0617 | | 0.527 J | 0.28 U | |
| Radium-228 | pci/L | 1 U | 0 397 U | 0.382 U | 0.646 U | 0.401 U | 0 339 U | 0.463 U | 0.278 U | 0.342 U | | 0.576 J | | 0.407 U | 0.476 U | |
| Selenium | mg/L | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 180 | 180 | 170 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 4.3 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 5.2 J | | |
| Iron | mg/L | | | | | | | | | | | | | | 11 | 5.4 |
| Magnesium | mg/L | | | | | | | | | | | | | 24 | 30 | 24 |
| Manganese | mg/L | | | | | | | | | | | | | | 0.089 | 0.055 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.05 U | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 4 | 1.4 | 1.3 |
| Potassium | mg/L | | | | | | | | | | | | | 2.6 J | 3.2 J | 3.3 J |
| Sodium | mg/L | | | | | | | | | | | | | 24 | 32 | 30 |
| **Sample Parameters** | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.48 | | 0.48 | 0.14 | 0.25 | 0.16 | 0.19 | 1 | 0.32 | 0.29 | 0.06 | 0.02 | 1.97 | 0.15 | 0.12 |
| Oxidation Reduction Potential | mV | -79.2 | | -60.1 | -111 | -114.3 | -104.1 | -104.4 | -46.9 | -43.7 | -13.8 | -56.8 | -99.1 | -254.7 | -27.5 | -100 |
| Eh | mV | 120.8 | | 139.9 | 89.0 | 85.7 | 95.9 | 95 6 | 153.1 | 156.3 | 186.2 | 143.2 | 100.9 | -54.7 | 172.5 | 100.0 |
| pH | SU | 6.88 | | 6.98 | 6.83 | 6.96 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7 34 |
| Spec f c Conductance | uS/cm | 779 | | 909 | 733 | 594 | 584 | 674 | 9.32 | 1004 | 901 | 581 | 933 | 855 | 730 | 598 |
| Temperature | deg C | 15 3 | | 20.3 | 19.9 | 14.6 | 12.1 | 11 6 | 14.6 | 16.6 | 18.1 | 10.8 | 10.6 | 17.1 | 8.3 | 15.8 |
| Turb dity | NTU | 4.48 | | 2.96 | 3.41 | 3.98 | 4.4 | 4.92 | 4.2 | 3.1 | 4.11 | 3.98 | 4.29 | 3.1 | 4.9 | 6.9 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nepheloметric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW158 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-03 | 2018-03-15 | 2018-04-24 | 2018-09-06 | | 2018-10-26 | 2019-05-08 | 2019-11-08 | |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.1 | 1.7 | 2 | 3.7 | 3.3 | 3.6 | 3.1 | 2.1 | 2.1 | | 4.4 | | 4.1 | 4.9 | 10 | | 6.2 |
| Ca cium | mg/L | 160 | 160 | 160 | 180 | 160 | 170 | 190 | 170 | 73 | | 230 | | 200 | 210 | 280 | | 280 |
| Ch oride | mg/L | 52 | 58 | 62 | 81 | 64 | 65 | 71 | 64 | 64 | | 87 | | 89 | 93 | 110 | | 80 |
| Fluoride | mg/L | 0.65 J | 0.62 J | 0.46 J | 0.74 J | 0.77 J | 0.75 J | 0.72 J | 0.61 J | 0.5 J | 0.69 J | 0.79 J | | 0.6 J | 0.6 | 0.84 J | | 0.89 |
| pH | SU | 7.81 | 7.49 | 7.04 | 7.52 | 7.48 | 7.11 | 7.26 | 7 37 | 7.42 | 7.45 | 7.36 | | 7.8 | 6.74 | 7.43 | | 7.57 |
| Su fate | mg/L | 380 J- | 390 | 340 | 500 | 390 | 460 | 530 | 540 | 500 | | 790 | | 720 | 770 | 1300 | | 940 |
| Total Dissolved Solids | mg/L | 830 | 800 | 840 | 1000 | 890 | 980 | 1200 | 1100 | 1100 | | 1400 | | 1400 | 1400 | 2100 | | 1600 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | | 0.002 U | 0 002 U | 0.002 U | | 0.002 U |
| Arsenic | mg/L | 0.003 J | 0.0011 J | 0.0014 J | 0.0022 J | 0.0011 J | 0.00098 J | 0.00084 J | 0.00081 J | | 0.005 U | | | 0.005 U | 0 005 U | 0.00088 J | | 0.005 U |
| Barium | mg/L | 0.054 | 0.053 | 0.056 | 0.056 | 0 051 | 0.052 | 0.064 | 0.069 | | 0.068 | | | 0.07 | 0.064 | 0.081 | | 0.054 |
| Beryllium | mg/L | 7 8E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U |
| Chromium | mg/L | 0 00062 J | 0.002 U | 0.002 U | 0.00033 J | 0.00034 J | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | | 0.002 U | 0 002 U | 0.002 U | | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.00016 J | 0 001 U | 0 001 U | 0.001 U | | 0 00029 J | | | 0 00037 J | 0 001 U | 0.001 U | | 0.001 U |
| Fluoride | mg/L | 0.65 J | 0.62 J | 0.46 J | 0.74 J | 0.77 J | 0.75 J | 0.72 J | 0.61 J | 0.5 J | 0.69 J | 0.79 J | | 0.6 J | 0.6 | 0.84 J | | 0.89 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.00023 J | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U |
| L thium | mg/L | 0.0069 J | 0.008 U | 0.008 U | 0.0077 J | 0.0053 J | 0.0082 | 0.0082 | 0.0077 J | | 0.007 J | | | 0.008 | 0.0096 | 0.012 | | 0.0085 |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U | | 0 0002 U |
| Molybdenum | mg/L | 0.011 | 0.013 | 0.01 | 0.012 | 0 015 | 0.014 | 0.014 | 0.012 | | 0.011 | | | 0.01 | 0.011 | 0.012 | | 0.01 |
| Radium Total | pci/L | 1 26 | 0.594 | 0.61 | 1.14 J | 0.876 | 0.687 | 0.789 | 0.872 | | 1.69 J | | | 1.31 | 1.51 J | 1.61 | | |
| Radium-226 | pci/L | 0.607 J | 0.442 | 0.361 U | 0.785 | 0.441 | 0.442 | 0.537 J | 0.547 | | 0.752 | | | 0.711 | 0.837 J | 1.07 | | |
| Radium-228 | pci/L | 1 U | 0.389 U | 0.498 U | 0.502 U | 0.435 | 0.378 U | 0 329 U | 0.363 U | | 0.94 J | | | 0.603 | 0.676 | 0.544 | | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | | 0.005 U | | | 0.0017 J | 0 005 U | 0.005 U | | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.0003 J | | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | 180 | 180 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | 180 | 180 | 200 | 200 | 180 | 180 |
| Ferr c Iron | mg/L | | | | | | | | | | | | 2 J | 2.1 J | 1.8 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | 0.1 R | 0.1 R | 0.38 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | | 4.6 | 3 | 3.1 |
| Magnesium | mg/L | | | | | | | | | | | | 36 | 39 | 39 | 62 | 43 | 45 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.59 | 0.54 | 0.57 |
| Nitrate as N | mg/L | | | | | | | | | | | | 0.05 R | 0.05 R | | 0.1 U | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | 0.05 R | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 0.05 U | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | 0.031 U | 0.031 U | 0.31 U | 0.14 J | 0.31 U | 0 31 U |
| Potassium | mg/L | | | | | | | | | | | | 4.5 J | 5 | 4.7 J | 7.2 | 5.1 | 5.3 |
| Sodium | mg/L | | | | | | | | | | | | 140 | 150 | 170 | 280 | 130 | 130 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.22 | 0.91 | 0.56 | 0.22 | 0.46 | 0 3 | 0.43 | 0 64 | 0 23 | 0.08 | 0.04 | | 0.29 | 2.06 | 0 23 | | 0.16 |
| Oxidation Reduction Potential | mV | -129.7 | -21.6 | -94.6 | -132.6 | -81 7 | -79 6 | -21.3 | -36.5 | -42.6 | -64 | -102.4 | | -91.2 | -256.1 | 46 3 | | -189 2 |
| Eh | mV | 70 3 | 178.4 | 105.4 | 67.4 | 118.3 | 120.4 | 178.7 | 163.5 | 157.4 | 136.0 | 97.6 | | 108.8 | -56.1 | 246.3 | | 10.8 |
| pH | SU | 7.81 | 7.49 | 7.04 | 7.52 | 7.48 | 7.11 | 7.26 | 7 37 | 7.42 | 7.45 | 7.36 | | 7.8 | 6.74 | 7.43 | | 7.57 |
| Spec f c Conductance | uS/cm | 834 | 1049 | 1060 | 1237 | 940 | 1096 | 1099 | 1110 | 1294 | 1255 | 1612 | | 2757 | 1889 | 1798 | | 1384 |
| Temperature | deg C | 12.71 | 15.9 | 16.1 | 13.9 | 13.6 | 13 | 13.8 | 14.2 | 14.5 | 13.3 | 13 | | 14.13 | 13 6 | 8.1 | | 13.8 |
| Turb dity | NTU | 4.72 | 1.56 | 1.48 | 3.8 | 2.23 | 3.65 | 3.16 | 1 78 | 0.4 | 4.59 | 4.88 | | 3.59 | 1.35 | 3.56 | | 1.49 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW16 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-15 | 2018-04-24 | 2018-10-29 | | 2019-05-03 | 2019-11-08 | |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.1 | 1.8 | 1.6 | 1.2 | 0.89 | 1.3 | 1 | 1.4 | 1.1 | | 1.4 | 1.4 | 1.4 | 1.6 | | 1.9 |
| Ca cium | mg/L | 230 | 180 | 170 | 120 | 160 | 210 | 220 | 240 | 57 | | 220 | 160 | 160 | 210 | | 210 |
| Ch oride | mg/L | 53 | 37 | 30 | 28 | 24 | 25 | 28 | 31 | 42 | | 58 | 36 | 36 | 28 | | 59 |
| Fluoride | mg/L | 1.4 J | 1 6 J | 1.3 J | 1.5 | 1.3 J | 1.3 J | 1.2 J | 1.3 J | 1.5 J | 1 J | 1.2 J | 1.1 | 1.1 | 0.99 | | 1.1 |
| pH | SU | 7.92 | 7.18 | 7.48 | 7.5 | 7.58 | 7.17 | 7.36 | 7 06 | 7 62 | 7.41 | 7.67 | | 7.28 | 7.46 | | 7.8 |
| Su fate | mg/L | 530 J- | 400 | 320 | 47 | 300 | 500 | 480 | 630 | 520 | | 530 | 340 | 350 | 570 | | 530 |
| Total Dissolved Solids | mg/L | 1100 | 810 | 790 | 570 | 670 | 930 | 1000 | 1100 | 980 | | 1100 | 740 | 730 | 1100 | | 1100 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.00028 J | 0.002 U | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0 002 U | | 0 002 U |
| Arsenic | mg/L | 0.011 | 0.0077 | 0.012 | 0.0084 | 0.0079 | 0.006 | 0.008 | 0.0096 | | 0.002 J | 0.0065 | 0.01 | 0.0098 | 0.005 | | 0.0082 |
| Barium | mg/L | 0.049 | 0.042 | 0.035 | 0.024 | 0 029 | 0.043 | 0.044 | 0.054 | | 0.057 | 0.045 | 0.035 | 0.035 | 0.034 | | 0 034 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| Chromium | mg/L | 0 00062 J | 0.002 U | 0.002 U | 0.0031 | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0 002 U | | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.00068 J | 0.00051 J | 0.00046 J | 0.00055 J | 0.00092 J | 0.00094 J | 0.0011 | | 0 0013 | | 0.00059 J | 0 00061 J | 0.00066 J | | 0.00061 J |
| Fluoride | mg/L | 1.4 J | 1 6 J | 1.3 J | 1.5 | 1.3 J | 1.3 J | 1.2 J | 1.3 J | 1.5 J | 1 J | 1.2 J | 1.1 | 1.1 | 0.99 | | 1.1 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| L thium | mg/L | 0 00043 J | 0.008 U | 0.008 U | 0.00023 J | 0.008 U | 0 008 U | 0 008 U | 0.008 U | | 0.008 U | | 0.008 U | 0.008 U | 0 008 U | | 0 008 U |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U |
| Molybdenum | mg/L | 0.024 | 0.036 | 0.045 | 0.044 | 0.03 | 0.027 | 0.023 | 0.024 | | 0.027 | 0.031 | 0.033 | 0.033 | 0.027 | | 0 028 |
| Radium Total | pci/L | 1 68 | 0.543 | 0.527 U | 0.629 U | 0 648 | 0.392 U | 0 339 U | 0.429 | | 0.862 J | 0.29 | 0.862 J | 1.32 J | 0.685 U | | |
| Radium-226 | pci/L | 0.537 J | 0.249 | 0.363 U | 0.256 U | 0.129 U | 0.094 | 0.106 J | 0.246 | | 0.1 | 0.0822 | 0.214 J | 0.278 J | 0 277 U | | |
| Radium-228 | pci/L | 1 14 | 0.395 U | 0.527 U | 0.629 U | 0 528 | 0.392 U | 0 339 U | 0.322 U | | 0.762 J | 0.208 | 0.648 J | 1.04 J | 0 685 U | | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.0005 J | 0.0005 J | 0.005 U | 0.0012 J | 0 005 U | 0.005 U | | 0.0015 J | | 0.005 U | 0.005 U | 0 005 U | | 0 0015 J |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 180 | 200 | 5 U | 210 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 1.8 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 0.19 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | 1.4 | 1.6 | 1 7 |
| Magnesium | mg/L | | | | | | | | | | | | | 23 | 29 | 29 | 31 |
| Manganese | mg/L | | | | | | | | | | | | | | 0.35 | 0.29 | 0.31 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 0.042 J | 0.1 U | 0 1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.056 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 1.2 | 0.55 | 0.47 | 0.42 |
| Potassium | mg/L | | | | | | | | | | | | | 4.3 J | 4.2 J | 4.9 J | 5 2 |
| Sodium | mg/L | | | | | | | | | | | | | 41 | 41 | 36 | 38 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.16 | 0.27 | 0.48 | 0.31 | 0.36 | 0.14 | 0.5 | 0 14 | 0 06 | 0.22 | 0.22 | | 1.27 | 0.29 | | 4.02 |
| Oxidation Reduction Potential | mV | -18.06 | 711.6 | -124 8 | -78.8 | -136.9 | -73 6 | -114.2 | 9.6 | -158.4 | -55.9 | -106.5 | | -216.8 | 8 | | -2 |
| Eh | mV | 181.9 | 911.6 | 75.2 | 121.2 | 63.1 | 126.4 | 85.8 | 209.6 | 41.6 | 144.1 | 93.5 | | -16.8 | 208.0 | | 198.0 |
| pH | SU | 7.92 | 7.18 | 7.48 | 7.5 | 7.58 | 7.17 | 7.36 | 7.06 | 7 62 | 7.41 | 7.67 | | 7.28 | 7.46 | | 7.8 |
| Spec f c Conductance | uS/cm | 1331 | 1112 | 927 | 751 | 821 | 1257 | 1123 | 1406 | 1254 | 1029 | 1239 | | 1046 | 1001 | | 1014 |
| Temperature | deg C | 15.02 | 18.8 | 18.15 | 12.1 | 9.72 | 10.6 | 15.41 | 18 | 17.8 | 8.71 | 9.2 | | 17.81 | 10 5 | | 17.52 |
| Turb dity | NTU | 3.89 | 2.16 | 1.93 | 3.16 | 4.14 | 3.25 | 4.33 | 2.45 | 4.95 | 4.62 | 12.81 | | 3.64 | 4.65 | | 3.98 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW16B | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-15 | 2018-04-24 | 2018-09-07 | 2018-10-29 | 2019-05-06 | 2019-11-08 | |
| Samp e Type | | N | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.8 | 1.6 | 1.4 | 1.4 | 1.4 | 1.4 | 1.1 | 3.4 | 6.5 | 2.9 | | 4.1 | 7.6 | 9.7 | 12 | 11 | 10 |
| Ca cium | mg/L | 230 | 190 | 180 | 180 | 210 | 210 | 270 | 220 | 260 | 100 | | 250 | 310 | 350 | 350 | 300 | 280 |
| Ch oride | mg/L | 63 | 56 | 57 | 55 | 57 | 47 | 71 | 71 | 120 | 78 | | 140 | 160 | 150 | 190 | 220 | 210 |
| Fluoride | mg/L | 1.1 J | 1 1 J | 0.84 J | 0.73 J | 0.99 J | 0.87 J | 0.83 J | 0.76 J | 0.78 J | 1 J | 0.8 J | 0.76 J | 0 73 J | 0.64 | 0.76 | 1 | 1 |
| pH | SU | 7.76 | 7.47 | | 7.41 | 7.57 | 7.55 | 7.3 | 7.51 | 7.28 | 7.54 | 7.6 | 7.65 | 7.97 | 7.02 | 7.49 | | 7.85 |
| Su fate | mg/L | 580 J- | 480 | 500 | 440 | 50 | 470 | 730 | 720 | 640 | 580 | | 690 | 760 | 890 | 940 | 1500 | 1500 |
| Total Dissolved Solids | mg/L | 1100 | 1000 | 1000 | 1000 | 1000 | 1000 | 1300 | 1200 | 1400 | 1200 | | 1400 | 20 U | 1600 | 1800 | 2400 | 2400 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.00057 J | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0.00095 J | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0 0068 | 0.0064 | 0.011 | 0.011 | 0.012 | 0.0095 | 0.012 | 0 0096 | 0.0081 | | 0.0099 | 0.0097 | 0.011 | 0.0088 | 0.0071 | 0.0079 | 0.0076 |
| Barium | mg/L | 0.072 | 0 04 | 0.036 | 0.035 | 0.038 | 0.039 | 0.055 | 0.043 | 0.046 | | 0.053 | 0.058 | 0.068 | 0.071 | 0.079 | 0.055 | 0.054 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.00022 J | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.00029 J | 0.002 U | 0.00026 J | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00016 J | 0.00019 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.0003 J | | 0.00054 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 1.1 J | 1 1 J | 0.84 J | 0.73 J | 0.99 J | 0.87 J | 0.83 J | 0.76 J | 0.78 J | 1 J | 0.8 J | 0.76 J | 0 73 J | 0.64 | 0.76 | 1 | 1 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0055 J | 0.008 U | 0.0032 J | 0.0022 J | 0 0058 J | 0.0035 J | 0.0072 J | 0 006 J | 0.0061 J | | 0.007 J | | 0 0059 J | 0.0059 J | 0.007 J | 0.0054 J | 0.0055 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.013 | 0.012 | 0.012 | 0.012 | 0.012 | 0.013 | 0.023 | 0.016 | 0.013 | | 0 016 | 0.015 | 0.012 | 0.011 | 0.014 | 0 02 | 0.019 |
| Radium Total | pci/L | 1 31 | 1 05 | 0.866 | 0.794 | 0.998 J | 0.577 | 1 23 | 0.795 | 1.21 | | 1.11 J | 0.99 | 1.17 J | 1.64 J | 0.984 | | |
| Radium-226 | pci/L | 0.651 J | 0.458 | 0.427 | 0.412 U | 0.507 | 0.348 | 0.635 | 0.54 J | 0.559 | | 0.443 | 0.535 | 0.724 J | 0.719 J | 0.753 | | |
| Radium-228 | pci/L | 0 66 | 0 59 | 0.467 U | 0.435 U | 0.491 J | 0 399 U | 0.597 | 0.287 U | 0.647 | | 0.671 J | 0.455 | 0 522 U | 0.919 J | 0.459 U | | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.00061 J | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | 200 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 200 | 210 | 190 | | 200 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 6 J | 5.1 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 0.1 R | 1.8 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | | 9.2 | | 7.5 |
| Magnesium | mg/L | | | | | | | | | | | | | 46 | 53 | 58 | | 49 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.49 | | 0.39 |
| Nitrate as N | mg/L | | | | | | | | | | | | | 0.05 R | | 0.018 J | | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 0.063 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 0.19 | 0 28 J | 0.22 J | | 0.17 J |
| Potassium | mg/L | | | | | | | | | | | | | 4.9 J | 5.2 | 5.5 | | 6.3 |
| Sodium | mg/L | | | | | | | | | | | | | 84 | 84 | 97 | | 380 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 1.23 | 1.63 | | 0.39 | 0.3 | 0.21 | 0.12 | 0.32 | 0.16 | 0.15 | 0.28 | 0.25 | 1.02 | 4.23 | 0 33 | | 3.41 |
| Oxidation Reduction Potential | mV | -122.6 | -89 | | -126.3 | -148.5 | -132.2 | -130.2 | -123.1 | -32.7 | -135.8 | -75.5 | -117.8 | -101.5 | -166.8 | 21.2 | | -99.5 |
| Eh | mV | 77.4 | 111.0 | 200.0 | 73.7 | 51.5 | 67.8 | 69 8 | 76.9 | 167.3 | 64.2 | 124.5 | 82.2 | 98.5 | 33.2 | 221.2 | | 100.5 |
| pH | SU | 7.76 | 7.47 | | 7.41 | 7.57 | 7.55 | 7.3 | 7.51 | 7.28 | 7.54 | 7.6 | 7.65 | 7.97 | 7.02 | 7.49 | | 7.85 |
| Spec f c Conductance | uS/cm | 1147 | 1297 | | 1158 | 1230 | 1192 | 1645 | 1333 | 1665 | 1461 | 1142 | 1653 | 3104 | 2098 | 1692 | | 2340 |
| Temperature | deg C | 13.04 | 14.44 | | 15 27 | 14.3 | 13.37 | 12 3 | 13.48 | 14.3 | 15 | 12.6 | 12.3 | 15 | 17.7 | 11.2 | | 14.65 |
| Turb dity | NTU | 4.1 | 3.99 | | 1 8 | 2.76 | 4.21 | 4.58 | 3.27 | 2.48 | 3.9 | 4.08 | 4 2 | 4.99 | 3.49 | 3.72 | | 2.81 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW17 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-14 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-14 | | 2018-04-23 | | 2018-10-29 | 2019-05-09 | 2019-11-08 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | FD | N | FD | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 12 | 12 | 11 | 11 | 11 | 8.9 | 7.6 | 12 | 12 | | | 5.8 | 5.8 | 16 | 7.7 | 4.9 |
| Ca cium | mg/L | 150 | 160 | 170 | 180 | 200 | 180 | 120 | 150 | 64 | | | 110 | 110 | 200 | 130 | 120 |
| Ch oride | mg/L | 110 | 100 | 130 | 150 | 140 | 81 | 170 | 130 | 160 | | | 40 | 38 | 150 | 90 | 92 |
| Fluoride | mg/L | 1.8 J | 2 2 J | 2 J | 1.9 J | 1.6 J | 1.6 J | 0.79 J | 1.9 J | 2.4 J | 5 U | 1.7 J | 1.9 J | 1.9 J- | 1.7 | 1.6 | 1.7 |
| pH | SU | 7.56 | 7.27 | 7.21 | 7.33 | 7.54 | 7.23 | 7.4 | 7 16 | 7 22 | | 7.62 | | 7 82 | 6.85 | 7.53 | 7.75 |
| Su fate | mg/L | 330 J- | 330 | 360 | 390 | 390 | 390 | 520 | 250 | 350 | | | 240 | 220 | 430 | 300 | 290 |
| Total Dissolved Solids | mg/L | 940 | 920 | 940 | 1000 | 1100 | 950 | 1400 | 890 | 1000 | | | 630 | 620 | 1100 | 800 | 860 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 00034 J | 0.00032 J | 0.00032 J | 0.002 U | 0.00028 J | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | 0.002 U | | | 0.002 U | 0.002 U | 0 002 U |
| Arsenic | mg/L | 0 0054 | 0.0056 | 0.0042 J | 0.0069 | 0.0055 | 0.0054 | 0 0035 J | 0.0028 J | | 0.005 U | 0.0027 J | | | 0.004 J | 0 0021 J | 0.0028 J |
| Barium | mg/L | 0.047 | 0.056 | 0.054 | 0.05 | 0 054 | 0.048 | 0.044 | 0.06 | | 0.041 | 0.058 | | 0.029 | 0.073 | 0.041 | 0.052 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.00076 J | 0 001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0 001 U |
| Chromium | mg/L | 0.0015 J | 0.002 U | 0.0011 J | 0.0011 J | 0.0012 J | 0.0012 J | 0 002 U | 0.002 U | | 0.0017 J | 0.0014 J | | | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 6 3E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 1.8 J | 2 2 J | 2 J | 1.9 J | 1.6 J | 1.6 J | 0.79 J | 1.9 J | 2.4 J | 5 U | 1.7 J | 1.9 J | 1.9 J- | 1.7 | 1.6 | 1.7 |
| Lead | mg/L | 0 00018 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0 001 U |
| L thium | mg/L | 0.0047 J | 0.008 U | 0.0036 J | 0.0047 J | 0.0024 J | 0.0045 J | 0 0058 J | 0.0076 J | | 0.008 U | 0.0035 J | | | 0.0066 J | 0 0035 J | 0.0052 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | 0.0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.015 | 0.012 | 0.011 | 0.01 U | 0.01 | 0.011 | 0.018 | 0.024 | | 0.024 | 0.024 | | 0.02 | 0.017 | 0.017 | 0.012 |
| Radium Total | pci/L | 0.569 | 0.451 U | 0.447 U | 0.553 U | 0.428 | 0.477 | 0.403 U | 0.71 | | 0.816 J | 0.384 U | | 0.205 | 1.1 J | 0.518 U | |
| Radium-226 | pci/L | 1 U | 0.331 | 0.415 U | 0.246 U | 0 222 | 0.23 | 0 191 J | 0.215 | | 0.202 | 0.112 | | 0.0399 | 0.315 J | 0.26 U | |
| Radium-228 | pci/L | 1 U | 0.451 U | 0.447 U | 0.553 U | 0.402 U | 0.406 U | 0.403 U | 0.495 | | 0.614 J | 0.384 U | | 0.166 | 0.783 J | 0.518 U | |
| Selenium | mg/L | 0.019 | 0 03 | 0.018 | 0.023 | 0 028 | 0.026 | 0.0081 | 0.0032 J | | 0.0074 | 0.021 | | 0.015 | 0.022 | 0.004 J | 0.011 |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.00063 J | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | 190 | 160 | 160 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | 0.1 U | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | 0.05 UJ | | |
| Iron | mg/L | | | | | | | | | | | | | | | 0.2 U | 0 2 U |
| Magnesium | mg/L | | | | | | | | | | | | | | 67 | 49 | 40 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.015 U | 0 015 U |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | 0.97 | 2 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 2.8 | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | 0.47 | 0 28 J | 0.3 J |
| Potassium | mg/L | | | | | | | | | | | | | | 5.3 | 3.5 J | 5 |
| Sodium | mg/L | | | | | | | | | | | | | | 34 | 31 | 28 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 5.78 | 1.7 | 1.8 | 1.01 | 2.35 | 7.33 | 3.18 | 4 33 | 3.3 | | 4.99 | | 9 | 1.78 | 5.75 | 6.47 |
| Oxidation Reduction Potential | mV | 45 8 | 825.9 | 6.1 | 82.3 | 6.6 | 67.9 | 23.3 | 8 | 57.9 | | -90.2 | | -90.2 | -237 | 53.1 | 35 |
| Eh | mV | 245.8 | 1025.9 | 206.1 | 282.3 | 206.6 | 267.9 | 223.3 | 208.0 | 257.9 | 200.0 | 109.8 | | 109.8 | -37.0 | 253.1 | 235.0 |
| pH | SU | 7.56 | 7.27 | 7.21 | 7.33 | 7.54 | 7.23 | 7.4 | 7.16 | 7.22 | | 7.62 | | 7 82 | 6.85 | 7.53 | 7.75 |
| Spec f c Conductance | uS/cm | 1059 | 1287 | 1141 | 1272 | 1541 | 1290 | 902 | 1151 | 1357 | | 832 | | 675 | 1513 | 894 | 798 |
| Temperature | deg C | 17.23 | 20.6 | 18.63 | 13.6 | 10.95 | 11.8 | 17.71 | 24.4 | 22.3 | | 10.9 | | 11.4 | 20 | 12.1 | 17.23 |
| Turb dity | NTU | 1.56 | 1.09 | 0.58 | 2.58 | 0.44 | 2.21 | 1.02 | 1.5 | 2 51 | | 0.54 | | 1.19 | 0.45 | 0.44 | 0.86 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW17B | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-04 | 2018-03-14 | 2018-04-23 | 2018-09-06 | 2018-10-29 | 2019-05-09 | 2019-11-08 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | |
| Boron | mg/L | 18 | 19 | 19 | 21 | 22 | 20 | 16 | 13 | 11 | | 13 | 10 | 12 | 12 | 9.4 |
| Ca cium | mg/L | 230 | 250 | 240 | 250 | 270 | 250 | 240 | 160 | 57 | | 180 | 150 | 150 | 180 | 150 |
| Ch oride | mg/L | 180 | 170 | 180 | 190 | 200 | 200 | 71 | 99 | 130 | | 140 | 120 | 110 | 130 | 110 |
| Fluoride | mg/L | 0.9 J | 0.98 J | 0.68 J | 0.58 J | 0.6 J | 0.6 J | 2.1 J | 1.3 J | 1.1 J | 0.55 J | 0.58 J | 0.84 J | 0.71 | 0.62 | 0.67 |
| pH | SU | 7.43 | 7.37 | 7.1 | 7.24 | 7.44 | 7.02 | 7.25 | 7 19 | 7 38 | 7.48 | 7.39 | 7.63 | 7.4 | 7.15 | 7.66 |
| Su fate | mg/L | 710 J- | 680 | 710 | 740 | 710 | 680 | 300 | 380 | 420 | | 520 | 350 | 350 | 270 | 350 |
| Total Dissolved Solids | mg/L | 1500 | 1400 | 1400 | 1500 | 1700 | 1500 | 660 | 1000 | 960 | | 1100 | 940 | 950 | 980 | 990 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Arsenic | mg/L | 0.0024 J | 0.0021 J | 0.0024 J | 0.0035 J | 0.0023 J | 0.0022 J | 0 0023 J | 0.0026 J | | 0.0011 J | | 0.0017 J | 0.0023 J | 0.0022 J | 0.0019 J |
| Barium | mg/L | 0.078 | 0.079 | 0.086 | 0.092 | 0 1 | 0.089 | 0.065 | 0.06 | | 0.085 | 0.069 | 0.066 | 0.073 | 0.11 | 0.074 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.00033 J | 0 001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.0003 J | 0.001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 0.9 J | 0.98 J | 0.68 J | 0.58 J | 0.6 J | 0.6 J | 2.1 J | 1.3 J | 1.1 J | 0.55 J | 0.58 J | 0.84 J | 0.71 | 0.62 | 0.67 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| L thium | mg/L | 0.0017 J | 0.008 U | 0.008 U | 0.0019 J | 0.00046 J | 0.0021 J | 0 0019 J | 0.008 U | | 0.008 U | | 0.008 U | 0.008 U | 0.008 U | 0 008 U |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.024 | 0.021 | 0.013 | 0.011 | 0 012 | 0.011 | 0.017 | 0.021 | | 0.017 | 0.016 | 0.01 | 0.011 | 0.0073 J | 0.01 |
| Radium Total | pci/L | 1 79 | 1 84 | 2.53 | 2.58 | 1.25 | 1.94 | 1.03 | 2.4 | | | 1.21 | 1.47 | 2.48 J | 1.71 | |
| Radium-226 | pci/L | 0.882 J | 0.864 | 1.28 | 1.4 | 1.01 | 1.09 | 0 639 J | 0.867 | | | 0.518 | 0.945 | 1.15 J | 0.964 | |
| Radium-228 | pci/L | 0.913 | 0.98 | 1.25 | 1.17 | 0.423 U | 0.846 | 0.395 | 1.53 | | | 0.696 | 0.524 | 1.33 J | 0.748 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.005 U | 0.00053 J | 0.00051 J | 0 005 U | 0 005 U | 0.005 U | | 0.005 U | | 0.0011 J | 0.005 U | 0.005 U | 0 005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.00022 J | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | 210 | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | 5 U | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | 5 U | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | 210 | 230 | 300 | 190 |
| Ferr c Iron | mg/L | | | | | | | | | | | | 4.1 J | 3 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | 0.1 R | 1.5 J | | |
| Iron | mg/L | | | | | | | | | | | | | | 6.8 | 5.1 |
| Magnesium | mg/L | | | | | | | | | | | | 32 | 33 | 53 | 44 |
| Manganese | mg/L | | | | | | | | | | | | | | 1 | 0.76 |
| Nitrate as N | mg/L | | | | | | | | | | | | 0.05 R | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | 0.05 R | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.23 | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | 0.46 | 0.17 J | 0.31 U | 0.31 U |
| Potassium | mg/L | | | | | | | | | | | | 5.7 | 6 2 | 9.5 | 6.1 |
| Sodium | mg/L | | | | | | | | | | | | 83 | 110 | 39 | 42 |
| **Sample Parameters** | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.33 | 0.24 | 0.67 | 0.36 | 0.13 | 0.13 | 0.18 | 0 14 | 0 09 | 0.16 | 0.11 | 0.2 | 0.88 | 0.23 | 4.2 |
| Oxidation Reduction Potential | mV | -115 | 654 | -100 8 | -119.6 | -91 8 | 102 3 | -98.6 | -51.1 | -129.4 | -95.2 | -131.9 | -91.9 | -244.5 | 11.8 | -3.6 |
| Eh | mV | 85 0 | 854.0 | 99.2 | 80.4 | 108.2 | 302 3 | 101.4 | 148.9 | 70.6 | 104.8 | 68.1 | 108.1 | -44.5 | 211 8 | 196.4 |
| pH | SU | 7.43 | 7.37 | 7.1 | 7.24 | 7.44 | 7.02 | 7.25 | 7 19 | 7 38 | 7.48 | 7.39 | 7.63 | 7.4 | 7.15 | 7.66 |
| Spec f c Conductance | uS/cm | 1525 | 1734 | 1568 | 171.9 | 2251 | 1950 | 1488 | 1244 | 1337 | 1235 | 1463 | 2077 | 1380 | 1060 | 890 |
| Temperature | deg C | 15.29 | 16.16 | 15.77 | 15 | 14.8 | 14.4 | 15.62 | 16.5 | 16.6 | 15.2 | 15.2 | 16.55 | 16.1 | 13.6 | 15.05 |
| Turb dity | NTU | 4.09 | 2.48 | 0.62 | 0.92 | 0.58 | 2.11 | 2.35 | 1 86 | 3.45 | 3.76 | 3.88 | 3.55 | 4.86 | 3.61 | 2.68 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW18 | | | | | | | | | | | | | | | | | GAMW18B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-07-12 | | 2017-08-23 | 2017-10-03 | | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-04-29 | 2019-11-07 | 2018-09-10 | 2018-10-25 | | 2019-04-29 | 2019-11-07 |
| Samp e Type | | N | N | FD | N | N | N | N | FD | N | N | FD | N | N | N | N | N | N | N | FD | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1 8 | 3.5 | 1 9 | 1 8 | 1 3 | 1 | 0 77 | 1 2 | 1 2 | 1 5 | 1 9 | 1 9 | | 1 2 | 1 7 | 0 95 | 1 7 | 13 | 12 | 13 | 14 | 11 |
| Ca cium | mg/L | 320 | 610 | 370 | 360 | 330 | 280 | 210 | 280 | 290 | 300 | 380 J | 64 J | | 320 | 230 | 320 | 360 | 260 | 200 | 220 | 240 | 180 |
| Ch oride | mg/L | 17 | 39 | 17 | 17 | 9 3 | 5 | 4 3 | 10 | 10 | 11 | 23 | 23 | | 7 3 | 22 | 12 | 27 | 150 | 140 | 140 | 170 | 140 |
| Fluoride | mg/L | 0 047 J | 0 036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0 057 | 0 074 | 0 15 | 0 77 J | 0 74 | 0 73 | 0 88 | 0 99 |
| pH | SU | 6 95 | 6 83 | | 6 7 | 6 88 | 7 11 | 6 6 | | 6 96 | 7 02 | | 6 91 | 7 2 | 7 21 | 6 54 | 6 71 | 7 18 | 7 73 | | 6 86 | 7 15 | 7 68 |
| Su fate | mg/L | 760 J- | 1400 | 850 | 830 | 640 | 540 | 370 | 600 | 610 | 690 | 960 | 950 | | 670 | 550 | 780 | 920 | 1100 | 1000 | 1100 | 1100 | 840 |
| Total Dissolved Solids | mg/L | 1300 | 2200 | 1500 | 1500 | 1200 | 1000 | 730 | 1100 | 1100 | 1300 | 1600 | 1500 | | 2400 | 1100 | 1400 | 1500 | 2100 | 2000 | 2000 | 2100 | 1500 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 002 U | 0 002 U | 0 00096 J | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | | | 0 002 U | | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U |
| Arsenic | mg/L | 0 0014 J | 0 0023 J | 0 0014 J | 0 00091 J | 0 0014 J | 0 005 U | 0 0015 J | 0 0021 J | 0 0021 J | 0 0011 J | | | 0 005 U | | 0 005 U | 0 00079 J | 0 005 U | 0 0018 J | 0 0026 J | 0 0028 J | 0 0037 J | 0 0041 J |
| Barium | mg/L | 0 038 | 0 047 | 0 041 | 0 039 | 0 037 | 0 024 | 0 021 | 0 051 | 0 052 | 0 055 | | | 0 048 | 0 035 | 0 037 | 0 039 | 0 05 | 0 048 | 0 035 | 0 039 | 0 039 | 0 024 |
| Beryllium | mg/L | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 00094 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 00053 U | 0 001 U |
| Cadmium | mg/L | 8 1E-05 J | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U |
| Chromium | mg/L | 0 002 U | 0 002 U | 0 00067 J | 0 00046 J | 0 0005 J | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | | | 0 002 U | | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U |
| Cobalt | mg/L | 0 001 U | 0 00023 J | 0 00047 J | 0 0002 J | 0 00024 J | 0 001 U | 0 00023 J | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 00028 J | 0 001 U | 0 00027 J | 0 00026 J | 0 00028 J | 0 00024 J | 0 00024 J |
| Fluoride | mg/L | 0 047 J | 0 036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0 057 | 0 074 | 0 15 | 0 77 J | 0 74 | 0 73 | 0 88 | 0 99 |
| Lead | mg/L | 0 001 U | 0 001 U | 0 00051 J | 0 00025 J | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 00067 J | | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U |
| L thium | mg/L | 0 00096 J | 0 008 U | 0 008 U | 0 008 U | 0 00042 J | 0 008 U | 0 008 U | 0 008 U | 0 008 U | 0 008 U | | | 0 008 U | | 0 008 U | 0 008 U | 0 008 U | 0 025 | 0 015 | 0 016 | 0 023 | 0 015 |
| Mercury | mg/L | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 UJ | | | 0 0002 U | | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U |
| Molybdenum | mg/L | 0 11 | 0 18 | 0 14 | 0 13 | 0 094 | 0 1 | 0 1 | 0 1 | 0 11 | 0 1 | | | 0 097 | 0 085 | 0 057 | 0 062 | 0 076 | 0 024 | 0 014 | 0 015 | 0 026 | 0 011 |
| Radium Total | pci/L | 5 U | 0 803 | 0 474 | 0 449 | 0 581 U | 0 398 U | 0 384 U | 0 493 | 0 337 U | 0 629 | | | 0 373 U | 0 259 | 0 477 | 0 365 U | | 1 7 | 1 28 | 1 46 | | |
| Radium-226 | pci/L | 1 U | 0 348 | 0 334 U | 0 33 U | 0 325 | 0 13 | 0 131 U | 0 166 J | 0 179 J | 0 332 | | | 0 111 | 0 0715 | 0 291 | 0 325 U | | 0 773 J | 0 717 | 0 748 | 0 41 | |
| Radium-228 | pci/L | 1 U | 0 49 U | 0 455 U | 0 413 U | 0 581 U | 0 398 U | 0 384 U | 0 381 U | 0 337 U | 0 369 U | | | 0 373 U | 0 187 | 0 357 U | 0 365 U | | 0 928 | 0 562 | 0 708 | 0 941 | |
| Selenium | mg/L | 0 01 | 0 018 | 0 0065 | 0 0052 | 0 0099 | 0 011 | 0 0053 | 0 012 | 0 012 | 0 006 | | | 0 009 | 0 0084 | 0 015 | 0 015 | 0 012 | 0 005 U | 0 005 U | 0 005 U | 0 005 U | 0 005 U |
| Thallium | mg/L | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | | 230 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | | 240 | 190 | 250 | 230 | | 230 | 210 | 200 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | | 0 032 J | | | 6 8 J | | 2 9 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | | 0 05 UJ | | | 0 1 R | | 1 3 J | | |
| Iron | mg/L | | | | | | | | | | | | | | | | 0 16 J | 0 083 J | | | | 3 6 | 3 |
| Magnesium | mg/L | | | | | | | | | | | | | | | 16 | 17 | 23 | 66 | | 58 | 67 | 51 |
| Manganese | mg/L | | | | | | | | | | | | | | | | 0 0047 J | 0 014 J | | | | 0 69 | 0 66 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | | 0 19 | 0 51 | 0 05 UJ | | | 0 1 U | 0 1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | | 0 05 UJ | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | 0 55 | | | | | 0 05 U | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | | 0 31 U | 0 14 J | 0 31 UJ | 0 031 U | | 0 31 U | 0 31 U | 0 31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | | 3 4 J | 2 J | 3 7 J | 7 3 | | 5 7 | 7 8 | 4 4 J |
| Sodium | mg/L | | | | | | | | | | | | | | | 28 | 24 | 39 | 260 | | 240 | 260 | 180 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 4.83 | 4.77 | | 5.93 | 7.52 | 8 86 | 7.79 | | 6.04 | 4.52 | | 5 32 | 6.5 | 8.49 | 3.78 | 7.01 | 2.95 | 0.24 | | 0.29 | 0.92 | 0.36 |
| Oxidation Reduction Potential | mV | 98.9 | 76.8 | | 28.7 | 106.8 | 97.9 | 209.2 | | 203.2 | 24.7 | | 121.9 | -129 6 | -51.6 | -36.6 | 129.2 | -41.1 | -140.7 | | -103.4 | 109.2 | -144.8 |
| Eh | mV | 298.9 | 276.8 | | 228.7 | 306.8 | 297.9 | 409.2 | 200.0 | 403.2 | 224.7 | | 321.9 | 70.4 | 148.4 | 163.4 | 329.2 | 158.9 | 59.3 | | 96.6 | 309.2 | 55.2 |
| pH | SU | 6.95 | 6.83 | | 6.7 | 6.88 | 7 11 | 6.6 | | 6.96 | 7.02 | | 6.91 | 7.2 | 7.21 | 6.54 | 6.71 | 7.18 | 7.73 | | 6.86 | 7.15 | 7.68 |
| Spec f c Conductance | uS/cm | 1474 | 2362 | | 1740 | 1255 | 986 | 970 | | 1299 | 1414 | | 1760 | 905 | 1170 | 1230 | 1060 | 1338 | 3311 | | 2147 | 1902 | 1475 |
| Temperature | deg C | 16 3 | 20.1 | | 16 6 | 9.65 | 8.47 | 11.2 | | 17.9 | 19.8 | | 19.3 | 8.1 | 8.9 | 17.4 | 8 8 | 14.2 | 15.39 | | 14.9 | 11.8 | 13.7 |
| Turb dity | NTU | 3.32 | 1.63 | | 2.38 | 3.05 | 4.44 | 2.48 | | 1.71 | 1.03 | | 4 16 | 4.59 | 0.71 | 1.29 | 4.55 | 2.04 | 2.78 | | 3.58 | 3 21 | 3.14 |

Notes:
CCR = coal combustion res dual
mg/L = m ligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW46 | | | | | | | | GAMW46B | | | | | | | | GAMW52 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2018-06-13 | 2019-03-01 | 2019-04-17 | 2019-06-06 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2018-06-13 | 2019-03-04 | 2019-04-17 | 2019-06-07 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2018-09-10 | 2018-10-31 | | 2019-05-09 | 2019-11-14 | |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.055 J | 0.1 U | 0.033 J | 0.1 U | 0.032 J | 0.053 J | 0.043 J | 0.049 J | 0.05 J | 0.05 J | 0.037 J | 0.047 J | 0.03 J | 0.05 J | 0.047 J | 0.046 J | 0.34 | | 0.17 | 0.077 J | | 0.13 |
| Ca cium | mg/L | 56 | 14 | 28 | 25 J- | 25 | 25 | 23 | 27 | 25 | 58 | 58 | 56 | 52 | 58 | 49 | 56 | 75 | | 59 | 52 | | 72 |
| Ch oride | mg/L | 8.4 | 2.4 | 1.9 | | 1 8 | 1.6 | 1.6 | 1.6 | 3 | 7.9 | 7.9 | | 7 2 | 8 | 7.1 | 6.9 | 34 | | 9.1 | 5.5 | | 37 |
| Fluoride | mg/L | 0.052 J | 0.068 | 0.063 | | 0 065 | 0.06 | 0 079 J | 0.062 | 0 048 J | 0.066 | 0.076 | | 0.072 | 0.069 | 0.073 J | 0.072 | 0.36 J | | 0.3 | 0.25 J | | 0.3 |
| pH | SU | 7.93 | 8.17 | 8.23 | 7.52 | 8.15 | 7.9 | 7.81 | 7.77 | 8.2 | 7.11 | 7.99 | 7.58 | 8.18 | 7.62 | 7.44 | 7.47 | 7.5 | | 7.06 | 7.17 | | 7.59 |
| Su fate | mg/L | 55 | 34 | 30 | | 28 | 29 | 30 | 27 | 29 | 64 | 64 | | 64 | 68 | 65 | 64 | 86 | | 39 | 24 | | 67 |
| Total Dissolved Solids | mg/L | 260 | 160 | 150 | | 130 | 150 | 140 J | 140 | 150 | 260 | 290 | | 240 | 220 J | 250 | 240 | 400 | | 250 | 240 | | 350 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0 002 U | 0.002 U | | 0.002 U |
| Arsenic | mg/L | 0.0014 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.00086 J | 0.005 U | 0.0015 J | 0.0012 J | 0.00076 J | 0.005 U | 0.00091 J | 0.00095 J | 0.0013 J | 0.001 J | 0.005 U | | 0 005 U | 0.005 U | | 0 005 U |
| Barium | mg/L | 0.027 | 0.0028 J | 0.0059 | 0.0065 | 0.0054 | 0.0054 | 0 0049 J | 0.0059 | 0.0086 | 0.027 | 0.026 | 0.025 | 0.023 | 0.024 | 0.021 | 0.025 | 0.039 | | 0.019 | 0.015 | | 0.02 |
| Beryllium | mg/L | 0.001 U | 0.005 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00054 J | 0.001 U | 0.001 U | 0 0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.0011 | 0.001 U | | 0 001 U | 0.001 U | | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.00024 J | 0.001 U | | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0014 J | 0 002 U | 0.002 U | 0.0021 | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0 002 U | 0.002 U | | 0.002 U |
| Cobalt | mg/L | 0.0002 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 00034 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.00058 J | | 0.00031 J | 0.001 U | | 0.001 U |
| Fluoride | mg/L | 0.052 J | 0.068 | 0.063 | | 0 065 | 0.06 | 0 079 J | 0.062 | 0 048 J | 0.066 | 0.076 | | 0.072 | 0.069 | 0.073 J | 0.072 | 0.36 J | | 0.3 | 0.25 J | | 0.3 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0 001 U | 0.001 U | | 0.001 U |
| L thium | mg/L | 0.008 U | 0 04 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U | 0 008 U | 0.008 U | 0.008 U | 0.0017 J | 0.008 U | 0.008 U | 0.002 J | 0.008 U | 0 008 U | 0 003 J | 0.0017 J | | 0 008 U | 0.008 U | | 0.0025 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | | 0.0002 U |
| Molybdenum | mg/L | 0.0031 J | 0 01 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0 0015 J | 0.01 U | 0.0018 J | 0.0024 J | 0.0022 J | 0.0025 J | 0.0028 J | 0.0028 J | 0.0025 J | 0.003 J | 0.005 J | | 0.0035 J | 0.0016 J | | 0.0017 J |
| Radium Total | pci/L | 0.384 U | 0.486 U | 0.33 U | | 0.427 U | 0.505 U | 0.566 | | 0.392 U | 0.402 U | 0.308 U | | 0.427 U | 0.609 U | 0.408 U | | 0.796 | | 1 J | 0.53 U | | |
| Radium-226 | pci/L | 0.244 U | 0.103 U | 0.0708 U | | 0.214 U | 0.0925 UJ | 0 179 J | | 0.223 U | 0.286 | 0.108 | | 0.232 U | 0.105 UJ | 0.192 J | | 0.46 J | | 0 299 J | 0.436 | | |
| Radium-228 | pci/L | 0.384 U | 0.486 U | 0.33 U | | 0.427 U | 0.505 UJ | 0.481 U | | 0.392 U | 0.402 U | 0.308 U | | 0.427 U | 0.609 UJ | 0.408 U | | 0.392 U | | 0 706 J | 0.53 U | | |
| Selenium | mg/L | 0.001 J | 0.025 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.0017 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0 005 U | 0.0014 J | | 0.0017 J | 0.0014 J | | 0.0011 J |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00059 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00068 J | 0.001 U | | 0 001 U | 0.001 U | | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | 210 | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | 5 U | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | 5 U | | | | | |
| Alkal nity Total | mg/L | | | 82 | | | | | 73 | | | 140 | | | | | 130 | 210 | 180 | 190 | 170 | 190 | 190 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | | | | 0.2 J | 0.1 U | 0.1 U | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | | | | 0.1 R | 0 05 J | 0.05 UJ | | | |
| Iron | mg/L | | | 0.054 J | | | | | 0 2 U | | | 1.5 | | | | | 1.6 | | | | 0.2 U | 0.2 U | 0.2 U |
| Magnesium | mg/L | | | 9.7 | | | | | 7.8 | | | 15 | | | | | 14 | 20 | 16 | 15 | 16 | 20 | 21 |
| Manganese | mg/L | | | 0.0066 J | | | | | 0.015 U | | | 0.26 | | | | | 0.23 | | | | 0.0022 J | 0.017 | 0.02 |
| Nitrate as N | mg/L | | | 0.58 | | | | | 0.48 | | | 0.1 U | | | | | 0.1 U | 1 J | | | 1.9 | 1.1 | 1.1 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | 0.089 J | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | | | | 1.3 | 1.3 | | | |
| Phosphorus (as phosphate) | mg/L | | | 0.16 J | | | | | 0.31 U | | | 0.15 J | | | | | 0.31 U | 0.031 U | 0.31 U | 0.31 U | 0.31 U | 0.31 U | 0.31 U |
| Potassium | mg/L | | | 0.97 J | | | | | 1 J | | | 0.83 J | | | | | 0.82 J | 4.7 | 3 J | 2.9 J | 2.1 J | 3.1 J | 3.3 J |
| Sodium | mg/L | | | 4.6 J | | | | | 2.4 J | | | 5.4 | | | | | 4.6 J | 25 | 13 | 13 | 9 8 | 18 | 21 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.12 | 1.85 | 4.18 | 6.44 | 6.58 | 4.03 | 2.44 | 3 36 | 3 59 | 0.08 | 1.9 | 0.3 | 1.4 | 1.25 | 0.31 | 0.3 | 0.48 | | 0.21 | 6.42 | | 2 2 |
| Oxidation Reduction Potential | mV | -171.4 | 1.9 | 7.7 | 157.6 | 25.5 | 40.6 | 9.16 | -141.1 | -29.4 | 111.9 | -111.1 | -133.1 | -93.9 | -119.9 | 33.7 | -229.6 | -30.3 | | 85.1 | 108.2 | | -43 2 |
| Eh | mV | 28 6 | 201.9 | 207.7 | 357.6 | 225.5 | 240.6 | 209.2 | 58.9 | 170.6 | 311.9 | 88.9 | 66.9 | 106.1 | 80.1 | 233.7 | -29.6 | 169.7 | | 285.1 | 308.2 | 200.0 | 156.8 |
| pH | SU | 7.93 | 8.17 | 8.23 | 7.52 | 8.15 | 7.9 | 7.81 | 7.77 | 8.2 | 7.11 | 7.99 | 7.58 | 8.18 | 7.62 | 7.44 | 7.47 | 7.5 | | 7.06 | 7.17 | | 7.59 |
| Spec f c Conductance | uS/cm | 367 | 155 | 161 | 179 | 153 | 153 | 152 | 132 | 211 | 268 | 294 | 282 | 274 | 284 | 260 | 242 | 0.896 | | 448 | 308 | | 320 |
| Temperature | deg C | 11.4 | 8 | 9.1 | 11.1 | 13.2 | 14.2 | 14.8 | 11.7 | 11.3 | 9.6 | 10.8 | 11 | 11.9 | 12.3 | 12.3 | 11 3 | 19.97 | | 17.6 | 14.2 | | 15.3 |
| Turb dity | NTU | 3.96 | 1.91 | 1.33 | 0.51 | 0.82 | 0.69 | 0.89 | 0 66 | 3.45 | 3.26 | 4.3 | 3.25 | 3.11 | 1.15 | 4.16 | 2.84 | 0.45 | | 0.83 | 0.42 | | 0.74 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW52B | | | | GAMW53 | | | | GAMW53B | | | | | GAMW54 | | | | GAMW54B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2018-09-11 | 2018-10-31 | 2019-05-09 | 2019-11-14 | 2018-09-11 | 2018-10-30 | 2019-04-30 | 2019-11-14 | 2018-09-11 | 2018-10-30 | | 2019-04-30 | 2019-11-14 | 2018-09-10 | 2018-10-31 | 2019-04-30 | 2019-11-14 | 2018-09-10 | 2018-10-31 | | 2019-05-01 | 2019-11-15 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | N | N | FD | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0 75 | 0.8 | 1 | 1.3 | 0.19 | 0.25 | 0.056 J | 0.13 | 2.5 | | 3.1 | 2 2 | 0.73 | 0.84 | 0.77 | 0.39 | 0 37 | 5.6 | | 6.5 | 5.9 | 6 |
| Ca cium | mg/L | 160 | 160 | 110 | 130 | 45 | 53 | 17 | 25 | 180 | | 190 | 150 | 140 | 93 | 88 | 93 | 81 | 210 | | 220 | 200 | 240 |
| Ch oride | mg/L | 530 | 470 | 380 | 370 | 4.9 | 4.6 | 1.9 | 3.6 | 90 | | 85 | 81 | 74 | 15 | 10 | 10 | 4 | 100 | | 95 | 110 | 120 |
| Fluoride | mg/L | 10 U | 0.18 | 0 21 J | 0.23 | 0.17 J | 0.17 | 0.05 U | 0.05 U | 0.52 J | | 0.46 | 0.51 | 0.7 | 0 18 J | 0.17 | 0.14 | 0 28 | 0.41 J | | 0.52 | 0.59 | 0.58 |
| pH | SU | 8.3 | 7.1 | 7.42 | 7.34 | 6 | 6.47 | 5.93 | 6 21 | 7.3 | | 7.35 | 7.41 | 7.52 | 6.24 | 7.92 | 6 82 | 7.08 | 6.95 | | 8.71 | 7.27 | 7.2 |
| Su fate | mg/L | 210 | 190 | 220 | 290 | 51 | 56 | 37 | 36 | 430 | | 510 | 340 | 320 | 190 | 150 | 190 | 76 | 750 | | 730 | 710 | 720 |
| Total Dissolved Solids | mg/L | 1500 | 1300 | 1100 | 1100 | 240 | 250 | 130 | 160 | 1100 | | 1100 | 900 | 770 | 500 | 400 | 470 | 350 | 1600 | | 1400 | 1500 | 1400 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.00061 J | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0 0011 J | 0.00074 J | 0 00078 J | 0.001 J | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0013 J | 0.0016 J | 0.00083 J | 0.0012 J | 0.013 | 0.015 | 0.00097 J | 0.0018 J | 0 00079 J | | 0.00083 J | 0.001 J | 0.0016 J | 0 0024 J | 0.0028 J | 0.0022 J | 0.0045 J | 0.0025 J | | 0.0032 J | 0.0045 J | 0.005 |
| Barium | mg/L | 0 32 | 0 31 | 0.25 | 0.28 | 0 027 | 0.028 | 0.019 | 0.026 | 0.052 | | 0.054 | 0 044 | 0.072 | 0.043 | 0.039 | 0.031 | 0.031 | 0.098 | | 0.093 | 0.08 | 0.084 |
| Beryllium | mg/L | 0.001 U | 0.00042 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0.00059 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.00029 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0019 J | 0.0018 J | 0 0012 J | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00032 J | 0.001 U | 0.001 U | 0.00084 J | 0.00099 J | 0 0005 J | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.00053 J | 0.00052 J | 0 00062 J | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 10 U | 0.18 | 0 21 J | 0.23 | 0.17 J | 0.17 | 0.05 U | 0.05 U | 0.52 J | | 0.46 | 0.51 | 0.7 | 0 18 J | 0.17 | 0.14 | 0 28 | 0.41 J | | 0.52 | 0.59 | 0.58 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0014 | 0.00089 J | 0.00057 J | 0.00063 J | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0041 J | 0.0031 J | 0.0033 J | 0.0071 J | 0.008 U | 0.008 U | 0 008 U | 0.0021 J | 0.0042 J | | 0.0052 J | 0.005 J | 0.0066 J | 0.008 U | 0.008 U | 0.008 U | 0.0023 J | 0.0048 J | | 0.0036 J | 0.0048 J | 0.0074 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.014 | 0.015 | 0.0095 J | 0.0086 J | 0 012 | 0.015 | 0 0051 J | 0.011 | 0.0083 J | | 0.0075 J | 0.0098 J | 0.02 | 0.043 | 0.044 | 0.023 | 0 03 | 0.018 | | 0.019 | 0 0085 J | 0.012 |
| Radium Total | pci/L | 3 52 | 5.55 J | 2.63 | | 0.547 U | 1.45 J | 0 344 U | | 1.69 | | 0.48 J | 1.26 | | 0.5 | 1.08 J | 0.393 U | | 2 03 | | 2.7 J | 1.82 | |
| Radium-226 | pci/L | 2 11 | 2.76 J | 1.2 | | 0.257 | 0.795 J | 0 316 U | | 0.789 | | 0 238 J | 0.544 | | 0.385 J | 0 237 J | 0.337 U | | 1 18 J | | 1.35 J | 0.956 | |
| Radium-228 | pci/L | 1.41 | 2.79 J | 1.44 | | 0.547 U | 0.658 J | 0 344 U | | 0.897 | | 0.347 U | 0.719 | | 0.385 U | 0 843 J | 0.393 U | | 0.849 | | 1.35 J | 0.865 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0 0017 J | 0.0012 J | 0.0043 J | 0.0035 J | 0.005 U | | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0.00049 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | 220 | | | | 120 | | | | 250 | | | | | 150 | | | | 240 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | 5 U | | | | 5 U | | | | 5 U | | | | | 5 U | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | 5 U | | | | 5 U | | | | 5 U | | | | | 5 U | | | | 5 U | | | | |
| Alkal nity Total | mg/L | 220 | 230 | 220 | 200 | 120 | 140 | 53 | 73 | 250 | 240 | 250 | 260 | 190 | 150 | 160 | 160 | 230 | 240 | 230 | 230 | 250 | 260 |
| Ferr c Iron | mg/L | 5 J | 3.4 | | | 2 J | 1 | | | 3.2 J | 2 3 | 2.7 | | | 0 13 J | 0.14 | | | 5.9 J | 4.5 | 3.4 | | |
| Ferrous Iron | mg/L | 0.1 R | 0.32 J | | | 0 1 R | 0.5 J | | | 0.1 R | 0 56 J | 1 J | | | 0.1 R | 0 029 J | | | 0.1 R | 0.94 J | 1.6 J | | |
| Iron | mg/L | | | 2.7 | 2.5 | | | 0.25 | 0.28 | | | | 3 1 | 2.4 | | | 0.14 J | 0 31 | | | | 5.4 | 5.4 |
| Magnesium | mg/L | 37 | 38 | 30 | 28 | 15 | 15 | 8.9 | 11 | 23 | 24 | 25 | 23 | 19 | 19 | 18 | 21 | 17 | 38 | 38 | 36 | 42 | 46 |
| Manganese | mg/L | | | 0.21 | 0.25 | | | 0 0079 J | 0.015 U | | | | 0.4 | 0.32 | | | 0.0097 J | 0.015 U | | | | 0.48 | 0.51 |
| Nitrate as N | mg/L | 0.05 UJ | | 0.1 U | 0.1 U | 1.3 J | | 1.4 | 0.4 | 0.05 UJ | | | 0.1 U | 0.1 U | 0.028 J | | 0.49 | 0 15 | 0.05 UJ | | | 0.1 U | 0 1 U |
| Nitrite as N | mg/L | 0.05 UJ | | | | 0.03 J | | | | 0.05 UJ | | | | | 0 05 UJ | | | | 0.05 UJ | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | 0.052 | | | | 0.05 U | | | | 0.099 | 0.74 J- | | | | 0.21 | | | | 0.15 | 0.091 | | |
| Phosphorus (as phosphate) | mg/L | 0.056 | 0.21 J | 0.31 U | 0.11 J | 0.32 | 0.31 U | 0.31 U | 0.31 U | 0.031 U | 0.14 J | 0.52 | 0.31 U | 0.31 U | 0.031 U | 0.31 U | 0.11 J | 0.31 U | 0.079 | 0.31 U | 0.39 | 0.38 | 0.3 J |
| Potassium | mg/L | 6 | 6.4 | 7 | 6.5 | 2 2 | 5 U | 1.3 J | 1.6 J | 4.6 | 5 2 | 5.4 | 4.9 J | 4.5 J | 1.9 | 1.8 J | 1.2 J | 1.6 J | 6.8 | 6.8 | 6.2 | 6 3 | 5.6 |
| Sodium | mg/L | 220 | 250 | 250 | 210 | 6 5 | 7.8 | 4.9 J | 3.9 J | 120 | 130 | 130 | 99 | 75 | 21 | 21 | 15 | 11 | 200 | 200 | 180 | 160 | 140 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.44 | 0.1 | 0.15 | 0.19 | 0.53 | 0.86 | 3.11 | 0 84 | 0 26 | | 0.8 | 0.36 | 0.09 | 0.61 | 1.41 | 0.72 | 0.26 | 0.42 | | 2.12 | 0.42 | 0.31 |
| Oxidation Reduction Potential | mV | -214.9 | -103.5 | 6.31 | -102.9 | -24 6 | -199.5 | 43.7 | -54.8 | -183.2 | | -168 | 27.7 | -75 3 | 107 8 | -294.7 | 48.4 | -69.5 | -123.4 | | -315.7 | -23.1 | -43.3 |
| Eh | mV | -14.9 | 96.5 | 206.3 | 97.1 | 175.4 | 0.5 | 243.7 | 145.2 | 16.8 | | 32.0 | 227.7 | 124 7 | 307 8 | -94.7 | 248.4 | 130.5 | 76.6 | 200.0 | -115.7 | 176.9 | 156.7 |
| pH | SU | 8.3 | 7.1 | 7.42 | 7.34 | 6 | 6.47 | 5.93 | 6.21 | 7.3 | | 7.35 | 7.41 | 7.52 | 6.24 | 7.92 | 6 82 | 7.08 | 6.95 | | 8.71 | 7.27 | 7.2 |
| Spec f c Conductance | uS/cm | 1934 | 2005 | 1652 | 1353 | 307 | 400 | 125 | 155 | 1354 | | 1620 | 1160 | 870 | 675 | 630 | 493 | 374 | 1816 | | 1983 | 1636 | 1310 |
| Temperature | deg C | 17.26 | 16.6 | 15.3 | 16.1 | 21.3 | 20.1 | 11.4 | 17.5 | 20.89 | | 20.4 | 18.7 | 19.7 | 21.2 | 18.53 | 10.5 | 15 3 | 17.6 | | 17.29 | 15.5 | 15.8 |
| Turb dity | NTU | 1.6 | 0.88 | 2.35 | 1.01 | 9.93 | 5.17 | 4.76 | 4.8 | 2.43 | | 3 | 3.45 | 2 5 | 2.03 | 1 | 3 24 | 2.31 | 4.2 | | 1.64 | 4.49 | 1.67 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW55 | | | | GAMW55R | GAMW55B | | | | | GAMW56 | | | | GAMW56B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2018-09-10 | | 2018-10-29 | | 2019-11-15 | 2018-09-11 | | 2018-10-29 | 2019-05-01 | 2019-11-15 | 2018-09-11 | 2018-10-26 | 2019-04-29 | 2019-11-15 | 2018-09-11 | 2018-10-29 | 2019-04-29 | 2019-11-15 |
| Samp e Type | | FD | N | FD | N | N | FD | N | N | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.9 | 1.9 | 1.8 | 1.8 | 1.1 | 7.1 | 7.4 | 8 2 | 9.1 | 11 | 0.26 | 0 28 | 0 21 | 0.2 | 1.2 | 1 2 | 2.3 | 3.2 |
| Ca cium | mg/L | 260 | 250 | 270 | 260 | 180 | 250 | 250 | 260 | 210 | 210 | 130 | 110 | 91 | 120 | 140 | 140 | 150 | 150 |
| Ch oride | mg/L | 58 | 59 | 69 | 70 | 61 | 220 | 220 | 190 | 170 | 150 | 3.1 | 2.4 | 3.2 | 2.1 | 50 | 36 | 55 | 64 |
| Fluoride | mg/L | 0 51 J | 0.52 J | 0.47 | 0.47 | 0 62 | 0 29 J | 10 U | 0.25 | 0.31 | 0.31 | 1.2 J | 0.99 | 0 53 | 0.71 | 0.41 J | 0.33 | 0.4 | 0.44 |
| pH | SU | | 6.77 | | 7.04 | 7.46 | 7.31 | | 7.07 | 7.19 | 7.31 | 6 82 | 7.17 | 6.83 | 7.06 | 6.95 | 6.91 | 7.08 | 7.21 |
| Su fate | mg/L | 590 | 600 | 630 | 620 | 480 | 820 | 820 | 910 | 790 | 750 | 57 | 63 | 54 | 56 | 170 | 130 | 260 | 360 |
| Total Dissolved Solids | mg/L | 1200 | 1300 | 1300 | 1300 | 950 | 1800 | 1900 | 1800 | 1700 | 1400 | 470 | 480 | 420 | 440 | 740 | 690 | 830 | 860 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 | 0 002 U |
| Arsenic | mg/L | 0.00083 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 0014 J | 0.0011 J | 0.005 U | 0.005 U | 0.005 U | 0.019 | 0.022 | 0.011 | 0.0097 | 0.005 U | 0.005 U | 0.005 | 0 005 U |
| Barium | mg/L | 0 099 | 0.097 | 0.068 | 0.069 | 0.035 | 0.14 | 0.14 | 0.12 | 0.074 | 0.067 | 0.068 | 0.049 | 0.044 | 0.04 | 0.076 | 0 072 | 0.082 | 0.076 |
| Beryllium | mg/L | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| Cadmium | mg/L | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| Chromium | mg/L | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 | 0 002 U |
| Cobalt | mg/L | 0.0065 | 0.0058 | 0.0044 | 0.0044 | 0.001 U | 0.00034 J | 0.00028 J | 0.001 U | 0.001 U | 0.001 U | 0.0017 | 0 0053 | 0.0084 | 0.0081 | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| Fluoride | mg/L | 0 51 J | 0.52 J | 0.47 | 0.47 | 0 62 | 0 29 J | 10 U | 0.25 | 0.31 | 0.31 | 1.2 J | 0.99 | 0 53 | 0.71 | 0.41 J | 0.33 | 0.4 | 0.44 |
| Lead | mg/L | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| L thium | mg/L | 0.0021 J | 0.0017 J | 0.008 U | 0.008 U | 0.0035 J | 0 0064 J | 0.0064 J | 0.0054 J | 0 0055 J | 0.0078 J | 0.0034 J | 0.0039 J | 0.0023 J | 0.0053 J | 0.0051 J | 0.0035 J | 0.0044 | 0 0062 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 | 0.0002 U |
| Molybdenum | mg/L | 0.03 | 0.028 | 0.026 | 0.026 | 0.024 | 0 0057 J | 0.0055 J | 0.0055 J | 0 0046 J | 0.005 J | 0.013 | 0.0094 J | 0.0072 J | 0.0079 J | 0.004 J | 0.003 J | 0.0031 | 0 0064 J |
| Radium Total | pci/L | 1.4 | 0.802 | 0.922 J | 1.24 J | | 3.35 | 3.18 | 3.66 J | 2.08 | | 0.728 | 0.698 J | | | 1.26 | 1.28 J | | |
| Radium-226 | pci/L | 0.574 J | 0.474 J | 0.363 J | 0.447 J | | 1.72 | 1.75 | 1.86 J | 1.15 | | 0.504 | 0.357 J | 0.334 U | | 0.763 | 0.578 J | 0.506 | |
| Radium-228 | pci/L | 0 824 | 0.403 U | 0.559 J | 0.796 J | | 1.63 | 1.43 | 1.79 J | 0.926 | | 0.371 U | 0.429 U | 0.373 U | | 0.493 | 0.698 J | 0.571 | |
| Selenium | mg/L | 0.0037 J | 0.0031 J | 0.0027 J | 0.0027 J | 0.0046 J | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 | 0 005 U |
| Thallium | mg/L | 0.00021 J | 0.001 U | 0.00023 J | 0.00022 J | 0.00022 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | 240 | | | | | 230 | | | | 370 | | | | 370 | | | |
| Alkal nity Carbonate (CO3) | mg/L | | 5 U | | | | | 5 U | | | | 5 U | | | | 5 U | | | |
| Alkal nity Hydrox de (OH) | mg/L | | 5 U | | | | | 5 U | | | | 5 U | | | | 5 U | | | |
| Alkal nity Total | mg/L | | 240 | | 240 | 230 | | 230 | 220 | 230 | 230 | 370 | 370 | 300 | 330 | 370 | 410 | 330 | 270 |
| Ferr c Iron | mg/L | | 0.65 J | | 0.19 | | | 5.2 J | 2 5 | | | 13 J | 5.5 | | | 6.4 J | 3.5 | | |
| Ferrous Iron | mg/L | | 0.1 R | | 0 058 J | | | 0.1 R | 2.8 J | | | 0.1 R | 6.5 J | | | 0.1 R | 1.7 J | | |
| Iron | mg/L | | | | | 0.044 J | | | | 4.2 | 4.1 | | | 10 | 3.9 | | | 5.7 | 4.3 |
| Magnesium | mg/L | | 32 | | 39 | 28 | | 46 | 51 | 50 | 42 | 24 | 25 | 27 | 24 | 37 | 38 | 40 | 38 |
| Manganese | mg/L | | | | | 0.22 | | | | 0.58 | 0.46 | | | 0.25 | 0.45 | | | 0 33 | 0.29 |
| Nitrate as N | mg/L | | 0.68 J | | | 1.4 | | 0.05 UJ | | 0.1 U | 0.1 U | 0.05 UJ | | 1.5 | 0.13 | 0.05 UJ | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | 0.058 J | | | | | 0.05 UJ | | | | 0.05 UJ | | | | 0.05 UJ | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | 0.44 | | | | 0.05 U | | | | 0.062 | | | | 0.05 U | | |
| Phosphorus (as phosphate) | mg/L | | 0.031 U | | 0 31 U | 0.31 U | | 2.1 | 0.7 | 0.31 U | 0.16 J | 0.031 U | 0.31 U | 0.12 J | 0.31 U | 0.045 | 0.15 J | 0.14 J | 0.31 U |
| Potassium | mg/L | | 8.3 | | 9.5 | 7.2 | | 6 | 6 6 | 6.2 | 4.8 J | 2.6 | 2.4 J | 1.6 J | 1.9 J | 3.3 | 3.6 J | 3 7 J | 3.6 J |
| Sodium | mg/L | | 58 | | 72 | 79 | | 200 | 230 | 200 | 180 | 11 | 12 | 6.3 | 5.5 | 50 | 49 | 58 | 62 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | | 1.73 | | 0.33 | 0.17 | 0.72 | | 0.37 | 0.17 | 0.11 | 0.99 | 0.28 | 1.3 | 0.34 | 0.29 | 0.26 | 0.79 | 0.18 |
| Oxidation Reduction Potential | mV | | 21.6 | | -69.4 | -137.9 | -28.9 | | -129.5 | -115.9 | -57.5 | -97.4 | -95.4 | 64 | -86.6 | -102.8 | -44.4 | 31.8 | -105.7 |
| Eh | mV | | 221.6 | 200.0 | 130.6 | 62.1 | 171.1 | | 70.5 | 84.1 | 142.5 | 102.6 | 104.6 | 264.0 | 113.4 | 97.2 | 155.6 | 231.8 | 94 3 |
| pH | SU | | 6.77 | | 7.04 | 7.46 | 7.31 | | 7.07 | 7.19 | 7.31 | 6 82 | 7.17 | 6.83 | 7.06 | 6.95 | 6.91 | 7.08 | 7.21 |
| Spec f c Conductance | uS/cm | | 1493 | | 1574 | 1491 | 1017 | | 2109 | 2201 | 1967 | 749 | 835 | 460 | 466 | 928 | 1036 | 856 | 741 |
| Temperature | deg C | | 21.1 | | 19.4 | 17.9 | 16.7 | | 19.2 | 18.5 | 18.1 | 17 | 15.7 | 8.7 | 14 | 13.9 | 13.8 | 11.6 | 12.9 |
| Turb dity | NTU | | 1.74 | | 0.66 | 3.92 | 2.26 | | 4.38 | 1.74 | 4.77 | 2.91 | 2.99 | 2.31 | 2.01 | 2.96 | 1.45 | 4.77 | 1.4 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Prepared by: DFSC
Checked by: KMC
Rev ewed by MAH

**Appendix A-2: Porewater Analytical Data**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| SYS_LOC_CODE | | DAPZ-02A | DAPZ-02B | GAPIEZ06 | GAPIEZ06 | GAPIEZ06 |
|---|---|---|---|---|---|---|
| SAMPLE_DATE_yyyy-MM-dd | | 2020-03-03 | 2020-03-03 | 2018-08-09 | 2018-09-13 | 2018-10-31 |
| FRACTION | | T | T | D | T | T |
| Chemical Name | Unit | | | | | |
| **CCR Appendix III** | | | | | | |
| Boron | mg/L | 7.4 | 13.8 | 9.6 | 8.6 | 8.3 |
| Calcium | mg/L | 489 | 175 | 210 | 210 | 210 |
| Chloride | mg/L | 21.9 | 119 | 56 | 58 | 55 |
| Fluoride | mg/L | 0.16 | 0.72 | 0.91 | 1.1 J | 0.92 |
| pH | SU | 7.33 | 7.62 | 7.51 | 7.43 | 9.37 |
| Sulfate | mg/L | 1760 | 2420 | 750 | 720 | 740 |
| Total Dissolved Solids | mg/L | 2810 | 3830 | | 1300 | 1300 |
| **CCR Appendix IV** | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.0014 J | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.001 U | 0.0018 | 0.011 | 0.011 | 0.012 |
| Barium | mg/L | 0.028 | 0.033 | 0.03 | 0.029 | 0.03 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.001 U | 0.00052 J | 0.001 U |
| Cadmium | mg/L | 0.00052 | 0.0002 U | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.0038 | 0.0023 J+ | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.0022 | 0.001 U | 0.0004 J | 0.00029 J | 0.001 U |
| Fluoride | mg/L | 0.16 | 0.72 | 0.91 | 1.1 J | 0.92 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.016 | 0.0041 J | 0.0038 J | 0.0033 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.81 | 0.063 | 0.079 | 0.094 | 0.11 |
| Selenium | mg/L | 0.011 | 0.001 U | 0.001 J | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | |
| Alkalinity, Bicarbonate (HCO3) | mg/L | | | | 170 | |
| Alkalinity, Carbonate (CO3) | mg/L | | | | 5 U | |
| Alkalinity, Hydroxide (OH) | mg/L | | | | 5 U | |
| Alkalinity, Total | mg/L | 99.6 | 224 | 170 | 170 | 160 |
| Ferric Iron | mg/L | | | 2.8 J | 2.7 J | 0.19 |
| Ferrous Iron | mg/L | | | 0.1 U | 0.1 R | 0.088 J |
| Iron | mg/L | 0.61 | 14.2 | | | |
| Magnesium | mg/L | 48.9 | 18.4 | 53 | 51 | 45 |
| Manganese | mg/L | 0.12 | 0.7 | | | |
| Nitrate | mg/L | | | 0.031 J | | |
| Nitrate as N | mg/L | 0.75 J+ | 0.1 U | | 0.05 U | |
| Nitrite as N | mg/L | | | | 0.05 U | |
| Nitrogen, Nitrate-Nitrite | mg/L | | | | | 0.038 J |
| Phosphorus (as phosphate) | mg/L | | | 0.031 U | 0.028 J | 0.12 J |
| Potassium | mg/L | 59.1 | 17.5 | 3.9 J | 4.1 | 5 U |
| Sodium | mg/L | 286 | 1050 | 100 | 110 | 99 |
| **Field Parameters** | | | | | | |
| Dissolved Oxygen | mg/L | 0.61 | 0.00 | 1.33 | 0.7 | 0.80 |
| Oxidation-Reduction Potential | mV | 66.9 | -197.4 | -130 8 | -118 2 | -261 |
| Eh | mV | 266.9 | 2.6 | 69.2 | 81.8 | -61 |
| pH | SU | 7.33 | 7.62 | 7.51 | 7.43 | 9.37 |
| Specific Conductance | uS/cm | 3025 | 4772 | 1518 | 1371 | 1672 |
| Temperature | deg C | 9.4 | 11.7 | 15.91 | 16.1 | 15.1 |
| Turbidity | NTU | 28.9 | 2.74 | 3.73 | 4.29 | 3.4 |

Notes:
CCR= coal combustion residual
mg/L = milligrams per liter
mV= millivolts
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
"U" = Indicates he result was not detected above the method detection limit (MDL) for the sample; he quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"R"= Indicates the result was rejected during data validation.

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

**APPENDIX B**

# Groundwater Flow Model Technical Memorandum

# TECHNICAL MEMORANDUM

**DATE** November 12, 2020

**TO** Danielle Sylvia Cofelice, PE and PJ Nolan, Ph.D.

**CC** Mark Haney, Joe Gormley, and Rens Verburg

**FROM:** Ross Bennett, PE(NH) and Brandon Poiencot, PE

**GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM**

**R.M. SCHAHFER GENERATING STATION**

## 1.0 GROUNDWATER MODELING

This Memorandum presents Golder's summary of groundwater modeling activities associated with the evaluation of hydrogeologic conditions and potential remedial designs at the R.M. Schahfer Generating Station in Wheatfield, Indiana (the Site).

A steady state groundwater flow model was developed and calibrated. This memorandum includes the following to document development of the groundwater flow model and includes:

1) Objectives;
2) Groundwater Flow Model Development
3) Model selection (numerical);
4) Model Geometry
5) Boundary Conditions
6) Input Parameters
7) Model Calibration and Verification
8) Parameter Sensitivity analysis
9) Design Simulations
10) Summary

The conceptual model (including geology, hydrology, lithology and analytical data) used to support numerical model development is described Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019).

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## 1.1 Objectives

The primary objective of the modeling was to simulate the groundwater flow conditions in the area surrounding R.M. Schahfer Generating Station to support evaluation of the remedy design including the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments for the Site.

The general scope of the groundwater modeling is to:

- Simulate the groundwater flow regimes on Site;
- Predict the travel times and flow paths of unattenuated particles originating at areas impacted by metals contamination;
- Inform remedy design (e.g., groundwater pump and treat design);
- Inform the groundwater monitored natural attenuation study.

# 2.0 GROUNDWATER FLOW MODEL DEVELOPMENT

## 2.1 Numerical Implementation

Golder developed the groundwater flow model for the site using the USGS MODFLOW-2005 Modular Three-Dimensional Finite-Difference Groundwater Flow Model (Harbaugh, 2005). The pre- and post-processing software used for the modeling was Groundwater Vistas (Vistas) Version 7.24 (Environmental Simulations Inc.).

Development of a numerical groundwater flow model involved the following steps:

- Definition of the model geometry including lateral and vertical extent, number and thickness of model layers, and grid spacing
- Definition and placement of model boundary conditions
- Selection of input parameters such as hydraulic conductivity (horizontal and vertical) and precipitation recharge

The following sections describe the steps used to develop the model.

## 2.2 Model Geometry

The finite-difference model grid location is shown on Attachment A**.** The model area (excluding no-flow cells) is approximately 10,800 feet (along x-axis) by 12,300 feet (along y-axis) at the widest points. The southwest corner of the model grid (model coordinates 0, 0) corresponds with Site coordinates 2165530.5N and 2962863.0 W (Indiana State Plane West). The model grid is oriented parallel with cardinal directions. The model grid contains 504 rows and 432 columns. The grid cell size in the XY direction is uniform, at 25 feet by 25 feet across the entire model domain. Based on geologic and hydrogeologic conditions discussed in Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019), the model utilizes three layers, with the lowermost layer representing the medium to coarse sand and the upper two layers representing the fine sands. Layers 1 and 2 have the same hydraulic properties, but they were divided to focus boundary condition cells in the upper portion of the aquifer using Layer 1. The base of Layer 3 is the top of the shale bedrock surface and ranges from 597 to 624

feet mean sea level (MSL). The surface topography is based on publicly available lidar data and ranges from 646 to 723 feet MSL. A cross section of model geometry along model column 200 is shown on Attachment B.

## 2.3 Model Boundary Conditions

Boundary conditions in groundwater models consist of physical and hydraulic boundaries within the model area. Physical boundary conditions are well-defined geologic and hydrologic features that influence groundwater flow patterns. The following sections describe the boundary conditions used in the model.

### 2.3.1 Constant Head Boundaries

Constant head boundaries (CHB) were assigned along an unnamed stream in Layer 1 in the southwestern corner of the model to recreate the approximate constant hydraulic heads where long-term average stream water levels are expected to remain relatively constant. Constant heads were also used within the basins that are surrounded slurry walls to simulate the average surface water elevations in the basins. The modeled CHBs are shown on Attachment C and summarized on Table B-1.

### 2.3.2 River Boundary Conditions

River boundary conditions are a head-dependent boundary condition, where the model computes the difference in head between the boundary and the model cell where the boundary is defined. River Boundary condition cells were used for the Kankakee River, as shown in Attachment A. River heads were defined by two USGS gauging stations that fell within the model grid, downstream at USGS station 05517530 in Kouts and upstream at USGS 05517500 at Dunns Bridge. The river width was estimated from satellite imagery, the river bottom elevation was assumed to be three feet lower than the stage, and the bed thickness was assumed to be 10 feet. The hydraulic conductivity of the river was set through calibration at 64.5 feet/day which is slightly lower than aquifer hydraulic conductivities discussed in Section 1.1.2.4.1.

### 2.3.3 Stream Boundary Conditions

Stream boundary conditions are a simplified version of river boundary conditions where surface water flow is monitored by MODFLOW and water is added or removed from the model based on the stream stage. Stream boundary conditions were used in the Model for Davis Ditch and Stalbaum Ditch, as shown in Attachment C. The stream width was estimated from satellite imagery, the stream bottom elevation was assumed to be 0.5 to 2 feet lower than the stage depending on size of the stream, and the bed thickness was assumed to be 5 feet. The hydraulic conductivity of the river was set at 100 feet/day for Davis Ditch where loosing stream conditions were expected, and at 0.5 feet per day in Stalbaum ditch where perched conditions where assumed to exist. Stream stage was set off two gauging stations in Stalbaum, SW-04 and SW-10. Elsewhere stream stage was estimated from surface elevations and then refined through model calibration.

### 2.3.4 Drain Boundary Conditions

Drain boundary conditions are a version of river/stream boundary conditions that can only remove water from the model. Drain boundary conditions were used in the Model for intermittent streams and drainage ditches, as shown in Attachment C. The drain width was estimated from satellite imagery, the drain bottom elevation was assumed to be 1 to 2 feet lower than the stage depending on size of the drain, and the bed thickness was assumed to be 1 foot. The hydraulic conductivity of the drains was set at 100 feet/day. Drain stage was estimated from surface elevations and then refined through model calibration.

### 2.3.5 No Flow Boundaries

No flow boundaries were assigned to the northeast side of the Kankakee River, as shown in Attachment C.

### 2.3.6 Horizontal Flow Barriers

A hydraulic flow barrier (HFB) or wall is a condition that limits flow between adjacent cells based on an assigned thickness and hydrologic conductivity. To model the slurry walls that are present around ponds, Golder used the HFB boundary condition with an assigned thickness of 1 foot and a horizontal hydraulic conductivity (K) value of 0.0000001 to model slurry walls that surround the basins. The location of HFB boundaries are presented in Attachment C

## 2.4 Model Input Parameters

The following paragraphs describe the input parameter data used for the model. Golder simulated steady state conditions in the model. Transient dependent parameters such as porosity and storage/storativity were not included in the model calibration process.

### 2.4.1 Hydraulic Conductivity

Golder based hydraulic conductivity values for the Site model on pumping test analysis results as discussed in Section 6.0 of the AT-01 Aquifer Test Report (Golder, 2020) and summarized in Table B-2. Golder used these results to assign initial hydraulic conductivity values to the groundwater flow model, and to check that the hydraulic conductivity values resulting from model calibration were within the range of values observed. Golder assigned a uniform Kx/Ky hydraulic conductivity value of 215 feet/day and a Kz of 21.5 feet/day across the entire model area for Layers 1 and 2. Layer 3 had a slightly lower hydraulic conductivity of 200 feet/day and a Kz of 20.0 feet/day across the entire model area. These hydraulic conductivities are based on a best fit from model calibration, and are within range of measured conductivities.

### 2.4.2 Precipitation Recharge

Precipitation recharge is the amount of precipitation that recharges the aquifer, which is generally the precipitation rate minus losses due to runoff and evapotranspiration. Recharge rates calculated for the area were presented in Letsinger (2015) and used in the model. After model calibration a best fit recharge value of 7.1 inches per year (0.00162 feet/day) was established, which was similar to the published rates. A recharge rate of 0.04 inches/year (0.00001 ft/day) was used for the capped landfill areas. Precipitation recharge rates are shown in Attachment D.

### 2.4.3 Groundwater Extraction and Recharge Wells

Groundwater extraction or recharge wells are present on and adjacent to the Site and were modeled in all versions of the model, as shown in Attachment D. The well field located on the northeast corner of the model contains eight wells that remove a total of 55,343 cubic feet/day. In the central portion of the Site the 5 cooling tower wells and two Miox wells remove a total of 7,701 cubic feet/day, and just west of the Site on well on the adjacent property removes 9,625 cubic feet/day.

# 3.0 MODEL CALIBRATION AND VERIFICATION

Model calibration consists of successive refinement of the model property assignments and input data from initial assumptions/estimates to improve the fit between observed and model-predicted results. A solution of a groundwater flow model problem requires information including aquifer parameters such as hydraulic conductivity, spatial boundary conditions, and the location and magnitude of applied stresses, such as recharge and drainage.

A solution is attained only when the proper combination of the above parameters and inputs are selected such that the physical problem is accurately represented by the model. The calibrated model described below should be considered a limited hydrologic effort founded on the available information within the context of necessary simplifying assumptions.

The purpose of the calibration effort was to simulate "steady-state" groundwater flow conditions that approximate the general flow patterns inferred from September 2019 groundwater level measurements. The model was calibrated through trial-and-error adjustment of model parameter values and through use of Model-Independent PEST, developed by Watermark Computing, to refine aquifer parameters. PEST allows model input parameters to be adjusted automatically over a given range until the model predicted head matches the observed head with the lowest possible numerical difference, referred to as the calibration residual (Doherty, 2016). Golder set the allowable range of parameter adjustment in PEST to represent realistic values as determined by previously published literature for the region and aquifer tests at the Site.

At each well location, the head residuals were calculated in Groundwater Vistas as the difference between the measured and simulated head values. Positive residual values indicate simulated head values were lower than measured elevations, while negative residual values indicate simulated head values were higher than measured elevations.

As a measure of the accuracy of the model, Groundwater Vistas calculates summary statistics using calculated residuals, which are used as measures of error in the calibrated model. The residual mean (RM) is the arithmetic mean of all calculated residual values. The absolute residual mean (ARM) is the arithmetic mean of the absolute value of the residuals (i.e., all negative residuals are considered positive). The root mean square error (RMSE) is the square root of the mean of the squared value of target residuals. Other statistics such as the residual standard deviation (RSD) (i.e., the square root of the variance [the average of the squared deviations from the mean]), and the sum of squared residuals (SSR) (computed by squaring each residual and adding them together) can also be useful in evaluation of the calibration process. While calibrating the model, Golder selected parameters estimated by PEST that were within a valid range from published literature or Site-specific data that resulted in improved calibration summary statistics.

## 3.1 Simulated Heads Calibrated to September 2019 Conditions

Measured groundwater elevations for 112 monitoring points from September 2019 were used for calibration, as presented in Table B-3. The model files for September 2019 calibration simulation use the root file name *V12_2019.* The simulated heads and residuals for targets screened in Layer 1 are presented in Attachment F. Based on the simulated contours of groundwater elevation, groundwater flows from the south/southwest toward the Site before it travels to the Kankakee River in the north/northeast.

A comparison of model-predicted versus observed September 2019 potentiometric heads for the 112 selected calibration points resulted in a RM of -0.36 feet and a RMSE of 0.72 feet. The calibration statistics for the model are presented in Table B-4. The RM of -0.36 feet, represents 4.9 percent of the total measured head difference for the model area (approximately 7.41 feet). The absolute residual mean for the model run is 0.57 feet, which is 7.7 percent of the total hydraulic head difference for the entire modeling area. The residual mean and the absolute residual mean are within the generally accepted standard of 10 percent of the total hydraulic head difference for the modeling area.

### 3.1.1 Water Balance

An effective measure of model calibration is the analysis of the water budget calculated by MODFLOW. The model provides flows across boundaries, flows to and from all sources and sinks, and flows generated by storage. Inflows into the model include:

- Constant head boundaries: 16,716 $ft^3/d$,
- Rivers: 165,339 $ft^3/d$,
- Streams: 182,984 $ft^3/d$ and
- Recharge: 545,949 $ft^3/d$.

Outflows in the model include

- Constant head boundaries: 5,640 $ft^3/d$,
- Wells: 70,469 $ft^3/d$,
- Rivers: 474,633 $ft^3/d$,
- Streams: 400,512 $ft^3/d$, and
- Drains: 45,574 $ft^3/d$.

The outflow deficit is 85,842 cubic feet per day ($ft^3/d$), which is equivalent to error between outflow and inflow estimates of approximately 8.9 percent.

### 3.1.2 Numerical Model Verification

Model verification was performed using a second water level calibration data set from October 2018. The model input parameter values defined in the September 2019 simulation were maintained. The verification data is presented in Table B-5. The model files for the October 2018 conditions use the root file name *V12.1_2019*. The verification results indicate a RM of 0.33 feet, which represents 4.1 percent of the total hydraulic head difference for the model area. The absolute residual mean for this simulation was 0.52 feet, which is 6.5 percent of the total hydraulic head difference for the entire model area. The verification statistics suggests that the model is calibrated and verified.

## 4.0 DESIGN SIMULATIONS

Using the calibrated model, Golder used MODPATH (Pollack, 1989) to simulate travel times for particles released from the metals cleaning basin. Particles were started in Layer 3 of the model to simulate the release of contaminants in the deeper part of the aquifer where Boron concentrations exceeded 10 micrograms/liter. Effective porosity of the aquifer was varied between 0.16, 0.3, and 0.46 to represent values within the expected range for medium to fine sand. The length of the particle traces produced by MODPATH along with travel time estimates were used to calculate average groundwater velocities. These travel time calculations are presented in Table B-6.

## 5.0 GROUNDWATER MODELING SUMMARY

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. This model was utilized to inform the groundwater monitored natural attenuation study by simulating travel times for particles released from the metals cleaning basin.

# 6.0 REFERENCES

Doherty, 2016. PEST, Model-Independent Parameter Estimation. User Manual 6th Edition.

Golder, 2019, CCR Assessment of Corrective Measures Northern Indiana Public Service Company Rollin M Schahfer Generating Station Wheatfield, Indiana. April 2019.

Golder, 2020, AT-01 Aquifer Test R. M. Schahfer Generating Station. August 2020.

Harbaugh, Arlen W, 2005. MODFLOW-2005, The U.S. Geological Survey Modular Ground-Water Model—the Ground-Water Flow Process. U.S. Geological Survey Techniques and Methods 6-A16

Letsinger, S. L., 2015, Map of Indiana showing near-surface aquifer recharge: Indiana Geological Survey Miscellaneous Map 92, scale 1:500,000.

Pollock, D.W., 1989 Documentation of computer programs to compute and display pathlines using results from the U.S. Geological Survey modular three-dimensional finite-difference groundwater flow model. U.S. Geological Survey, Open File Report 89-381.

## List of Attachments:

Attachment A Model Grid

Attachment B Cross Section of Model Grid

Attachment C Boundary Conditions

Attachment D Precipitation Recharge Zones

Attachment E Active Pumping Wells

Attachment F Model Calibration – September 2019

## List of Tables

Table B-1 Boundary Conditions

Table B-2 Site Pumping Test Results

Table B-3 Measured Groundwater Elevations - September 2019

Table B-4 Calibration Residuals and Summary Statistics - September 2019

Table B-5 Verification Residuals and Summary Statistics – October 2018

Table B-6 Travel Time Simulations

**Table B-1 Boundary Conditions**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

**Constant Head Boundaries**

| Name | Layer | Reach | Starting Head (ft) | Ending Head (ft) |
|---|---|---|---|---|
| Intake Settling Basin | 1 | 104 | 675 0 | 675.0 |
| Final Settling Basin | 1 | 101 | 675 0 | 675.0 |
| Drying Area | 1 | 100 | 672 0 | 672.0 |
| Unnamed SW. Stream | 1 | 1 | 663.17 | 661.20 |

**Rivers**

| Name | Layer | Starting Stage (ft) | Starting Bed Elevation (ft) | Ending Stage (ft) | Ending Bed Elevation (ft) | Starting Width (ft) | Ending Width (ft) | Length (ft) | Thickness of Bed (ft) | Hydraulic Conductivity (ft/d) |
|---|---|---|---|---|---|---|---|---|---|---|
| Kakakanee River | 1 | 651.82 | 649.10 | 646.72 | 644.01 | 135 28 | 159.88 | 24.0 | 10.0 | 64.41 |

**Streams**

| Name | Layer | Starting Stage (ft) | Starting Bed Elevation (ft) | Ending Stage (ft) | Ending Bed Elevation (ft) | Starting Width (ft) | Ending Width (ft) | Length (ft) | Thickness of Bed (ft) | Hydraulic Conductivity (ft/d) | Slope of Channel (ft/ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Davis Ditch | 1 | 661.99 | 659.99 | 650.29 | 646.31 | 20.05 | 74.80 | 50 | 10.0 | 63.41 | 0.001 |
| Stalbaum Ditch | 1 | 660.74 | 659.74 | 654.5 | 652.0 | 10.07 | 50 | 28 | 1.0 | 50 | 0.001 |
| Fisher Ditch | 1 | 661.49 | 659.49 | 660.88 | 658.88 | 30.04 | 32.08 | 51 | 5.0 | 100 | 0.001 |
| Stalbaum South Ancillary Ditch | 1 | 661.50 | 660 0 | 659.21 | 657.76 | 2.06 | 29.93 | 31 | 1.0 | 10 | 0.001 |
| Stalbaum East Ancillary Ditch | 1 | 661 0 | 655.36 | 657.17 | 655.21 | 18.80 | 30.36 | 13 | 5.0 | 0.1 | 0.001 |
| Coal Yard Ditch | 1 | 660.7 | 659.00 | 660.7 | 659 | 5.0 | 5.0 | 50 | 1.0 | 50 | 0.001 |

**Drains**

| Name | Layer | Starting Stage (ft) | Ending Stage (ft) | Starting Width (ft) | Ending Width (ft) | Length (ft) | Thickness of Bed (ft) | Hydraulic Conductivity (ft/d) |
|---|---|---|---|---|---|---|---|---|
| Sands Ditch | 1 | 662 0 | 654.1 | 1 0 | 5 | 38 | 1 | 50 |
| W. Sands Drain | 1 | 660 0 | 655 6 | 2 | 2 | 27 | 1 | 50 |
| Hilliard St Ditch | 1 | 659 | 659 | 2 | 2 | 24 | 1 | 10 |
| N. LF Drain | 1 | 661 | 661 | 8 8 | 8 8 | 50 0 | 1.0 | 62.0 |
| S. LF Drain | 1 | 661 | 661 | 8 8 | 8 8 | 50 0 | 1.0 | 62.0 |
| W. LF Drain | 1 | 661 | 661 | 5 | 5 | 50 | 2 | 100 |

**Hydraulic Flow Barriers (Slurry Walls)**

| Name | First Layer | Last Layer | Thickness (ft) | Hydraulic Conductivity (ft/d) |
|---|---|---|---|---|
| Intake Settling Basin Slurry Wall | 1 | 3 | 1 | 1.00E-07 |
| Final Settling Basin Slurry Wall | 1 | 3 | 1 | 1.00E-07 |
| Drying Area Slurry Wall | 1 | 3 | 1 | 1.00E-06 |

**Table B-2: Site Pumping Test Results**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Pumping Test Results | | Estimated Hydraulic Conductivity (ft/d) |
|---|---|---|
| SHALLOW WELLS | *Minimum:* | 192 |
| | *Maximum:* | 363 |
| | *Arithmetic Mean:* | 266 |
| DEEP WELLS | *Minimum:* | 234 |
| | *Maximum:* | 320 |
| | *Arithmetic Mean:* | 268 |

**Table B-3: Measured Groundwater Elevations - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Well ID | Layer | Groundwater Elevation (ft msl) |
|---|---|---|
| GAMW01 | 1 | 658.89 |
| GAMW01B | 3 | 658.72 |
| GAMW03 | 1 | 659.84 |
| GAMW03B | 3 | 659.26 |
| GAMW07 | 1 | 660.74 |
| GAMW07B | 3 | 660.79 |
| GAMW08 | 1 | 658.87 |
| GAMW08B | 3 | 658.98 |
| GAMW09 | 1 | 659.27 |
| GAMW09B | 3 | 658.87 |
| GAMW12 | 1 | 658.64 |
| GAMW12B | 3 | 658.66 |
| GAMW13 | 1 | 658.35 |
| GAMW13B | 3 | 658.37 |
| GAMW14 | 1 | 658.14 |
| GAMW14B | 3 | 658.12 |
| GAMW15 | 1 | 660.35 |
| GAMW15B | 3 | 660.33 |
| GAMW16 | 1 | 659.31 |
| GAMW16B | 3 | 659.46 |
| GAMW17B | 3 | 658.92 |
| GAMW18 | 1 | 658.92 |
| GAMW18B | 3 | 659.17 |
| GAMW20 | 1 | 658.21 |
| GAMW24 | 1 | 658.66 |
| GAMW24B | 2 | 658.73 |
| GAMW25 | 1 | 658.41 |
| GAMW25B | 2 | 658.41 |
| GAMW26 | 1 | 658.33 |
| GAMW26B | 3 | 658.26 |
| GAMW27 | 1 | 658.29 |
| GAMW27B | 3 | 658.32 |
| GAMW29 | 1 | 657.48 |
| GAMW29B | 3 | 657.48 |
| GAMW30 | 1 | 657.42 |
| GAMW30B | 3 | 657.51 |
| GAMW31 | 1 | 657.24 |
| GAMW31B | 2 | 657.25 |
| GAMW32 | 1 | 657.19 |
| GAMW32B | 3 | 657.15 |
| GAMW33 | 1 | 657.04 |
| GAMW33B | 3 | 657.13 |
| GAMW34 | 1 | 657.58 |

**Table B-3: Measured Groundwater Elevations - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Well ID | Layer | Groundwater Elevation (ft msl) |
|---|---|---|
| GAMW34B | 3 | 657.59 |
| GAMW35B | 2 | 658.16 |
| GAMW36 | 1 | 656.67 |
| GAMW36B | 3 | 656.69 |
| GAMW37B | 2 | 657.26 |
| GAMW38 | 1 | 657.91 |
| GAMW38B | 3 | 657.91 |
| GAMW39 | 2 | 657.88 |
| GAMW39B | 3 | 657.84 |
| GAMW40 | 1 | 657.66 |
| GAMW40B | 3 | 657.65 |
| GAMW42 | 1 | 658.12 |
| GAMW42B | 3 | 658.13 |
| GAMW43 | 1 | 657.83 |
| GAMW43B | 3 | 657.83 |
| GAMW44 | 1 | 657.71 |
| GAMW44B | 3 | 657.69 |
| GAMW45B | 3 | 654.52 |
| GAMW46 | 1 | 655.22 |
| GAMW46B | 3 | 655.21 |
| GAMW48 | 1 | 654.5 |
| GAMW48B | 3 | 654.51 |
| GAMW49 | 1 | 656.26 |
| GAMW49B | 3 | 656.34 |
| GAMW50 | 1 | 656.37 |
| GAMW50B | 3 | 656.35 |
| GAMW51 | 1 | 658.07 |
| GAMW51B | 3 | 658.19 |
| GAMW52 | 1 | 657.81 |
| GAMW52B | 3 | 657.82 |
| GAMW53 | 1 | 658.04 |
| GAMW53B | 3 | 658.21 |
| GAMW54 | 1 | 657.87 |
| GAMW54B | 3 | 657.82 |
| GAMW55B | 3 | 657.78 |
| GAMW56 | 1 | 657.81 |
| GAMW56B | 3 | 657.77 |
| GAMW02 | 1 | 660.14 |
| GAMW05 | 1 | 658.17 |
| GAMW06 | 1 | 659.65 |
| GAMW10 | 1 | 657.63 |
| GAMW11 | 1 | 657.37 |
| GAMW20B | 3 | 658.25 |

**Table B-3: Measured Groundwater Elevations - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Well ID | Layer | Groundwater Elevation (ft msl) |
|---|---|---|
| MW-1D | 3 | 659.11 |
| MW-1S | 2 | 659.09 |
| MW-2S | 2 | 657.7 |
| MW-3D | 3 | 656.68 |
| MW-4S | 2 | 657.08 |
| MW-5D | 3 | 658.17 |
| MW-5S | 2 | 658.14 |
| MW-6D | 3 | 654.1 |
| MW-6S | 2 | 654.07 |
| MW-7D | 3 | 656.12 |
| MW-7S | 2 | 656.1 |
| MW-8S | 3 | 654.65 |
| MW-9D | 3 | 655.18 |
| MW-9S | 3 | 655.14 |
| MW-10D | 3 | 658.66 |
| MW-10S | 1 | 658.61 |
| MW-11D | 3 | 656.75 |
| MW-11S | 2 | 656.73 |
| MW-12D | 3 | 656.97 |
| MW-12S | 2 | 656.95 |
| MW-13D | 3 | 657.2 |
| MW-13S | 2 | 657.17 |
| MW-14D | 2 | 656.51 |
| MW-14S | 2 | 656.54 |
| SW-4 | 1 | 661.48 |
| SW-10 | 1 | 660 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Layer 1 | | | |
| GAMW01 | 658.89 | 658.87 | 0.02 |
| GAMW03 | 659.84 | 660.22 | -0.38 |
| GAMW07 | 660.74 | 662.14 | -1.40 |
| GAMW08 | 658.87 | 658.87 | 0.00 |
| GAMW09 | 659.27 | 659.05 | 0.22 |
| GAMW12 | 658.64 | 658.58 | 0.06 |
| GAMW13 | 658.35 | 658.50 | -0.15 |
| GAMW14 | 658.14 | 658.57 | -0.43 |
| GAMW15 | 660.35 | 662.08 | -1.73 |
| GAMW16 | 659.31 | 659.11 | 0.20 |
| GAMW18 | 658.92 | 659.30 | -0.38 |
| GAMW20 | 658.21 | 658.72 | -0.51 |
| GAMW24 | 658.66 | 659.16 | -0.50 |
| GAMW25 | 658.41 | 658.67 | -0.26 |
| GAMW26 | 658.33 | 658.34 | -0.01 |
| GAMW27 | 658.29 | 658.09 | 0.20 |
| GAMW29 | 657.48 | 658.19 | -0.71 |
| GAMW30 | 657.42 | 658.20 | -0.78 |
| GAMW31 | 657.24 | 658.12 | -0.88 |
| GAMW32 | 657.19 | 657.99 | -0.80 |
| GAMW33 | 657.04 | 657.92 | -0.88 |
| GAMW34 | 657.58 | 658.44 | -0.86 |
| GAMW36 | 656.67 | 657.59 | -0.92 |
| GAMW38 | 657.91 | 658.24 | -0.33 |
| GAMW40 | 657.66 | 658.27 | -0.61 |
| GAMW42 | 658.12 | 658.62 | -0.50 |
| GAMW43 | 657.83 | 658.54 | -0.71 |
| GAMW44 | 657.71 | 658.56 | -0.85 |
| GAMW46 | 655.22 | 654.39 | 0.83 |
| GAMW48 | 654.5 | 654.25 | 0.25 |
| GAMW49 | 656.26 | 656.37 | -0.11 |
| GAMW50 | 656.37 | 656.86 | -0.49 |
| GAMW51 | 658.07 | 658.84 | -0.77 |
| GAMW52 | 657.81 | 657.89 | -0.08 |
| GAMW53 | 658.04 | 658.21 | -0.17 |
| GAMW54 | 657.87 | 658.36 | -0.49 |
| GAMW56 | 657.81 | 658.51 | -0.70 |
| GAMW02 | 660.14 | 659.81 | 0.33 |
| GAMW05 | 658.17 | 658.77 | -0.60 |
| GAMW06 | 659.65 | 660.42 | -0.77 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW10 | 657.63 | 658.34 | -0.71 |
| GAMW11 | 657.37 | 658.19 | -0.82 |
| MW-10S | 658.61 | 659.16 | -0.55 |
| SW-4 | 661.48 | 657.77 | 3.71 |
| SW-10 | 660 | 659.21 | 0.79 |
| **Layer 2** | | | |
| GAMW24B | 658.73 | 659.16 | -0.43 |
| GAMW25B | 658.41 | 658.67 | -0.26 |
| GAMW31B | 657.25 | 658.12 | -0.87 |
| GAMW35B | 658.16 | 659.00 | -0.84 |
| GAMW37B | 657.26 | 658.24 | -0.98 |
| GAMW39 | 657.88 | 658.29 | -0.41 |
| MW-1S | 659.09 | 659.72 | -0.63 |
| MW-2S | 657.7 | 658.54 | -0.84 |
| MW-4S | 657.08 | 657.79 | -0.71 |
| MW-5S | 658.14 | 658.13 | 0.01 |
| MW-6S | 654.07 | 654.60 | -0.53 |
| MW-7S | 656.1 | 656.26 | -0.16 |
| MW-11S | 656.73 | 657.28 | -0.55 |
| MW-12S | 656.95 | 657.48 | -0.53 |
| MW-13S | 657.17 | 657.95 | -0.78 |
| MW-14S | 656.54 | 657.27 | -0.73 |
| **Layer 3** | | | |
| GAMW01B | 658.72 | 658.87 | -0.15 |
| GAMW03B | 659.26 | 660.22 | -0.96 |
| GAMW07B | 660.79 | 660.99 | -0.20 |
| GAMW08B | 658.98 | 658.87 | 0.11 |
| GAMW09B | 658.87 | 659.05 | -0.18 |
| GAMW12B | 658.66 | 658.58 | 0.08 |
| GAMW13B | 658.37 | 658.50 | -0.13 |
| GAMW14B | 658.12 | 658.57 | -0.45 |
| GAMW15B | 660.33 | 662.22 | -1.89 |
| GAMW16B | 659.46 | 659.11 | 0.35 |
| GAMW17B | 658.92 | 659.55 | -0.63 |
| GAMW18B | 659.17 | 659.30 | -0.13 |
| GAMW26B | 658.26 | 658.34 | -0.08 |
| GAMW27B | 658.32 | 658.13 | 0.19 |
| GAMW29B | 657.48 | 658.19 | -0.71 |
| GAMW30B | 657.51 | 658.20 | -0.69 |
| GAMW32B | 657.15 | 657.98 | -0.83 |
| GAMW33B | 657.13 | 657.92 | -0.79 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW34B | 657.59 | 658.44 | -0.85 |
| GAMW36B | 656.69 | 657.59 | -0.90 |
| GAMW38B | 657.91 | 658.24 | -0.33 |
| GAMW39B | 657.84 | 658.29 | -0.45 |
| GAMW40B | 657.65 | 658.27 | -0.62 |
| GAMW42B | 658.13 | 658.62 | -0.49 |
| GAMW43B | 657.83 | 658.54 | -0.71 |
| GAMW44B | 657.69 | 658.56 | -0.87 |
| GAMW45B | 654.52 | 653.66 | 0.86 |
| GAMW46B | 655.21 | 654.39 | 0.82 |
| GAMW48B | 654.51 | 654.24 | 0.27 |
| GAMW49B | 656.34 | 656.36 | -0.02 |
| GAMW50B | 656.35 | 656.86 | -0.51 |
| GAMW51B | 658.19 | 658.84 | -0.65 |
| GAMW52B | 657.82 | 657.88 | -0.06 |
| GAMW53B | 658.21 | 658.21 | 0.00 |
| GAMW54B | 657.82 | 658.36 | -0.54 |
| GAMW55B | 657.78 | 658.47 | -0.69 |
| GAMW56B | 657.77 | 658.51 | -0.74 |
| GAMW20B | 658.25 | 658.72 | -0.47 |
| MW-1D | 659.11 | 659.72 | -0.61 |
| MW-3D | 656.68 | 657.50 | -0.82 |
| MW-5D | 658.17 | 658.13 | 0.04 |
| MW-6D | 654.1 | 654.61 | -0.51 |
| MW-7D | 656.12 | 656.26 | -0.14 |
| MW-8S | 654.65 | 654.32 | 0.33 |
| MW-9D | 655.18 | 654.27 | 0.91 |
| MW-9S | 655.14 | 654.28 | 0.86 |
| MW-10D | 658.66 | 659.16 | -0.50 |
| MW-11D | 656.75 | 657.27 | -0.52 |
| MW-12D | 656.97 | 657.48 | -0.51 |
| MW-13D | 657.2 | 657.95 | -0.75 |
| MW-14D | 656.51 | 657.27 | -0.76 |

| Calibration Parameter | Value |
|---|---|
| Residual Mean (ft) | -0.36 |
| Redsidual Standard Deviation (ft) | 0.63 |
| Absolute Residual Mean (ft) | 0.57 |
| Residual Sum of Squares | 59 |
| RMS Error | 0.72 |
| Minimum Residual (ft) | -1.89 |
| Maximum Residual (ft) | 3.71 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Range of Observations (ft) | | | 7.41 |
| Scaled Residual Standard Deviation | | | 0.085 |
| Scaled Absolute Mean | | | 0.076 |
| Scaled RMS (%) | | | 9.8 |
| Number of Observations | | | 112 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Layer 1 | | | |
| GAMW01 | 659.19 | 658.87 | 0.32 |
| GAMW03 | 660.82 | 660.22 | 0.60 |
| GAMW07 | 659.27 | 660.62 | -1.35 |
| GAMW08 | 659.06 | 658.87 | 0.19 |
| GAMW09 | 660.34 | 659.05 | 1.29 |
| GAMW12 | 658.84 | 658.58 | 0.26 |
| GAMW13 | 658.72 | 658.50 | 0.22 |
| GAMW14 | 659.55 | 658.57 | 0.98 |
| GAMW15 | 659.10 | 660.00 | -0.90 |
| GAMW16 | 659.07 | 659.11 | -0.04 |
| GAMW18 | 659.57 | 659.30 | 0.27 |
| GAMW20 | 659.81 | 658.72 | 1.09 |
| GAMW24 | 659.90 | 659.16 | 0.74 |
| GAMW25 | 659.67 | 658.67 | 1.00 |
| GAMW26 | 659.73 | 658.34 | 1.39 |
| GAMW27 | 659.67 | 658.09 | 1.58 |
| GAMW29 | 658.28 | 658.19 | 0.09 |
| GAMW30 | 658.62 | 658.20 | 0.42 |
| GAMW31 | 658.13 | 658.12 | 0.01 |
| GAMW32 | 657.99 | 657.99 | 0.00 |
| GAMW33 | 657.84 | 657.92 | -0.08 |
| GAMW34 | 658.47 | 658.44 | 0.03 |
| GAMW36 | 657.71 | 657.59 | 0.12 |
| GAMW38 | 659.19 | 658.24 | 0.95 |
| GAMW40 | 658.76 | 658.27 | 0.49 |
| GAMW42 | 658.40 | 658.62 | -0.22 |
| GAMW43 | 658.16 | 658.54 | -0.38 |
| GAMW44 | 657.95 | 658.56 | -0.61 |
| GAMW46 | 655.25 | 654.39 | 0.86 |
| GAMW48 | 654.68 | 654.25 | 0.43 |
| GAMW49 | 656.86 | 656.37 | 0.49 |
| GAMW50 | 657.22 | 656.86 | 0.36 |
| GAMW51 | 658.42 | 658.84 | -0.42 |
| GAMW52 | 657.99 | 657.89 | 0.10 |
| GAMW53 | 658.14 | 658.21 | -0.07 |
| GAMW54 | 658.47 | 658.36 | 0.11 |
| GAMW56 | 658.86 | 658.51 | 0.35 |
| GAMW02 | 660.52 | 659.81 | 0.71 |
| GAMW05 | 658.53 | 658.77 | -0.24 |
| GAMW06 | 658.63 | 660.42 | -1.79 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW10 | 658.61 | 658.34 | 0.27 |
| GAMW11 | 657.97 | 658.19 | -0.22 |
| MW-10S | 659.83 | 659.16 | 0.67 |
| SW-4 | 662.48 | 657.77 | 4.71 |
| SW-10 | 660.45 | 659.21 | 1.24 |
| **Layer 2** | | | |
| GAMW24B | 659.95 | 659.16 | 0.79 |
| GAMW25B | 659.69 | 658.67 | 1.02 |
| GAMW31B | 658.14 | 658.12 | 0.02 |
| GAMW35B | 659.16 | 659.00 | 0.16 |
| GAMW37B | 658.42 | 658.24 | 0.18 |
| GAMW39 | 659.08 | 658.29 | 0.79 |
| MW-1S | 659.76 | 659.72 | 0.04 |
| MW-2S | 658.58 | 658.54 | 0.04 |
| MW-4S | 657.62 | 657.79 | -0.17 |
| MW-5S | 659.47 | 658.13 | 1.34 |
| MW-6S | 654.83 | 654.60 | 0.23 |
| MW-7S | 656.72 | 656.26 | 0.46 |
| MW-11S | 657.55 | 657.28 | 0.27 |
| MW-12S | 657.68 | 657.48 | 0.20 |
| MW-13S | 657.97 | 657.95 | 0.02 |
| MW-14S | 657.49 | 657.27 | 0.22 |
| **Layer 3** | | | |
| GAMW01B | 659.23 | 658.87 | 0.36 |
| GAMW03B | 660.31 | 660.22 | 0.09 |
| GAMW07B | 659.29 | 660.56 | -1.27 |
| GAMW08B | 659.12 | 658.87 | 0.25 |
| GAMW09B | 659.94 | 659.05 | 0.89 |
| GAMW12B | 657.90 | 658.58 | -0.68 |
| GAMW13B | 658.70 | 658.50 | 0.20 |
| GAMW14B | 658.50 | 658.57 | -0.07 |
| GAMW15B | 659.13 | 660.03 | -0.90 |
| GAMW16B | 659.14 | 659.11 | 0.03 |
| GAMW17B | 659.18 | 658.84 | 0.34 |
| GAMW18B | 660.15 | 659.30 | 0.85 |
| GAMW26B | 659.66 | 658.34 | 1.32 |
| GAMW27B | 659.70 | 658.13 | 1.57 |
| GAMW29B | 658.43 | 658.19 | 0.24 |
| GAMW30B | 658.71 | 658.20 | 0.51 |
| GAMW32B | 657.95 | 657.98 | -0.03 |
| GAMW33B | 657.89 | 657.92 | -0.03 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW34B | 658.46 | 658.44 | 0.02 |
| GAMW36B | 657.72 | 657.59 | 0.13 |
| GAMW38B | 659.21 | 658.24 | 0.97 |
| GAMW39B | 659.04 | 658.29 | 0.75 |
| GAMW40B | 658.68 | 658.27 | 0.41 |
| GAMW42B | 658.41 | 658.62 | -0.21 |
| GAMW43B | 658.10 | 658.54 | -0.44 |
| GAMW44B | 657.91 | 658.56 | -0.65 |
| GAMW45B | 654.52 | 653.66 | 0.86 |
| GAMW46B | 655.24 | 654.39 | 0.85 |
| GAMW48B | 654.67 | 654.24 | 0.43 |
| GAMW49B | 656.94 | 656.36 | 0.58 |
| GAMW50B | 657.25 | 656.86 | 0.39 |
| GAMW51B | 658.58 | 658.84 | -0.26 |
| GAMW52B | 658.00 | 657.88 | 0.12 |
| GAMW53B | 658.24 | 658.21 | 0.03 |
| GAMW54B | 658.42 | 658.36 | 0.06 |
| GAMW55B | 658.68 | 658.47 | 0.21 |
| GAMW56B | 658.87 | 658.51 | 0.36 |
| GAMW20B | 659.85 | 658.72 | 1.13 |
| MW-1D | 659.76 | 659.72 | 0.04 |
| MW-3D | 657.50 | 657.50 | 0.00 |
| MW-5D | 659.47 | 658.13 | 1.34 |
| MW-6D | 654.86 | 654.61 | 0.25 |
| MW-7D | 656.70 | 656.26 | 0.44 |
| MW-8S | 654.80 | 654.32 | 0.48 |
| MW-9D | 655.15 | 654.27 | 0.88 |
| MW-9S | 655.14 | 654.28 | 0.86 |
| MW-10D | 659.83 | 659.16 | 0.67 |
| MW-11D | 657.52 | 657.27 | 0.25 |
| MW-12D | 657.64 | 657.48 | 0.16 |
| MW-13D | 657.96 | 657.95 | 0.01 |
| MW-14D | 657.46 | 657.27 | 0.19 |

| Calibration Parameter | Value |
|---|---|
| Residual Mean (ft) | 0.33 |
| Redsidual Standard Deviation (ft) | 0.71 |
| Absolute Residual Mean (ft) | 0.52 |
| Residual Sum of Squares | 69 |
| RMS Error | 0.78 |
| Minimum Residual (ft) | -1.79 |
| Maximum Residual (ft) | 4.71 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Range of Observations (ft) | | | 7.96 |
| Scaled Residual Standard Deviation | | | 0.09 |
| Scaled Absolute Mean | | | 0.066 |
| Scaled RMS (%) | | | 9.9 |
| Number of Observations | | | 112 |

**Table B-6: Travel Time Simulations**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Shallow Flow Paths | | | | Deep Flow Paths | | | |
|---|---|---|---|---|---|---|---|---|
| **Starting Well** | **GAMW-16** | **GAMW-18** | **GAMW-17B** | **GAMW-09B** | **GAMW-16B** | **GAMW-18B** | **GAMW-17B** | **GAMW-09B** |
| **Ending Well** | **GAMW-53** | **GAMW-55** | **GAMW-54B** | **GAMW-54B** | **GAMW-53B** | **GAMW-55B** | **GAMW-54B** | **GAMW-54B** |
| **Distance (ft)** | **1521** | **1964** | **1200** | **1714** | **1521** | **1964** | **1200** | **1714** |
| **Effective Porosity = 16%** | | | | | | | | |
| Travel Time (years) | 4.8 | 11.0 | 4.5 | 8.9 | 5.0 | 11.0 | 5.5 | 9.0 |
| Velocity (ft/year) | 317 | 179 | 267 | 193 | 304 | 179 | 218 | 190 |
| Time to Davis Ditch (years) | 5.5 | - | - | - | 6 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 27 | 49 | 41 | - | 28.5 | 45 | 41 |
| **Effective Porosity = 30%** | | | | | | | | |
| Travel Time (years) | 8.5 | 19.8 | 8.0 | 16.0 | 8.9 | 20.0 | 10.0 | 16.5 |
| Velocity (ft/year) | 179 | 99 | 150 | 107 | 171 | 98 | 120 | 104 |
| Time to Davis Ditch (years) | 10 | - | - | - | 9.9 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 49.8 | 79 | 75 | - | 51.5 | 80 | 76 |
| **Effective Porosity = 46%** | | | | | | | | |
| Travel Time (years) | 13.0 | 31.0 | 12.0 | 25.0 | 13.5 | 29.0 | 15.0 | 25.0 |
| Velocity (ft/year) | 117 | 63 | 100 | 69 | 113 | 68 | 80 | 69 |
| Time to Davis Ditch (years) | 15 | - | - | - | 15 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 76.8 | 122 | 117 | - | 77 | 130 | 120 |

**Notes:**
ft = feet



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

MODEL GRID

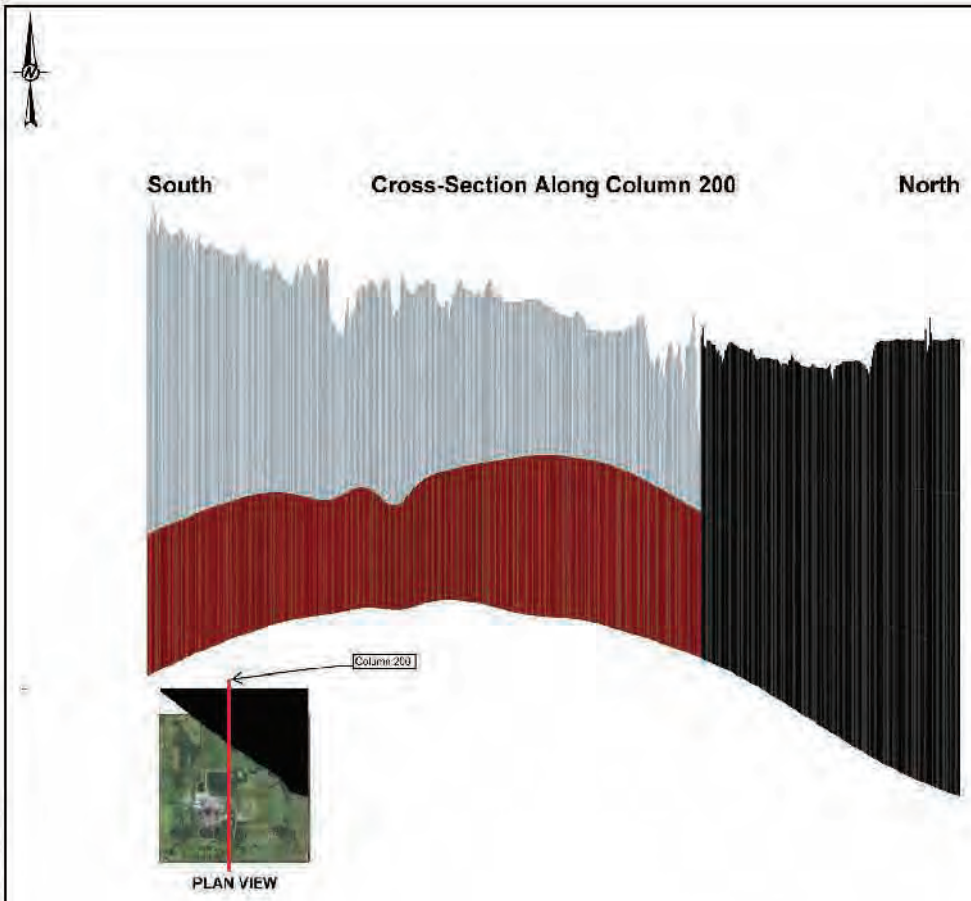
GOLDER

DESIGNED RWB

APPROVED RWB

19121587

A




NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

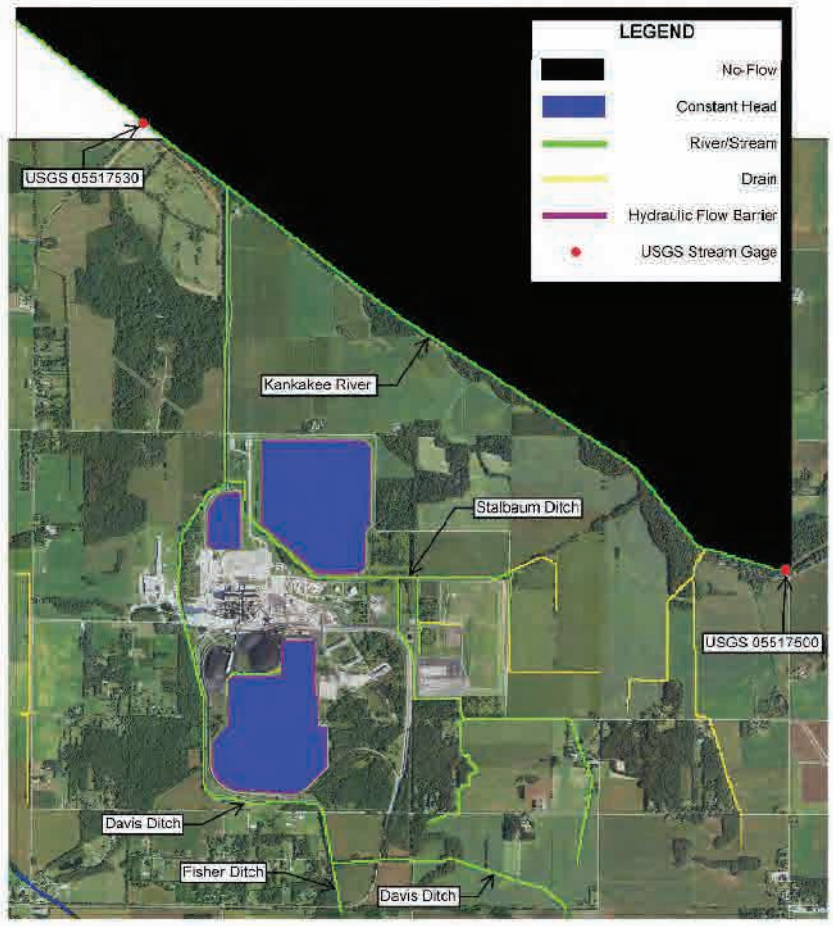
CROSS SECTION OF MODEL GRID

GOLDER

DESIGNED RWB
APPROVED MWD

19121587

B




NORTH [N]
1. BASED ON NAD83 (2011) 2010

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

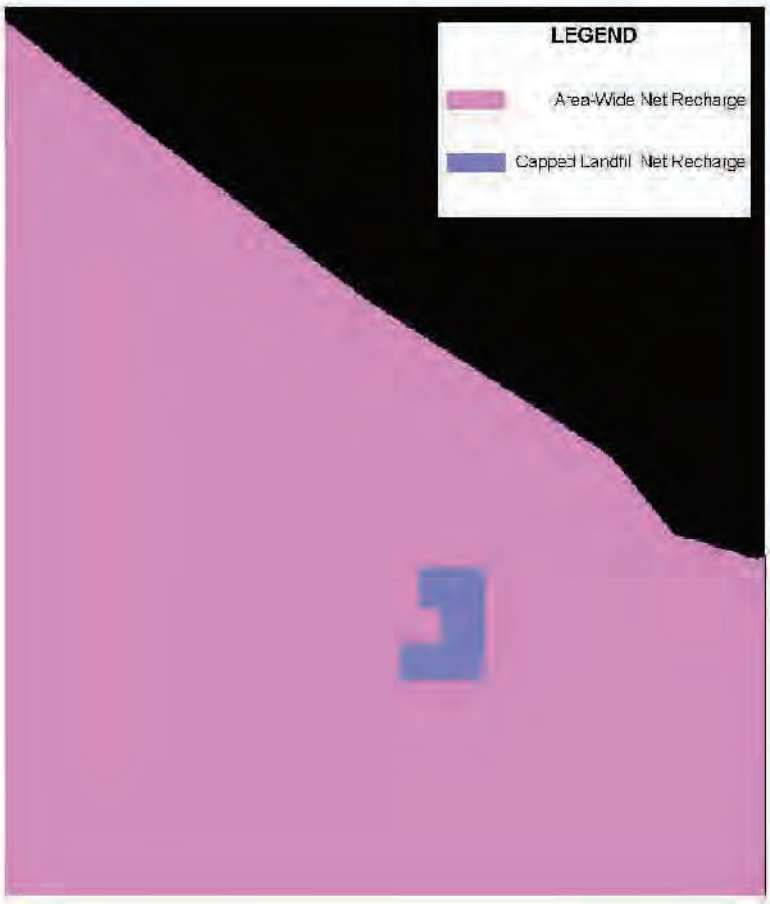
PROJECT
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE
**BOUNDARY CONDITIONS**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2023-12-22 |
| DESIGNED | RWB |
| PREPARED | SR |
| REVIEWED | RP |
| APPROVED | RWB |

PROJECT NO.: 19431587 | CONTROL: - | REV: - | REVISION: C




NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHAEL G GIBSON GENERATING STATION

**PRECIPITATION RECHARGE ZONES**

GOLDER

DESIGNED RWS

19121587

D



LEGEND

Well Location

0 700 1,400

Feet

1:1 - 1,667 (at)

NOTE(S)

1. DIGITIZATION MODEL VER. 2019.

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATE PLANE INDIANA WEST FIPS 1302 FEET
2. 2019 NAIP IMAGERY RETRIEVED FROM ESRI ARCGIS ONLINE IMAGERY SERVICE LAYER

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE

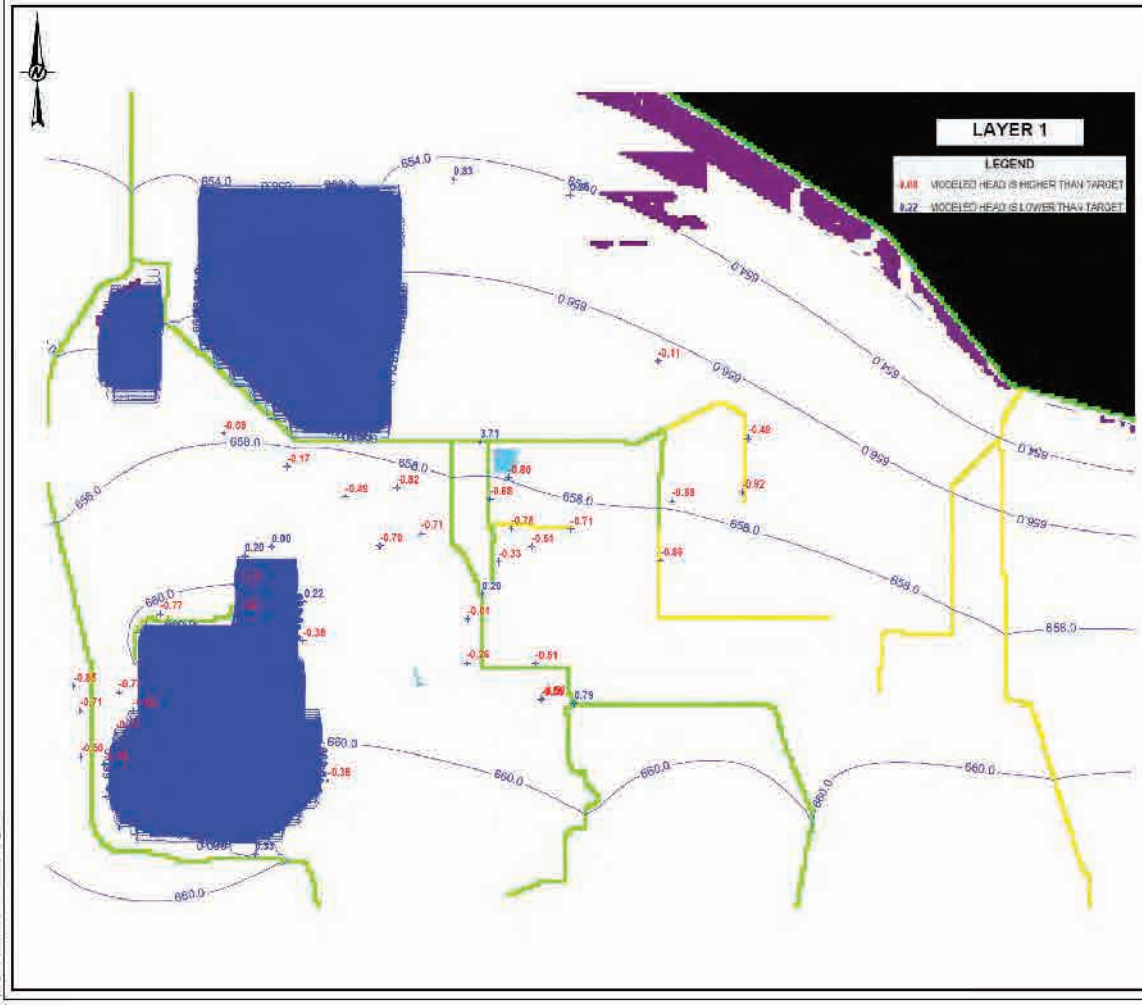
ACTIVE PUMPING WELLS

CONSULTANT

GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-12-09 |
| DESIGNED | RWS |
| PREPARED | SR |
| REVIEWED | RP |
| APPROVED | DAH |

PROJECT NO. 19101567 | CONTROL - | REV. - | FIGURE NO. E




NOTE(S):
1. BASED ON MODEL V12_2019

REFERENCE(S):
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT:
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT:
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE:
MODEL CALIBRATION - SEPTEMBER 2019

CONSULTANT:
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-12-22 |
| DESIGNED | RWS |
| PREPARED | SR |
| REVIEWED | RP |
| APPROVED | RWS |

PROJECT NO.: 19121567 | CONTROL: - | REV.: - | FIG. NO.: F




golder.com

**APPENDIX O**

# CCR Assessment of Corrective Measures Addendum 3 – March 2022

GOLDER
MEMBER OF WSP

**REPORT**

# MCU Assessment of Corrective Measures - Addendum #3

*Northern Indiana Public Service Company LLC*
*Rollin M. Schahfer Generating Station*
*Wheatfield, Indiana*

Submitted to:

**Northern Indiana Public Service Company LLC**

801 East 86th Avenue
Merriville, Indiana 46410

Submitted by:

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20447130.01

June 2022

**Northern Indiana Public Service Company LLC (NIPSCO)**
**R. M. Schahfer Generating Station – MSRB, MCWB and DA (collectively the Multi-Cell Unit [MCU] or CCR Unit)**
**Wheatfield, Indiana**

## Certification of Addendum #3 to the Assessment of Corrective Measures Report 40 CFR §257.96 & Corresponding Regulations under Indiana Administrative Code

I have personally reviewed Addendum #3 to the assessment of corrective measures (ACM) report that was prepared by Golder Associates Inc. (Golder) and dated July 2021. The subject of Addendum #3 to the ACM Report is three impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), which are collectively referred to as the Multi-Cell Unit (MCU) or simply the CCR Unit, at the NIPSCO R. M. Schahfer Generating Station. Based on an inquiry of those individuals immediately responsible and on supporting data that I understand to be true, accurate, and complete, I verify the information in this Addendum #3 to the ACM Report is accurate and meets the applicable requirements of the CCR Rule and Indiana Administrative Code. In consideration of the above, I certify to the best of my knowledge, information, and belief, that Addendum #3 to the ACM Report for the regulated CCR management unit referred to as the MCU has been prepared and meets the applicable requirements of 40 CFR §257.96 and corresponding State of Indiana requirements.




**Joseph Bernard Gormley, Jr.**
**Indiana Professional Engineer**
**License #: PE11900213**

6/17/2022
**Date**

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# Acronyms

| | |
|---|---|
| ACM | Assessment of Corrective Measures |
| CCR | Coal Combustion Residuals |
| CFR | Code of Federal Regulations |
| COC | Constituents of Concern |
| DA | Drying Area |
| GAC | granular activated carbon |
| GDL | Geocomposite drainage layer |
| GWPS | Groundwater Protection Standards |
| Golder | Golder Associated USA Inc. |
| IDEM | Indiana Department of Environmental Management |
| ISS | In situ Stabilization/Solidification |
| LLDPE | linear low-density polyethylene |
| MCWB | Metal Cleaning Waste Basin |
| MCU | Multi-Cell Unit |
| MNA | Monitored Natural Attenuation |
| MSRB | Material Storage Runoff Basin |
| NIPSCO | Northern Indiana Public Service Company LLC |
| NPDES | National Pollutant Discharge Elimination System |
| O&M | Operations & Maintenance |
| POC | Point of Compliance |
| POTW | Publicly Owned Treatment Works |
| PRB | Permeable Reactive Barrier |
| SSL | Statistically Significant Level |
| SOR | Selection of Remedy |
| ug/L | Microgram per liter |
| USEPA | United States Environmental Protection Agency |
| ZVI | zero-valent iron |

# 1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO), Golder Associates USA Inc*., a member of WSP* (Golder) has prepared this Addendum #3 to supplement, refine, and update findings of the April 2019 CCR Assessment of Corrective Measures (ACM) Report and the November 2020 and July 2021 ACM Addenda for the Rollin M. Schahfer Generating Station (RMSGS, Site) located at 2723 E 1500 N Road, in Wheatfield, Jasper County, Indiana (see ACM Addendum #3, Figure 1). Specifically, Golder has included updated findings relative to the detection of cobalt, a 40 Code of Federal Regulations (CFR) Coal Combustion Residuals (CCR) Rule as amended Appendix IV constituent, at a statistically significant level (SSL) above the groundwater protection standard (GWPS). Cobalt has been identified as the only CCR Rule Appendix IV SSL above the GWPS, detected at a single shallow groundwater monitoring location immediately downgradient of three collectively monitored impoundments, the Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and Drying Area (DA), together the Multi-Cell Unit (MCU) or simply the CCR Unit (ACM Report, Golder 2019; ACM Addendum #1, Golder 2020; and ACM Addendum #2, Golder 2021). Addendum #3, Figure 2 shows the location of the MCU on RMSGS as well as the names/locations of the individual impoundments.

Previous ACM documents were by design predicated on and tied closely to time frames associated with key regulatory agency approval processes and NIPSCO planned impoundment closure events. These include the MCU Closure Application regulatory review and approval by Indiana Department of Environmental Management (IDEM) and NIPSCO's scheduled 2023 construction implementation. The MCU Closure Application, which addresses critical aspects interrelated with the groundwater remedy, has undergone multiple reviews by IDEM and revisions by NIPSCO. However, additional review comments were recently received, and the Closure Application has not yet been approved by IDEM. Nevertheless, although lacking this approval, NIPSCO/Golder will immediately proceed to the Selection of Remedy (SOR) process following completion of this ACM Addendum #3.

Preparation of an SOR report will be preceded by scheduling/holding a public meeting to present the results of the revised ACM. This meeting will be held at least 30 days prior to the final selection of a groundwater remedy. At present, NIPSCO believes an ACM-based public meeting can be held within the next 60-90 days, subject to personnel availability, logistical details, and input from IDEM.

Following a preliminary review by and based on feedback from conversations with United States Environmental Protection Agency (EPA) Headquarters CCR Rule staff, Golder prepared ACM Addendum #1 to the initial April 2019 ACM to provide further details of its evaluation of the potential corrective measures for the MCU. In accordance with EPA Headquarters staff observations and late 2020 informal discussions with EPA regarding NIPSCO ACM documents prepared at that time, ACM Addendum #1 and succeeding Addenda specifically focus on addressing the following requirements under 40 CFR §257.96(c)

> *"The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under §257.97 addressing at least the following:*
>
> *1) The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies including safety impacts, cross-media impacts, and control of exposure to any residual contamination;*
>
> *2) The time required to begin and complete the remedy;*

3) *The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).”*

Like the ACM and Addendum #1, ACM Addendum #2 addressed potential groundwater impacts beyond the identified Appendix IV constituent SSL, cobalt. ACM Addendum #2, which superseded and fully replaced ACM Addendum #1, also revised and updated information provided in the predecessor documents, and it incorporated an enhanced final cap design along with post-closure management requirements to supplement MCU source removal (i.e., impoundment closure-by-removal) in all corrective measure alternatives.

Evolution and revision of the enhanced cover system design reflected ongoing requests for additional information by and subsequent discussions with IDEM over the course of more than a year. Although a final closure design in accordance with IDEM requests was prepared and submitted in May 2021, IDEM provided further comments and requested additional information in March 2022. NIPSCO/Golder are currently working to address these requests. Thus, IDEM approval and public notification and request for comment on the draft Closure Application have not yet been issued.

Like the ACM and previous addenda, ACM Addendum #3 addresses groundwater remedial alternatives, consistent with the requirements of the assessment of corrective measures process as outlined in 40 CFR §257.96. Unlike the previous documents, however, ACM Addendum #3 focuses solely on cobalt. This focus is based on an evaluation of groundwater monitoring results from July 2016 to present that showed the following:

- Cobalt is the sole Appendix IV constituent detected in shallow groundwater at a statistically significant level (SSL)
- The Cobalt SSL was detected in a single shallow-screened monitoring well that is located immediately downgradient of the MCU
- Cobalt concentrations have been and are continuing to decline since the initial identification of cobalt at an SSL.

This progression of the ACM process, including revision of the most recent ACM document and preparation of this ACM Addendum #3, reflects the ongoing CCR Unit-specific state regulatory review and closure approval processes. Furthermore, this progression is consistent with EPA Headquarters’ staff observations and their subsequent discussions with NIPSCO regarding previously prepared ACM documents. The specific discussion during October 13 and November 24, 2020, conference calls included comments by several senior EPA representatives[1] that ACMs were “living documents” and thus subject to revisions in accordance with changes in conditions. As part of this progression, NIPSCO has revised the ACM, as appropriate, in response to site conditions, evolving state regulatory agency (i.e., IDEM) requests/requirements, and changing Federal (i.e., EPA) regulation and policy interpretations.

This Addendum #3, in combination with the remaining applicable sections of the ACM Report (Golder 2019) and Addendum #2 (Golder 2021), results in a process for NIPSCO to move forward towards the selection of a corrective measure that addresses cobalt impacts in groundwater. The following text provides an updated

[1] Senior EPA representatives on the October 13, 2020, conference call included Lydia Anderson, Frank Behan, Laurel Celeste, Kirsten Hillyer, Richard Huggins, Susan Mooney, and Jessica Schumacher. Senior EPA representatives on the November 24, 2020, conference call included Richard Huggins and Stacey Yonce.

summary of the Site background and contaminant plume conditions along with modifications to the identification and evaluation sections of the ACM.

## 2.0 BACKGROUND

NIPSCO owns and operates the RMSGS which, among other activities, manages CCR in surface impoundments subject to applicable requirements of 40 CFR Part 257 as amended (CCR Rule). Pursuant to 40 CFR §257.96(a), the MCU is subject to an ACM, the results of which were presented in the ACM Report and Addenda. ACM Addendum #3, Figures 2 through 6, show the monitoring well network, geologic cross sections, groundwater elevation contours and cobalt isoconcentration contour maps for the Site. Regional and Site Hydrogeology are summarized in the ACM and supported by mass and volume calculations, slug test data and calculations, and vertical gradient calculation included in Appendices A, B, and C, respectively.

NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. To meet the requirements of 40 CFR §257.97-98, NIPSCO plans to combine the following MCU closure activities in conjunction with additional groundwater corrective measures for cobalt to demonstrate achievement of applicable groundwater protection standards (GWPS):

- Removal of CCR source material from the MCU
- Construction and maintenance of a low permeability cap over residual materials in the MCU
- Long-term monitoring

These corrective measures are further described in ACM Addendum #3, Table 1.

In the 2019 ACM Report, Golder presented the analytical data for the MCU monitoring wells, identified general groundwater response actions (Table 3), presented an initial screening of corrective measure alternatives/process options for groundwater, and identified eight potential groundwater corrective measures and their key components for further consideration following closure of the MCU.

After preparation of the ACM Report and ACM Addendum #1, NIPSCO performed additional work with respect to future performance of the initially proposed closure approach and its possible impact on groundwater conditions. Based upon this assessment, NIPSCO determined that an enhanced combination soil/geomembrane cap along with a minor modification of the remaining in-place slurry wall, designed to alleviate potential groundwater level build up under the cap, would provide better long-term performance post-closure than either no cap or a soil-only cap. Consequently, NIPSCO proposed this alternative design to IDEM and prepared ACM Addendum #2. As referenced above and as of this writing, consideration of the alternative design remains under IDEM review.

Based on further review of groundwater data and recent EPA policy interpretations, Golder prepared Addendum #3, to modify the ACM to include an evaluation of groundwater remediation alternatives to address cobalt in groundwater.

Because of NIPSCO's decision and subsequent proposal to IDEM to construct a low permeability cap in conjunction with source removal during the closure process, ACM Alternative 2 – Capping with MNA was effectively removed from future consideration. Furthermore, other alternatives that did not previously include or consider the implications of constructing a low permeability cap immediately following source removal were likewise removed from future consideration while other alternatives were modified to reflect the inclusion of a low

permeability cap. The alternatives that were previously removed or modified in ACM Addenda #1 and #2 are listed below:

Alternatives Removed

- In situ Stabilization/Solidification (ISS) and MNA
- Capping, Pump-and-Treat and MNA
- ISS, Pump-and-Treat, and MNA

Alternatives Modified

- MNA
- Vertical Barrier/Hydraulic Controls and MNA
- Pump-and-Treat and MNA
- Vertical Barrier/Hydraulic Controls, Pump-and-Treat, and MNA

Based on the revised focus of Addendum #3 on the SSL exceedance of cobalt in a single shallow location, certain previously removed technologies and alternatives may now be feasible and will be revaluated. These alternatives include Vertical Barriers in the form of permeable reactive barriers and ISS with MNA as presented in the table below:

| Alternative | Status | Comments |
|---|---|---|
| Monitored Natural Attenuation (MNA) | Retained | MNA feasibility and appropriateness is validated by the Tier I-III evaluation and requires no modifications to the current closure strategy. |
| Capping and MNA | Removed | Capping is already included in the current closure strategy but remains under review by IDEM with no predictable approval status or timeframe. |
| Vertical Barrier/Hydraulic Controls and MNA | Retained/Modified | Hydraulic controls can be integrated into the current closure strategy with limited modifications to the cap. |
| In situ Stabilization/Solidification (ISS) and MNA | Reevaluated | ISS cannot be integrated into the current closure strategy without significant modifications and potentially severe damage to the cap. However, ISS may be an appropriate remedial alternative for the cobalt groundwater plume located downgradient of the MCU. |
| Pump-and-Treat and MNA | Retained/Modified | Pump and treat external to the current MCU footprint can be integrated into the current closure strategy with no impact to the cap. |

| Alternative | Status | Comments |
|---|---|---|
| Capping, Pump-and-Treat, and MNA | Removed | Capping is already included in the current closure strategy. |
| Vertical Barrier/Hydraulic Control, Pump-and-Treat, and MNA | Retained/Modified | Hydraulic controls and pump-and-treat external to the current MCU footprint can be integrated into the current closure strategy with limited modifications to the cap. |
| ISS, Pump-and-Treat, and MNA | Removed | ISS cannot be integrated into the current closure strategy without significant modifications and potentially severe damage to the cap. Furthermore, ISS and pump-and-treat would be incompatible technologies for treatment of the downgradient cobalt plume. |

# 3.0 CONTAMINANT PLUME CONDITIONS

Due to the required schedule for closure and EPA's recent interpretations of the timeline to select and implement a corrective remedy, the ACM is being revised to address Appendix IV constituents with SSL exceedances as described in Section 1. The only such constituent is cobalt, which has been found to exceed the SSL level of 6 micrograms per liter (μg/L) and the GWPS of 10 μg/l in one well, GAMW-08 located hydraulically downgradient and immediately to the north of the MCU.

In accordance with the requirement of 40 CFR 257.95(g)(1), the nature, mass, and extent of contamination must be characterized for the ACM. Groundwater samples have been collected at least bi-annually from GAMW-08 since July 2016. The analytical sampling results indicate cobalt concentrations ranging from 7.9 to 59 μg/L, with an average of 29 μg/L. The cobalt concentration detected during the most recent monitoring event in September 2021 was 15 μg/L (see Table 2) which exceeds the GWPS. However, cobalt concentrations in this well have reflected a generally decreasing trend since November 2016.

No other assessment monitoring wells adjacent to the MCU have been found to contain cobalt at an SSL above the GWPS. The maximum cobalt concentration detected in porewater samples collected from the MSRB portion of the MCU is 2.2 μg/L. An alternative source determination has not been made regarding the detections in GAMW-08; therefore, for the purposes of this ACM addendum the source of the contamination is assumed to be due to a release from the MCWB portion of the MCU, the porewater of which has not been sampled. Cobalt has not been detected in monitoring well GAMW-08B, which is co-located with GAMW-08 and screened from 27.5 to 37.5 feet below ground surface (ft bgs), compared to the screened interval of GAMW-08 which extends from 5 to 15 ft bgs.

The assumed extent of the plume potentially requiring treatment (i.e., cobalt concentrations exceeding the GWPS) is shown on Figure 6. The plume dimensions shown were developed by extrapolating cobalt concentrations between an assumed concentration of 20 μg/L at the downgradient end of the slurry wall and known concentrations at GAWM-08, cross-gradient wells GAMW-16R and -17, and downgradient wells GAMW-53, -54, and -55. Based on these extents and concentrations the mass of cobalt within the plume needing to be treated was calculated to be between 0.07 and 0.18 kilograms (see Appendix A for calculation).

# 4.0 IDENTIFICATION OF POTENTIAL CORRECTIVE MEASURES

## 4.1 Source Material

As discussed in the ACM Report and Addendum #2, NIPSCO plans to close the MCU in accordance with 40 CFR §257.102(c) and an approved IDEM Closure Application. NIPSCO's approach combines CCR source removal/capping and groundwater remediation, including addressing a single-location cobalt GWPS exceedance in accordance with recommendations of the ACM/SOR processes, and monitoring to demonstrate achievement of the IDEM-approved Closure Application requirements and applicable GWPS. The multi-part corrective action approach will be integrated, but it will also be sequenced to address both the requirements of 40 CFR §257.97-98 for cobalt exceedances of GWPS during the near-term and allow for monitoring of early-stage post-closure results and plume stability. This approach will facilitate optimization of subsequent groundwater monitoring steps following completion of the initial source removal and capping stages.

The first phase of the integrated CCR Unit closure approach is closure by removal/capping of the MCU. Following dewatering activities, the three impoundments will be excavated. In accordance with the Closure Application, excavations are being planned to remove CCR and non-CCR materials to the original design limits (sides and bottom) of the impoundments, leaving the slurry wall in-place. Satisfactory excavation will be confirmed by a visual determination that the CCR materials have been removed (Wood 2021).

Following completion of CCR excavation and visual verification of the source removal activities, a final low permeability cap will be installed. As proposed to IDEM, the final cap will consist of the following components presented in descending order from top to bottom (Wood 2021):

- Topsoil (6-inch)
- Cover soil (18-inch)
- Geocomposite drainage layer (GDL)
- 40-mil linear low-density polyethylene (LLDPE) geomembrane
- Subgrade fill.

During cap construction a hydraulically downgradient section of the slurry wall will be permanently removed down to the average elevation of the groundwater table to address the water buildup/overtopping possibility within the former impoundment. This action should reduce concerns regarding long-term cap performance and maintenance; however, it may result in periodic discharges from within the former impoundment of diluted water that has previously been in contact with CCR. Monitoring within and outside the capped former impoundment will inform NIPSCO with future water quality data, allowing review of closure remedy performance and identifying post-closure groundwater quality trends outside the former CCR Unit.

## 4.2 Groundwater Impacts

As noted above, ACM Addendum #3 focuses on addressing cobalt-impacted groundwater downgradient of the MCU. As such, those alternatives that are effective at remediating groundwater in the downgradient plumes will be evaluated further. These include alternatives that were previously considered and are still applicable (e.g., ISS), and alternatives that were not previously considered but are now applicable (e.g., passive reactive barriers). For clarification and to differentiate the ACM Addendum #3 alternatives from those presented and discussed in predecessor documents, the remaining alternatives are renumbered as follow:

- Alternative A – MNA
- Alternative B – Vertical Barrier/Hydraulic Controls and MNA
- Alternative C – Pump-and-Treat and MNA
- Alternative D – Vertical Barrier and MNA
- Alternative E – ISS and MNA

Initial corrective action measures screening results are presented in ACM Addendum #3 Table 4 and a summary of the retained groundwater corrective measure alternatives is shown in ACM Addendum #3 Table 5. The remedial components of the groundwater corrective measure alternatives following source removal and capping are described further in Section 5.

# 5.0 EVALUATION OF POTENTIAL GROUNDWATER CORRECTIVE MEASURES

## 5.1 Evaluation Criteria

In conformance with the applicable requirements of 40 CFR §257.96 and 40 CFR §257.97, Golder evaluated the effectiveness of each of the five remaining potential groundwater corrective measures originally identified in the ACM Report (Golder 2019) using the following criteria:

- **Performance** - Potential corrective measures were evaluated for their relative performance based on the magnitude of reduction of existing risks, ability to obtain the GWPS at the point of compliance (POC), the magnitude of residual risks in terms of likelihood of future releases due to remaining CCR following implementation of remedy, and the required type and degree of long-term management including monitoring, operation, and maintenance associated with the corrective measure.
- **Reliability** - Potential corrective measures were evaluated for their relative reliability based on the long-term reliability of engineering and institutional controls, potential need for the replacement of the remedy, extent to which containment practices will reduce further releases, and extent to which the treatment technologies may be used.
- **Ease of Implementation** - Potential corrective measures were evaluated based on their relative ease of implementation based on difficulty associated with construction of the technology, operational reliability of the technology(ies), coordination of regulatory approvals and permits from pertinent agencies, availability of necessary equipment and specialists, and availability capacity and location of needed treatment, storage, and disposal services.
- **Potential Impacts** - Potential corrective measures were evaluated based on their relative potential impacts based on safety impacts, cross-media impacts, and control of exposure. Exposure controls include short-term risks during implementation of a remedy and potential exposure to remaining wastes to the community or environment including potential threats associated with excavation, transportation, re-disposal of CCR, or contaminant.
- **Time Requirements** - Potential corrective measures were evaluated based on the time required to initiate, construct, and complete the remedy.

- **Institutional Requirements** - Potential corrective measures were evaluated based on their institutional requirements including local, state, and federal permit needs.

## 5.2 Evaluation Summaries

Relative to the above evaluation criteria, the following sections present brief summaries of the proposed groundwater corrective measure alternatives considered prior to and following source removal, associated dewatering, and capping. It should be noted that these closure-related actions are considered a part of all the remedial alternatives discussed in this section because source removal and dewatering will address and help control the presumed source of the release and reduce or eliminate further releases of cobalt (and any other CCR-related Appendix IV constituents) as required under 40 CFR 257.97(b)(3). In addition, the summaries highlight areas where a particular remedy may perform well or poorly relative to other alternatives. A summary of Golder's evaluation of the retained groundwater corrective measure alternatives is provided in ACM Addendum #3 Table 6.

### 5.2.1 Alternative A: Monitored Natural Attenuation

Golder evaluated MNA alone as a potential groundwater corrective measure for a number of CCR-related potential Site constituents of concern (COCs), including the Appendix IV SSL cobalt. The MNA Evaluation (Golder 2020) is presented in Appendix D. The results of the evaluation indicate that MNA is a technically feasible and appropriate corrective measure for groundwater at the Site based on the following factors:

- Attenuation is already occurring at the Site at a reasonable rate
- The dissolved plume is stable
- The aquifer has the long-term capacity to attenuate COCs
- Cobalt has been detected at only a single location immediately downgradient of the MCU and concentrations appear to be decreasing with time

Based on the results of the Tier I, II, and III MNA evaluations for the Site, Golder concluded that MNA is expected to provide good long-term performance at reducing cobalt concentrations through chemical (i.e., adsorption and co-precipitation) and physical processes (e.g., diffusion, dispersion). While MNA alone typically will not substantially affect groundwater concentrations in the short-term, Golder's review of cobalt concentrations since monitoring began in 2016 indicates the concentrations are currently decreasing.

**Linear Regression Analysis**

A linear regression analysis of the cobalt concentrations at GAMW-08 indicates that groundwater would attain the GWPS for cobalt (0.010 mg/l) by January 2022 without implementation of any active remedial technologies. Furthermore, if similar attenuation rates are assumed at the MCU boundary along with a starting cobalt concentration of 0.020 mg/l, groundwater will meet the GWPS at the downgradient side of the MCU in approximately 2 years.

The above cobalt concentration estimates are based on current conditions and do not take source removal and dewatering into account, which would likely further shorten these timeframes. While these timeframes are based on incomplete data and linear interpolation of existing data with a degree of variation, they do provide an order-of-magnitude estimate of the remediation timeline indicating a relatively short timeframe for MNA alone to remediate groundwater at the Site.

**MNA Evaluation**

For the MNA evaluation, Golder conducted a point decay evaluation at monitoring wells downgradient of the MCU. Based on the results of the evaluation, the maximum concentration of cobalt observed in downgradient wells over the period of monitoring would take approximately 39 years to attenuate to concentrations below the GWPS (Golder 2020). However, this estimate is based on a point decay constant calculated using the decrease in concentration between GAWM-08 and the next nearest downgradient well GAMW-52, which is located approximately 1,200 feet downgradient. Cobalt has not been detected in GAMW-52 so the point decay constant and subsequently the estimated time for the cobalt concentration to reach the GWPS was a conservative estimate. As discussed above, more recent data from GAMW-08 indicates that the rate of attenuation may be significantly higher than estimated.

For the evaluation, Golder also considered the following factors:

- The low groundwater flow velocities observed at the Site
- The distance from the MCU to the property boundary and lack of off-Site migration of groundwater impacts
- The lack of potable water supply wells at the Site in the vicinity of the MCU and the downgradient plume
- Planned institutional controls prohibiting use of groundwater from any impacted area at the Site for drinking water

Based on these other factors, MNA is expected to be protective of human health and reduce environmental degradation of groundwater containing cobalt that is not removed during closure.

Because there is an existing monitoring well network downgradient of the MCU, implementation of a supplemental MNA program is unlikely to require any component construction/installation apart from additional monitoring wells between GAMW-08 and GAMW-53, -54, and -55. Installation of such wells may be complicated by the presence of a complex subsurface utility network and surface infrastructure located hydraulically downgradient of and adjacent to the MCU. Therefore, MNA will be relatively easy to implement following regulatory approval and poses no short-term safety risks, but it may not be feasible to install new MNA performance monitoring wells at optimal locations (i.e., immediately downgradient of GAMW-08). Long-term operation and maintenance (O&M) will include routine semi-annual groundwater sampling and potentially periodic well redevelopment.

### 5.2.2 Alternative B: Vertical Barrier/Hydraulic Controls and MNA

For the Vertical Barrier/Hydraulic Control and MNA Alternative, hydraulic controls within the existing slurry wall would be added to the MNA alternative. The Vertical Barrier/Hydraulic Control and MNA alternative would be implemented to reduce or eliminate downgradient migration of potentially impacted groundwater by generating a hydraulic gradient inward toward the MCU. This alternative assumes that the existing slurry wall is intact, albeit slightly modified from the original design to address potential water buildup with the former impoundment cell, and that implementation of this alternative consists of installation and operation of a pump-and-treat system within the former impoundment areas as necessary to prevent potential over-topping of the modified slurry wall by water impacted above the GWPS due to groundwater recharge.

The Vertical Barrier/Hydraulic Control and MNA Alternative would have a similar effect as the MNA Alternative on groundwater downgradient of the closed MCU with the added benefit of active contaminant mass removal (to the extent such remains an issue of concern following closure by removal) and reduction of Appendix IV constituent

contaminated groundwater releases from the MCU. It would reduce or eliminate the volume of impacted groundwater potentially overtopping and/or passing through the existing or modified slurry wall(s), thus removing a potential residual source of contamination, and allowing for more efficient natural attenuation. This remedy would also result in removal of contaminant mass through groundwater extraction and treatment with an appropriate media such as cobalt-specific ion exchange resin or granular activated carbon (GAC) depending on the results of pilot treatment studies, which would reduce the potential for future releases of impacted groundwater if the integrity of the slurry wall is shown to be compromised.

Because there is an existing and functional slurry wall around the MCU, corrective measure implementation would include design, well installation, enclosure construction, and treatment system assembly/construction. Some treatment system components may require lead times prior to delivery; however, most components should be readily available. An amendment to the Site's National Pollutant Discharge Elimination System (NPDES) permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review.

Well installation would be complicated due to the geomembrane cap to be installed as part of the unit closure. Extraction wells would either need to be installed prior to cap placement and incorporated into the cap design, or the cap would need to be penetrated and repaired following well installation.

In the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged in the treatment system effluent. However, this is unlikely to occur as the treatment media vessel effluent will be monitored routinely and the system will be designed with a redundant "lag" vessel to treat any breakthrough contaminants in the lead vessel effluent until the lead vessel can be changed out.

The hydraulic control system will require a high level of periodic O&M compared to more passive alternatives (i.e., MNA, vertical barriers, ISS) as influent and effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, pH adjustment system, etc.) that are needed to keep the system operational. Most or all these components will also need replacement over the 30-year design lifetime of the system.

### 5.2.3 Alternative C: Pump-and-Treat and MNA

For the Pump-and-Treat and MNA Alternative, a groundwater pump-and-treat system would be designed and installed to capture contaminated groundwater present downgradient of the MCU and GAMW-08, to remove impacts from the environment and prevent downgradient off-Site migration. The captured groundwater would then be treated to reduce concentrations to an acceptable concentration and discharged to surface water. Portions of the plume downgradient of the extraction well capture zone would then be subject to MNA as a polishing step in the remedy process.

The Pump-and-Treat and MNA Alternative offers a higher level of short- term protection than vertical barrier/hydraulic control and vertical reactive barriers as it would be quicker and easier to implement due to the limited subsurface infrastructure required and does not need to be coordinated with the CCR Unit closure, though source removal and dewatering during closure are important measures related to controlling/eliminating the release. Contaminant mass removal through operation of the pump-and-treat system will reduce contaminant concentrations and thereby enhance natural attenuation downgradient of the capture zone.

Some treatment system components may require lead times prior to delivery, but most components should be readily available. An amendment to the Site's NPDES permit would likely be required to discharge treated water to an on-site stormwater pond, which could delay implementation while awaiting regulatory review. In the event of unidentified contaminant breakthrough, there is the potential for treated water containing unacceptable contaminant levels to be discharged in the treatment system effluent. However, this is unlikely to occur as the treatment media vessel effluent will be monitored routinely and the system will be designed with a redundant "lag" vessel to treat any breakthrough contaminants in the lead vessel effluent until the lead vessel can be changed out. The system will require a higher level of periodic O&M compared to vertical barrier and ISS as effluent samples will likely need to be collected monthly and there is significant potential for shut-downs due to the number of different components (filter vessels, ion-exchange columns, pH adjustment system, etc.) that are needed to keep the system operational. The O&M would be similar to the vertical barrier/hydraulic control alternative, though would likely be somewhat less onerous due to the need for fewer wells and a lower pumping rate to achieve capture compared to the pumping rate required to generate an inward gradient inside the closed impoundments. Most or all these components will also need replacement over the 30-year design lifetime of the system.

### 5.2.4 Alternative D: Vertical Barrier and MNA

The Vertical Barrier and MNA Alternative would include a funnel-and-gate permeable reactive barrier (PRB) using an appropriate treatment media such as mixed zero-valent iron (ZVI) and GAC, which has been shown to remove cobalt (Mueller et al. 2009), with MNA to further reduce concentrations of cobalt in any portion of the plume located downgradient of the PRB, and/or cobalt migrating downgradient of the PRB following breakthrough. This alternative would offer a high level of short-term protection as little to no contaminated media would be transported off-site, and long-term protection through the immobilization and subsequent removal (during media changeout) of cobalt-contaminated groundwater. This alternative would offer a similar level of contaminant mass removal to Alternatives B and C as all three alternatives include intercepting or capturing the plume followed by adsorption to a treatment media that can be removed and disposed of off-site. Implementation/installation of a PRB would be substantially more difficult due to the extent and depth of excavation required coupled with the high density of subsurface infrastructure downgradient of the MCU. Long-term O&M requirements consisting of routine monitoring and media changeouts would be less onerous than for the alternatives incorporating active groundwater extraction systems.

### 5.2.5 Alternative E: ISS and MNA

ISS could be used within the plume area to bind cobalt in a cementitious matrix and reduce its potential to leach into groundwater. MNA would be implemented to address any remaining contaminant mass that is not bound by the ISS process. ISS does not remove contaminant mass, but it does result in sequestration of contaminants from the environment, eliminating potential exposure pathways for human and ecological receptors.

The ISS program would include stabilizing the soil within the cobalt plume. Based on the lack of detections in GAWM-08B and the nearby deep monitoring wells (GAMW-16B and GAMW-17B), the plume appears to be limited vertically to the top 27.5 feet bgs, at most. ISS would be accomplished using a large-diameter (6- to 10-ft diameter) rotary auger capable of injecting slurry chemicals through the auger flight to mix the residual soil with a stabilizing agent. The stabilizing agent will be determined during a design-phase pilot study and will likely consist of a mixture of Portland cement, pozzolans, and/or bentonite. At each location within the plume, the auger would be advanced through the depth of the plume and rotated to thoroughly mix the soil within the auger diameter with the stabilizing agent, generating one "column" of stabilized soil. The auger will then be advanced to an adjacent

area and advanced such that it overlaps with the last column and there are no gaps between stabilized columns. This will continue until the entire plume area exceeding the GWPS has been mixed.

Short-term protection by ISS is low compared to other alternatives due to the high level of effort and materials required to implement and the associated traffic and construction safety issues associated with this technology. ISS offers good long-term protection through the isolation of contaminants from the environment and the geochemical conditions (pH 6.8 to 7.5) at the Site are favorable for the long-term lifetime of the stabilized material. However, due to the high density of subsurface utilities in the area north of the MCU, the ease of implementation for ISS is ranked lowest of the alternatives evaluated and would likely require substantial rerouting of buried piping currently in-service. ISS would also likely take the longest of the alternatives to implement apart from potentially the PRB portion of Alternative D.

### 5.2.6 Retained Alternatives

Based on the evaluations presented in the preceding sections, each alternative is considered feasible for the Site and fully consistent with the requirements of 40 CFR 257.98, and therefore, retained for further evaluation in the Selection of Remedy (SOR) process. The retained alternatives for the Selection of Remedy process are presented below:

- Alternative A - Monitored Natural Attenuation (MNA)
- Alternative B - Vertical Barrier/Hydraulic Controls and MNA
- Alternative C - Pump-and-Treat and MNA
- Alternative D - Vertical Barrier and MNA
- Alternative E – ISS and MNA

## 6.0 SUMMARY AND NEXT STEPS

This Addendum #3 supplements the ACM Report (Golder 2019) and replaces in full ACM Addenda #1 (Golder 2020) and #2 (Golder 2021) by providing additional details regarding the remaining five potential groundwater corrective measures originally identified in those reports and evaluating those corrective measures in accordance with the performance requirements identified in 40 CFR §257.96(c). It reflects NIPSCO's enhanced closure strategy, is consistent with ongoing discussions with IDEM in response to comments on the latest Closure Application, and considers recent EPA interpretations of ACM/SOR timing requirements. Addendum #3 is also consistent with EPA's earlier statements regarding ACMs as being living documents, and therefore subject to revision in accordance with changing conditions. A summary of Golder's evaluation of the five retained groundwater corrective measure alternatives is provided in Table 6.

In addition to updating the ACM to reflect the most recent discussions with IDEM and the revision/submission of the Closure Application for IDEM for review and approval, NIPSCO continues to conduct activities in accordance with the expectations of the ACM and SOR processes, including the following:

- Meeting with IDEM mid-April to discuss status and anticipated timing of the Closure Application approval.
- Preparation of bid documents (specifications and drawings) for closure of the MCU.

- Contractor procurement (including contractor pre-qualification, scheduling of site walks, scope of work question-and-answer, request for alternative approach(es), and establishment of a bid due date) to perform the source removal/capping phase of the corrective measures.
- Communications with vendors regarding water treatment technologies, equipment availability, and media costs/handling. This activity also informs and helps refine cost and schedule aspects of the SOR evaluation.
- Developing logistics and potential meeting dates for a public meeting in accordance with 40 CFR 257.96(e).

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**Table 1: Applicable Groundwater Cleanup Standards**
**CCR Unit Schahfer MSRB, MCWB, and DA**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL (mg/L) | GWPS (mg/L) | IDEM RCG (mg/L) |
|---|---|---|---|
| **Appendix III Constituents** | | | |
| Boron | - | NA | 4 |
| Calcium | - | NA | - |
| Chloride | - | NA | - |
| Fluoride | 4 | 4 | 0.8 |
| pH | - | NA | - |
| Sulfate | - | NA | - |
| Total Dissolved Solids | - | NA | - |
| **Appendix IV Constituents** | | | |
| Antimony | 0.006 | 0.006 | 0.006 |
| Arsenic | 0.01 | 0.078 | 0.01 |
| Barium | 2 | 2 | 2 |
| Beryllium | 0.004 | 0.004 | 0.004 |
| Cadmium | 0.005 | 0.005 | 0.005 |
| Chromium | 0.1 | 0.1 | 0.1 |
| **Cobalt[1]** | **0.006[2]** | **0.01** | **0.006** |
| Fluoride | 4 | 4 | 0.8 |
| Lead[1] | 0.015[2] | 0.0007 | 0.015 |
| Lithium[1] | 0.04[2] | 0.0082 | 0.04 |
| Mercury | 0.002 | 0.002 | 0.002 |
| Molybdenum[1] | 0.1[2] | 0.036 | 0.1 |
| Radium 226+228 | 5 | 5 | - |
| Selenium | 0.05 | 0.05 | 0.05 |
| Thallium | 0.002 | 0.002 | 0.002 |

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

**Notes:**
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard calculated August 23 2018 Guidance- Table A-6 2018 Revision
mg/L= milligrams per liter
NA= not applicable; GWPS are calculated for Appendix IV constituents only
1) These four constituents do not have an established MCL. Prior to the Phase 1 Part 1 amendment, effective August 29, 2018, the GWPS was calculated based on background concentrations according to the CCR Final Rule.

2) The Phase 1 Part 1 amended health-based standard, effective August 29, 2018 pursuant to 40 CFR §257.95(h)(2)

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW04 | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-12 | 2016-09-08 | 2016-11-09 | 2017-01-10 | | 2017-03-01 | 2017-04-26 | 2017-06-28 | 2017-08-22 | 2017-10-04 | 2018-03-13 | 2018-03-14 | 2018-04-20 | | 2018-10-25 | 2019-04-23 | 2019-11-07 | 2020-05-13 | | 2020-10-22 | 2021-0 -15 | 2021-09-23 | 2021-09-23 | |
| | | | | N | N | N | FD | N | N | N | N | N | N | FD | N | FD | N | N | N | N | FD | N | N | N | FD | N | |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | .48 | 1.4 | 2.4 O | 1.1 | 1 | 1.2 | 0.74 | 0.92 | 1.2 | 0.54 | | | 0.74 | 0.72 | 0.78 | 0.74 | 1.3 | 0 66 | 0.64 | 0. | 1.1 | 0.36 | 0 35 | | |
| Calcium | | | mg/L | 10 | 230 | 300 O | 270 | 240 | 230 | 220 | 200 | 200 | 140 | | | 140 | 140 | 210 | 130 | 190 | 115 | 112 | 90.3 | 178 | 108 | 107 | | |
| Chlor de | | | mg/L | 2.2 | 27 | 69 O | 13 | 14 | 13 | .4 | 12 | 13 | 4.5 | | | 3.7 J | 4.4 | 10 | 3.7 | 9.5 | 2 | 2 | 9 | 6.2 | 3.7 | 3 6 | | |
| Fluor de | 4 | 4 | mg/L | .92 J | 0 2 J | 10 UO | 0.19 J | 0.17 J | 5 U | 5 U | 0 19 J | 0.21 J | 0.24 J | 0.15 J | 5 U | 5 U | 0.17 J- | 0.26 | 0.16 J | 0.23 | 0.15 | 0.15 | 0 59 | 0.2 | 0.35 | 0 35 | | |
| pH | | | SU | 7.22 | 6 83 | 6.75 | | 6.93 | 7.01 | 6.76 | 6 88 | 7.21 | 7.28 | | 6.95 | | 7.2 | 6.39 | 7 | 7.14 | | 7.42 | 7.79 | 7.26 | | 7 | | |
| Sulfate | | | mg/L | 40 J- | 460 | 480 O | 460 | 470 | 390 | 70 | 370 | 440 | 250 | | | 220 | 210 | 530 | 260 | 490 | 136 | 139 | 82 1 | 375 | 116 | 121 | | |
| Total D ssolved Sol ds | | | mg/L | 20 | 990 | 1400 O | 1000 | 1000 | 890 | 870 | 880 | 920 | 610 | | | 580 J | 580 | 980 | 600 | 900 | 411 | 419 | 299 | 726 | 381 | 380 | | |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 002 U | 0 00027 JO | 0.002 U | 0.00057 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0 002 U | | | 0.002 U | 0.00065 J | 0.00092 J | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | |
| Arsenic | 0 01 | 0.01 | mg/L | .0059 | 0 013 | 0 0052 O | 0 0058 | 0.0072 | 0.005 U | 0.0099 | 0 012 | 0.012 | | 0.004 J | 0 0054 | | | 0.014 | 0.0023 J | 0.0018 J | 0 002 | 0.002 | 0 0055 | 0.0019 | 0.00 1 | 0 0036 | | |
| Barium | 2 | 2 | mg/L | .041 | 0 077 | 0.11 O | 0.095 | 0.079 | 0.089 | 0.069 | 0 084 | 0.09 | | 0.11 | 0 077 | | | 0.074 | 0.068 | 0.066 | 0 076 | 0.077 | 0 05 | 0.079 | 0.057 | 0 056 | | |
| Bery lium | 0 004 | 0.004 | mg/L | .00027 J | 0 001 U | 0 001 UO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.00048 J | 0.00053 J | 0.001 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0 001 U | 0 001 UO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0 00036 JO | 0.00036 J | 0.0052 JO | 0.002 U | .002 U | 0 002 U | 0.002 U | | 0.0011 J | 0 0012 J | | | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | | |
| Coba t | | 0.006 | mg/L | .001 U | 0 00031 J | 0 00064 JO | 0.0061 | 0.0058 | 0.0038 | 0.0049 | 0 003 | 0.0023 | | 0.0028 | 0 0031 | | | 0.0026 | 0.0011 | 0.00043 J | 0 001 U | 0.001 U | 0 001 U | 0.0016 | 0.001 U | 0 001 U | | |
| Fluor de | 4 | 4 | mg/L | .92 J | 0 2 J | 10 UO | 0.19 J | 0.17 J | 5 U | 5 U | 0 19 J | 0.21 J | 0.24 J | 0.15 J | 5 U | 5 U | 0.17 J- | 0.26 | 0.16 J | 0.23 | 0.15 | 0.15 | 0 59 | 0.2 | 0.35 | 0 35 | | |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0 001 UO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | |
| Lithium | | 0.04 | mg/L | .0018 J | 0 008 U | 0 008 UO | 0.0021 J | 0.0023 J | 0.0033 J | 0.0033 J | 0.0062 J | 0.0062 J | | 0.008 U | 0 008 U | | | 0.0023 J | 0.0045 J | 0.0028 J | 0 008 U | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0 008 U | | |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0 0002 UO | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | 0 0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | |
| Molybdenum | | 0.1 | mg/L | .0075 J | 0 023 | 0 073 O | 0.037 | 0.038 | 0.034 | 0.016 | 0 02 | 0.034 | | 0.0048 J | 0 024 | | | 0.039 | 0.024 | 0.055 | 0 022 | 0.022 | 0 01 | 0.066 | 0.015 | 0 016 | | |
| Radium 226 228 | 5 | | pCi/L | U | 0 583 | 0 697 O | 0.804 | 0.515 U | 0.362 U | 0.379 U | 0 364 U | 0.352 U | | 1.35 J | 0 778 J | | | 0.473 | 0.591 | | 1.7 U | 1.62 U | | 0.659 U | | | | |
| Selenium | 0.05 | 0.05 | mg/L | .005 U | 0 005 U | 0 00064 JO | 0.0017 J | 0.0021 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.001 J | 0 001 J | | | 0.005 U | 0.0013 J | 0.0052 | 0 001 U | 0.001 U | 0 001 U | 0.0033 | 0.001 U | 0 001 U | | |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0 001 UO | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .09 | 0 58 | 0.37 | | 1.82 | 1.47 | 0.12 | 0 3 | 0.52 | 0.09 | | 0 66 | | 2.3 | 0.15 | 7.08 | 2.55 | | 1.32 | 0 37 | 1.71 | | 0 31 | | |
| Ox dation Reduct on Potential | | | m llivolts | 9 6 | -24 | -6.9 | | -31.7 | 14 | -57 8 | -45 | -27 | -105 8 | | -181.8 | | -81.2 | -58.1 | 19 | -60.7 | | -28.6 | -7 | -29 | | 0.1 9 | | |
| pH | | | SU | 7.22 | 6 83 | 6.75 | | 6.93 | 7.01 | 6.76 | 6 88 | 7.21 | 7.28 | | 6.95 | | 7.2 | 6.39 | 7 | 7.14 | | 7.42 | 7.79 | 7.26 | | 7. | | |
| Specif c Conductivity | | | uS/cm | 95 | 1345 | 1681 | | 1109 | 910 | 137 | 911 | 1153 | 813 | | 562 | | 770 | 1311 | 549 | 866 | | 681 | 521 | 950 | | 595 | | |
| Temperature | | | deg C | 3 | 17.3 | 16.3 | | 10.5 | 8.05 | 0.2 | 13.1 | 15.9 | 16.1 | | 7 55 | | 3.5 | 15 5 | 4.2 | 13.2 | | 9.8 | 16.2 | 9.2 | | 15 9 | | |
| Turbidity | | | NTU | .04 | 1.48 | 2 21 | | 2.28 | 4.26 | 4.04 | 4 88 | 1.65 | 0.51 | | 4.92 | | 3.12 | 1.92 | 4.48 | 1.38 | | 3.51 | 1 9 | .67 | | 7 06 | | |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Table 2: Analytical Results for 2021 Promissory Wells
NIPSCO Rolls M. Schahfer Generating Station
Wheatfield, Indiana

| Analyte | MCL | IDEM RCG | Unit | GMW07 | | | | | | | | | | | | | | GMW07B | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-10-24 | 2019-05-06 | 2019-10-30 | 2020-05-05 | 2020-10-28 | 2021-04-28 | 2021-10-26 | 2018-10-24 | 2019-05-06 | 2019-10-30 | 2020-05-05 | 2020-10-28 | 2021-04-28 | 2021-10-26 | 2018-10-24 | 2019-05-06 | 2019-10-30 | 2020-05-05 | 2020-10-28 | 2021-04-28 | 2021-10-26 | 2018-10-24 | 2019-05-06 | 2019-10-30 | 2020-05-05 | 2020-10-28 | 2021-04-28 | 2021-10-26 |
| | | | | N | N | N | N | N | N | N | FD | N | FD | N | FD | N | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 1.2 | 1 | 0.91 | 0.9 J | 1 | 0.88 | 0.87 | 0.88 | 0.87 J | 0.72 | | 1.2 | 1.2 | 0.93 | 0.95 | 0.87 | 0.87 | 1.1 | 0.81 | 0.91 | 0.89 | 0.89 | 38 | 33 | 38 | 15 | 11.1 | 6.3 | 6.9 | 9.5 |
| Calcium | | | mg/L | 570 | 590 | 580 | 520 | 570 | 560 | 550 | 560 | 550 | | 550 | 590 | 580 | 556 | 515 | 513 | 106 | 242 | 212 | 570 | 490 | 480 | 380 | 405 | 370 | 262 | 327 | 273 |
| Chloride | | | mg/L | 6.8 | 6.6 | 5.8 | 6 | 7.6 | 7.8 | 8.1 | 8.1 | 8.1 | | 8.1 | 8.1 | 8.5 | 8.5 | 8.8 | 8.3 | 12.3 | 11.7 | 11.9 | 12 | 10 U | 950 | 170 | 130 | 110 | 91 | 58 | 50.5 |
| Fluoride | 4 | 4 | mg/L | 0.23 J+ | 0.21 J | 0.16 J | 0.15 J | 0.18 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 0.17 J | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| pH | | | SU | 7.63 | 7.27 | 7.91 | 8.13 | 7.1 | 7.12 | 6.97 | 7.2 | | 7.2 | 7.25 | 7.32 | 7.31 | 7.2 | 7.41 | 7.2 | 7.3 | 6.91 | 7.14 | 7.14 | 6.28 | 6.78 | 7.58 | 7.15 | 7.72 | 7.28 | 7.44 | 7.56 |
| Sulfate | | | mg/L | 1100 J+ | 1100 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1200 | 1900 | 2500 | 2400 | 2400 | 2200 | 1900 | 1900 |
| Total Dissolved Solids | | | mg/L | 2700 | 2800 | 2800 | 2700 | 2700 | 2800 | 2800 | 2800 | 2800 | 2800 | 2700 | 2800 | 2800 | 2800 | 2800 | 2800 | 2800 | 2800 | 2800 | 2800 | 2800 | 4200 | 4600 | 4600 | 4300 | 4200 | 3940 | 3700 | 3940 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.000952 J | 0.00019 J | 0.000953 J | 0.00238 J | 0.002 U | 0.002 U | 0.002 U | | | | 0.002 U | | | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.00313 J | 0.00126 J | 0.00191 J | 0.00201 J | 0.0026 U | 0.0026 U | 0.0026 U | | | | 0.0026 U | | | 0.0026 U | 0.00154 J | 0.0021 J | 0.0026 U | 0.0026 U | 0.0026 U | 0.0026 U | 0.0026 U | | 0.00264 J | 0.0015 J | 0.00191 J | 0.00121 J | 0.00161 J | 0.0025 | 0.0022 |
| Barium | 2 | 2 | mg/L | 0.055 | 0.053 | 0.056 | 0.047 | 0.05 | 0.05 | 0.056 | 0.055 | | | 0.056 | | | 0.054 | 0.051 | 0.045 | 0.04 | 0.047 | 0.048 | 0.049 | 0.049 | | 0.072 | 0.061 | 0.065 | 0.045 | 0.048 | 0.038 | 0.041 | 0.037 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.00013 J | 0.00012 J | 0.00015 J | 0.00017 J | 0.0002 U | 0.0002 U | 0.0002 U | | | | 0.0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0001 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.00022 U | 0.0002 U | 0.0002 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | | | | 0.0001 U | | | 0.00014 J | 0.001 U | 0.0001 U | 0.00021 J | 0.00022 J | 0.00021 J | 0.00022 J | 0.00019 J | | 0.001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.00021 J | 0.00029 J | 0.00027 J | 0.00026 J |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.0005 J | 0.0026 J | 0.002 U | 0.002 U | 0.002 U | | | | 0.002 U | | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | | 0.006 | mg/L | 0.0009 | 0.0007 | 0.0008 | 0.0008 | 0.0004 | 0.0005 | 0.001 | | | | 0.0006 | | | 0.001 | 0.0007 | 0.0006 | 0.0003 | 0.0004 | 0.0004 | 0.0004 | 0.0005 | | 0.0007 J | 0.001 U | 0.0003 U | 0.0003 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U |
| Fluoride | 4 | 4 | mg/L | 0.23 J+ | 0.21 J | 0.83 | 0.82 J | 0.003 | 0.75 J | 0.79 J | 0.8 J | 0.8 J | 0.58 J | 0.77 J | 0.73 | 0.87 | 0.88 | 0.67 | 0.64 | 0.88 | 0.86 | 0.86 | 0.89 | 10 U | 1.3 | 1.5 | 1.2 | 1.2 | 1.2 | 0.79 | 0.95 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | 0.00913 J | 0.008 U | 0.008 U | 0.0023 J | 0.0031 J | 0.00411 J | 0.00273 J | 0.0038 J | 0.0038 J | 0.00251 J | 0.0055 J | 0.00411 J | 0.0033 J | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.0089 J | 0.0019 J | 0.0045 J | 0.00973 J | 0.0035 J | 0.008 U | 0.008 U | 0.008 U | 0.013 |
| Mercury | 0.0002 | 0.002 | mg/L | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U |
| Molybdenum | | 0.2 | mg/L | 0.00851 J | 0.00284 J | 0.00852 J | 0.01 U | 0.01 U | 0.00283 J | 0.00383 J | 0.0054 J | | 0.00256 J | | 0.00282 J | 0.00271 J | 0.00403 J | 0.00373 J | 0.0035 J | 0.0084 | 0.0078 | 0.01 U | 0.01 U | 0.015 | 0.012 | 0.0025 | 0.026 | 0.0126 | 0.038 | 0.028 | 0.035 |
| Selenium (2m a SW) | 0.05 | | mg/L | 0.58 | 0.56 | 0.545 | 0.47 J1 | 0.42 J1 | 0.51 J1 | 0.49 | 0.505 | | | 0.492 J+ | | | 0.503 J+ | 0.511 | | 0.64 | 0.39 J1 | | 1.29 J1 | | | 0.61 | 1.6 J+ | 2.3 | | 1.59 J1 | | 2.16 | |
| Selenium | 0.05 | 0.05 | mg/L | 0.005 U | 0.005 U | 0.0023 J | 0.005 J | 0.005 U | 0.005 | 0.005 | 0.005 | | | 0.0038 J | | | 0.0016 J | 0.00452 J | 0.0049 J | 0.0015 | 0.0018 J | 0.0015 J | 0.0054 J | 0.0044 J | | 0.0012 J | 0.0062 J | 0.005 U | 0.0025 U | 0.001 U | 0.00111 J | 0.00171 J | 0.001 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.00113 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.002 U | | | 0.001 U | | | 0.00124 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.45 | 1.31 | 0.58 | 0.53 | 0.57 | 0.58 | 0.64 | 0.48 | 0.6 | | 0.67 | 0.56 | 0.61 | 0.49 | | | 0.34 | 0.47 | 0.19 | | 0.25 | 0.16 | 0.67 | 0.19 | 0.2 | 0.5 | 0.18 | 0.23 | 0.26 |
| Oxidation Reduction Potential | | | millivolts | 111.2 | 61.2 | 6.7 | 71.3 | 45.5 | 75.9 | 79.1 | 85 | | 93.1 | 55 | 98.2 | 233.8 | 133 | 151.8 | | 115.2 | 209.4 | 56.6 | | 91 | 107.6 | 235.2 | 51.9 | 156.2 | 128.7 | 73.9 | 124.1 | 0.374 |
| pH | | | SU | 7.63 | 7.27 | 7.91 | 8.13 | 7.1 | 7.12 | 6.97 | 7.2 | | 7.2 | 7.25 | 7.32 | 7.31 | 7.2 | 7.41 | 7.2 | 7.3 | 6.91 | 7.14 | 7.14 | 6.28 | 6.78 | 7.58 | 7.15 | 7.72 | 7.28 | 7.44 | 7.56 |
| Specific Conductivity | | | uS/cm | 3666 | 3603 | 3698 | 3616 | 3620 | 3737 | 3737 | 3743 | 3743 | 3743 | 3615 | 3768 | 3764 | 3748 | 3743 | 3743 | 3743 | 3743 | 3743 | 3743 | 3743 | 5578 | 6132 | 6357 | 5856 | 5722 | 5566 | 4878 | 5224 |
| Temperature | | | deg C | 15.4 | 13.42 | 10.7 | 12.9 | 10.83 | 12.4 | 14.6 | 15.2 | | 13.2 | 10 | 10 | 13.05 | 10.7 | 10.2 | | 14.2 | 10.2 | 11.05 | | 11 | 13.03 | 12.89 | 12.4 | 13.9 | 12.7 | 10.2 | 11.2 | 11.7 |
| Turbidity | | | NTU | 3.8 | 4.51 | 1.36 | 8.2 | 1.76 | 2.7 | 2.87 | 2.9 | | 10.45 | 7.5 | 1.72 | 1.26 | 0.72 | 1.58 | | 5.3 | 1.34 | 1.14 | | 2.65 | 0.38 | 3.84 | 5.89 | 3.11 | 3.48 | 1.02 | 2.81 | 1.04 |

Notes:
IDEM RCG – Indiana Department of Environmental Management Remediation Closure Guidance Table A-6 Screening Levels - 2021 Revision
MCL – Maximum Contaminant Level
mg/L – milligrams per liter
SU – standard units
pCi/L – picocuries per liter
uS/cm – microSiemens per centimeter
deg C – degrees Celsius
NTU – Nephelometric Turbidity Units
"U" – Indicates the result was not detected above the method detection limit (MDL) for the sample, the quantitation limit (QL) is provided
"J" – Indicates the result is estimated.
"J1" – Indicates the result is estimated and may be biased.
"J+" – Indicates the result is estimated and may be biased high.
"J-" – Indicates the result is estimated and may be biased low.
"FD" – Indicates the duplicate sample result was used for the MDL, the estimated DL is provided
"D" – Indicates the result was identified as an outlier and removed from the statistical

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW08 | | | | | | | | | | | | | | | | | | GAMW-08B | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-04 | 2018-03-14 | 2018-04-23 | 2018-10-26 | 2019-05-08 | 2019-11-07 | 2020-04-24 | 2020-10-28 | 2021-0 -22 | 2021-09-2 | 2018-09-0 | 2018-10-24 | 2019-05-03 | 2019-11-07 | 020-04-2 | 2020-10-23 | 2021-0 -22 | 2021-09-2 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | .5 | 3.9 | 3 2 | 3.4 | 3.3 | 3.2 | 2.9 | 2.2 | 3.7 | | 2.4 | 1.8 | 1.4 | 2.5 | 3 | 0 52 | 0.89 | 1.1 | 18 | 15 | 14 | 13 | 20.4 | 7 | 7 | 8. |
| Calcium | | | mg/L | 10 | 310 | 300 | 260 | 270 | 310 | 340 | 270 | 290 | | 360 | 230 | 250 | 280 | 309 | 168 | 266 | 260 | 380 | 370 | 350 | 340 | 355 | 203 | 98 | 235 |
| Chlor de | | | mg/L | 88 | 71 | 89 | 99 | 110 | 86 | 83 | 39 | 87 | | 64 | 56 | 49 | 66 | 67 | 26. | 50 | 1 9 | 240 | 180 | 160 | 180 | 220 | 13 | 78 | 179 |
| Fluor de | 4 | 4 | mg/L | J | 1 2 J | 0.73 J | 0.87 J | 0.94 J | 0.92 J | 1 3 J | 2 J | 0.68 J | 1.2 J | 1 3 J- | 1.6 | 2.2 | 1.9 | 1.1 J- | 0 71 | 0.97 | 0. | 1 6 J | 1 5 | 1.9 | 1.7 | 1.5 J- | 0.93 | .9 | 0 73 |
| pH | | | SU | 6.92 | 7 03 | 6 85 | 7.02 | 7.09 | 6.93 | 7 | 7.27 | 6.89 | 7.41 | 7.41 | 6.99 | 7.37 | 7.5 | 7.35 | 6 87 | 7.0 | 7.0 | 7 7 | 7.45 | 7 57 | 7.85 | 7.89 | 7.95 | 9 | 7. |
| Sulfate | | | mg/L | 770 J- | 690 | 680 | 610 | 630 | 770 | 800 | 640 | 670 | | 800 | 460 | 540 | 670 | 719 | 229 | 77 | 8 1 | 1500 | 1500 | 1400 | 1300 | 1280 | 769 | 51 | 1060 |
| Total Dissolved Sol ds | | | mg/L | 600 | 1500 | 1600 | 1300 | 1400 | 1700 | 2000 | 1400 | 1500 | | 1700 | 1100 | 1300 | 1300 | 1550 | 636 | 1120 | 2380 | 1900 J | 2300 | 2300 | 2200 | 2560 | 1250 | 620 | 20 0 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .00073 J | 0 00069 J | 0 0014 J | 0.00041 J | 0.00043 J | 0.002 U | 0 00059 J | 0.00075 J | | 0.002 U | | 0.00082 J | 0.00076 J | 0.00077 J | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 002 U | 0 002 U | 0 002 U | 0.002 U | 0.001 U | 0.001 U | .001 U | 0 001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .0018 J | 0 0019 J | 0 0018 J | 0.0027 J | 0.0016 J | 0.0031 J | 0 0027 J | 0.0023 J | | 0.005 U | | 0.0011 J | 0.0015 J | 0.0016 J | 0.0012 | 0 001 U | 0.001 U | 0.0013 | 0 005 U | 0 005 U | 0 005 U | 0.005 U | 0.001 U | 0.001 U | .001 U | 0 001 U |
| Barium | 2 | 2 | mg/L | .068 | 0 065 | 0 065 | 0.05 | 0.055 | 0.064 | 0 074 | 0.077 | | 0.066 | 0 069 | 0.053 | 0.058 | 0.066 | 0.061 | 0 056 | 0.07 | 0.076 | 0 042 | 0 03 | 0 025 | 0.023 | 0.028 | 0.031 | .039 | 0 0 6 |
| Bery lium | 0 004 | 0.004 | mg/L | .00017 J | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.0004 J | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | .0002 U | 0 0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | 7.4E-05 J | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.00037 J | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.00022 | 0 001 U | 0 001 U | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | .0002 U | 0 0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0 002 U | 0.00029 J | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | .002 U | 0 002 U |
| Coba t | | 0.006 | mg/L | .036 | 0 034 | 0 059 | 0.047 | 0.05 | 0.037 | 0 047 | 0.02 | | 0.022 | 0 027 | 0.011 | 0.0079 | 0.011 | 0.022 | 0 037 | 0.017 | 0.015 | 0 00066 J | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | .001 U | 0 001 U |
| Fluor de | 4 | 4 | mg/L | J | 1 2 J | 0.73 J | 0.87 J | 0.94 J | 0.92 J | 1 3 J | 2 J | 0.68 J | 1.2 J | 1 3 J- | 1.6 | 2.2 | 1.9 | 1.1 J- | 0 71 | 0.97 | 0. | 1 6 J | 1 5 | 1.9 | 1.7 | 1.5 J- | 0.93 | .9 | 0 73 |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | .001 U | 0 001 U |
| Lithium | | 0.04 | mg/L | .0098 | 0 012 | 0 009 | 0.0098 | 0.0093 | 0.012 | 0 011 | 0.012 | | 0.0089 | 0 009 | 0.011 | 0.015 | 0.0091 | 0.0087 | 0 008 U | 0.012 | 0.015 | 0 0098 | 0 0073 J | 0 0063 J | 0.0058 J | 0.008 U | 0.008 U | .012 | 0 01 |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | .0002 U | 0 0002 U |
| Molybdenum | | 0.1 | mg/L | .034 | 0 036 | 0 024 | 0.02 | 0.019 | 0.038 | 0 049 | 0.083 | | 0.058 | 0 058 | 0.059 | 0.08 | 0.068 | 0.048 | 0 013 | 0.03 | 0.0 3 | 0 037 | 0 039 | 0 057 | 0.044 | 0.05 | 0.0096 | .011 | 0 011 |
| Radium 226 228 | 5 | | pCi/L | .07 | 1 08 | 1 09 | 0.581 | 0.777 | 0.632 | 1 11 | 0.762 | | 1.13 J | 0 99 | 1 J | 0.473 | | 1.25 U | | 1.57 | | 1.67 J | 1 02 J | 0 704 | | 1.67 U | | .53 | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0 0065 | 0 0033 J | 0.0014 J | 0.0032 J | 0.011 | 0 0088 | 0.0081 | | 0.024 | 0 022 | 0.0021 J | 0.016 | 0.0036 J | 0.0062 | 0 0011 | 0.01 | 0.005 | 0 0014 J | 0 005 U | 0 005 U | 0.005 U | 0.001 U | 0.001 U | .001 U | 0 001 U |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.00045 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | .001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .9 | 0 38 | 1 62 | 1.27 | 0.96 | 0.63 | 1.96 | 0.93 | 0.21 | 0.97 | 5 09 | 0.21 | 0.44 | 4.2 | 0.34 | 0. | 1 | 0.35 | 0.42 | 0.12 | 0 13 | 2.61 | 0.12 | 0.33 | .29 | 0 27 |
| Ox dation Reduct on Potential | | | millivolts | 59.7 | 64.6 | -8 | 58.4 | 49.9 | 60.4 | 242 5 | 61.9 | -15.9 | 110.1 | -106.4 | 27.7 | 62 2 | 44.1 | 52.5 | 300 | 22 | 19.3 | -185.5 | -67 | 7.9 | -67 | -142 2 | -51 2 | 120.1 | 0 218 |
| pH | | | SU | 6.92 | 7 03 | 6 85 | 7.02 | 7.09 | 6.93 | 7 | 7.27 | 6.89 | 7.41 | 7.41 | 6.99 | 7.37 | 7.5 | 7.35 | 6 87 | 7.0 | 7.0 | 7.7 | 7.45 | 7 57 | 7.85 | 7.89 | 7.95 | 9 | 7. |
| Specif c Conductivity | | | uS/cm | 925 | 1807 | 1664 | 1517 | 1494 | 2098 | 1834 | 1713 | 1840 | 1121 | 1732 | 1440 | 1102 | 1322 | 2009 | 10 0 | 1 32 | 167 2 | 2538 | 2375 | 2190 | 1896 | 3391 | 1917 | 151 | 286.3 |
| Temperature | | | deg C | 5.5 | 18.78 | 17.75 | 12 2 | 10 06 | 11.1 | 15.8 | 18.5 | 18.3 | 9.6 | 10.2 | 17.2 | 11 | 10.84 | 10.5 | 16.3 | 11.2 | 18.8 | 14.6 | 14.5 | 12.8 | 8.05 | 13 | 1 | 3 | 15 2 |
| Turbidity | | | NTU | 2.3 | 3 22 | 0 58 | 1.26 | 1.56 | 1.1 | 2.41 | 0.68 | 4.38 | 1.11 | 1.54 | 1.4 | 1.81 | 0.31 | 2.5 | 2.39 | 1.99 | 1. 8 | 3.4 | 1.63 | 1 72 | 2.89 | 2.91 | 3.85 | .78 | 3 9 |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW09 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | | 2017-04-26 | | 2017-06-28 | 2017-08-23 | 2017-10-03 | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-05-02 | | 2019-11-07 | 2020-04-24 | 2020-10-23 | 2021-0 -28 | 2021-09-23 |
| | | | | N | N | N | N | FD | N | FD | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | _7 | 4.7 | 7 3 | 5.3 | 7.7 | 7.6 | 5.9 | 6.1 | 4.9 | 7.9 | 7 3 | | 4.9 | 6.3 | 3 | 3 | 2.7 | 3 3 | 3.7 | 3 5 | 3.8 |
| Calcium | | | mg/L | 20 | 240 | 210 | 210 | 200 | 200 | 220 | 240 | 270 | 280 | 220 | | 220 | 220 | 200 | 200 | 150 | 178 | 192 | 168 | 227 |
| Chlor de | | | mg/L | 63 | 55 | 58 | 58 | 75 | 73 | 71 | 67 | 53 | 39 | 64 | | 58 | 82 | 46 | 46 | 39 | 54.4 | 59.8 | 1.6 | 5 .7 |
| Fluor de | 4 | 4 | mg/L | _15 J | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0.16 J | 0.13 J | 0.18 J | 2 JO | 0 21 J | 5 U | 0.26 J- | 0.28 | 0 27 | 0 27 | 0.33 | 0 3 J- | 0 31 | 0 26 | 0.3 |
| pH | | | SU | 7.27 | 7 25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7 31 | 7 3 | 7.28 | 6.87 | 6.88 | | 7.1 | 7.06 | 7.15 | 7 92 | 8. 8 O | 7.51 |
| Sulfate | | | mg/L | 910 J- | 570 | 360 | 500 | 440 | 420 | 460 | 460 | 600 | 740 | 540 | | 510 | 510 J- | 530 | 530 | 380 | 390 | 397 | 18 | 509 |
| Total Dissolved Sol ds | | | mg/L | 500 | 1100 | 880 | 980 | 1000 | 990 | 1000 | 960 | 1300 | 1400 | 1100 | | 930 | 1100 | 970 | 980 | 770 | 772 | 796 | 659 | 10 0 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | _002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U |
| Arsenic | 0 01 | 0.01 | mg/L | _0015 J | 0 0013 J | 0 00076 J | 0.0031 J | 0.005 U | 0.005 U | 0.0028 J | 0.0029 J | 0.002 J | 0 0027 J | | 0.005 U | | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U |
| Barium | 2 | 2 | mg/L | _059 | 0 043 | 0 036 | 0.039 | 0.035 | 0.037 | 0.039 | 0.042 | 0.047 | 0 054 | | 0.041 | 0.039 | 0.039 | 0 041 | 0.041 | 0.036 | 0 032 | 0 0 6 | 0 037 | 0.053 |
| Bery lium | 0 004 | 0.004 | mg/L | _00012 J | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.00036 J | 0.001 U | 0.001 U | 0 001 U | | 0.001 UO | | 0.00092 J | 0.00058 J | 0 00052 J | 0.00049 J | 0 00039 | 0 0002 U | 0 0002 U | 0.0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | | 0.001 U | | 0.00033 J | 0.001 U | 0 001 U | 0.001 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | _0036 | 0 002 U | 0 00062 J | 0.0013 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0011 J | 0 0015 J | | 0.0016 J | | 0.002 U | 0.0012 J | 0 0012 J | 0.002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0.002 U |
| Coba t | | 0.006 | mg/L | _001 U | 0 00018 J | 0 0002 J | 0.0002 J | 0.001 U | 0.001 U | 0.00029 J | 0.00025 J | 0.001 U | 0 001 U | | 0.001 U | | 0.00038 J | 0.00049 J | 0 00055 J | 0.00035 J | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U |
| Fluor de | 4 | 4 | mg/L | _15 J | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0.16 J | 0.13 J | 0.18 J | 2 JO | 0 21 J | 5 U | 0.26 J- | 0.28 | 0 27 | 0 27 | 0.33 | 0 3 J- | 0 31 | 0 26 | 0.3 |
| Lead | 0 015 | 0.015 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | _0019 J | 0 008 U | 0 008 U | 0.0016 J | 0.0011 J | 0.0012 J | 0.008 U | 0.008 U | 0.0017 J | 0 0018 J | | 0.008 U | | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0 008 U | 0 008 U | 0 008 U | 0 008 U | 0.008 U |
| Mercury | 0 002 | 0.002 | mg/L | _0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | _02 | 0 017 | 0 029 | 0.023 | 0.027 | 0.027 | 0.021 | 0.021 | 0.028 | 0 032 | | 0.025 | 0.035 | 0.04 | 0 043 | 0.043 | 0.035 | 0 052 | 0 051 | 0 0 | | 0.058 |
| Radium 226 228 | 5 | | pCi/L | _5 | 0 568 | 0.477 U | 0.467 U | 0.55 | 0.469 | 0.593 | 0.414 | 0.707 | 0 803 | | 1.45 J | 0.096 | 0.679 | 0 505 | 0.427 U | | 1.47 U | | 0 6 9 U | | |
| Selenium | 0 05 | 0.05 | mg/L | _014 | 0 0091 | 0 0049 J | 0.011 | 0.014 | 0.014 | 0.019 | 0.02 | 0.013 | 0 027 | | 0.0082 | 0.011 | 0.0098 | 0 012 | 0.012 | 0.0077 | 0 0096 | 0 0082 | 0 0053 | 0.0079 |
| Thallium | 0 002 | 0.002 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | _59 | 6 69 | 1.98 | 6.1 | | 3.41 | | 3.92 | 5.27 | 3 24 | 5.98 | 6.71 | 5.43 | 0.22 | | 6.82 | 5.54 | 3 14 | 3. 3 | 3. 2 | 6.2 |
| Ox dation Reduct on Potential | | | millivolts | 1.4 | 75.7 | 27.6 | 236 | | 90.5 | | 152.6 | 280.8 | 58.9 | 139.5 | -116 3 | -90.8 | -48 8 | | 53.6 | -25.7 | 44 | 337.2 | -20.6 | 0.2 |
| pH | | | SU | 7.27 | 7 25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7 31 | 7 3 | 7.28 | 6.87 | 6.88 | | 7.1 | 7.06 | 7.15 | 7 92 | 8. 8 | 7.51 |
| Specif c Conductivity | | | uS/cm | 671 | 736 | 1110 | 822 | | 1041 | | 1209 | 702 | 1542 | 1331 | 600 | 1156 | 1274 | | 888 | 685 | 774 | 1218 | 970 | 138. |
| Temperature | | | deg C | 4.4 | 18.4 | 16.9 | 11.9 | | 10.75 | | 11.9 | 14 7 | 17.2 | 18.2 | 10 2 | 10 6 | 17.9 | | 11.4 | 15.9 | 10.3 | 17.8 | 10.6 | 18.7 |
| Turbidity | | | NTU | _59 | 3.92 | 1.15 | 1.34 | | 3.12 | | 1.88 | 1.91 | 0.91 | 0 39 | 0.82 | 2.44 | 2.41 | | 3.41 | 1.55 | 2 37 | | 1 02 | 2.95 |

Notes:
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Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

| | | |
|---|---|---|
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 25C
Schahfer CCR Part A Demonstration
Addendum
Part 3

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW09B | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-06-28 | 2017-08-23 | | 2017-10-03 | 2018-03-14 | 2018-04-23 | 2018-09-06 | 2018-10-26 | 2019-05-08 | | 2019-11-07 | 2020-04-27 | 2020-10-23 | 2021-0 -20 | | 2021-09-23 |
| | | | | FD | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | FD | N | N | N | N | N | FD | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 24 | 25 | 25 | 16 | 11 | 11 | 11 | 12 | 16 | 16 | 16 | | 14 | 12 | 12 | 14 | 14 | 8 | 6 1 | 6.3 | 8.1 | 6.2 | 6.7 | | | |
| Calcium | | | mg/L | 260 | 280 | 270 | 190 | 200 | 170 | 170 | 180 | 180 | 180 | 160 | | 160 | 150 | 180 | 150 | 150 | 150 | 148 | 162 | 169 | 171 | 163 | | | |
| Chlor de | | | mg/L | 210 | 180 | 190 | 130 | 110 | 120 | 130 | 150 | 170 | 160 | 140 | | 150 | 180 | 150 | 140 | 140 | 110 | 117 | 107 | 102 | 9 | 113 | | | |
| Fluor de | 4 | 4 | mg/L | .54 J | 0.55 J | 0 67 J | 0.68 J | 0.1 J | 1.3 J | 1 2 J | 1.4 J | 1.2 J | 0.37 J | 1.5 J | 1.4 J | 1 6 J | 1 8 J | 1 6 | 1 6 | 1.6 | 1.5 | 1.3 | 1. | 1. | 1. | 1 3 | | | |
| pH | | | SU | | 7.08 | 7 15 | 6.96 | 7.36 | 7.44 | 7 29 | 7.36 | | 7.46 | 7.36 | 7 56 | 7.43 | 7.32 | 7.46 | | 7.49 | 7.56 | 7 65 | 8 | | 10 9 O | 7 56 | | | |
| Sulfate | | | mg/L | 970 J- | 1000 J- | 960 | 740 | 670 J | 550 | 570 | 640 | 630 | 650 | 550 | | 430 | 570 | 580 | 510 | 520 | 440 | 387 | 5 0 | 582 J | 10 0 J | 773 | | | |
| Total Dissolved Sol ds | | | mg/L | 2100 | 2000 | 2100 | 1700 | 1300 | 1200 | 1200 | 1500 | 1500 | 1500 | 1300 | | 990 | 1300 | 1200 | 1200 | 1200 | 990 | 906 | 1010 | 1030 | 982 | 1 30 | | | |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0 002 U | | 0.002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | |
| Arsenic | 0 01 | 0.01 | mg/L | .0024 J | 0.0026 J | 0 002 J | 0.0014 J | 0.0027 J | 0.005 U | 0 004 J | 0.004 J | 0.0031 J | 0.0031 J | | 0.0054 | 0.0064 | 0.0044 J | 0 004 J | 0 0052 | 0.0057 | 0.0042 J | 0.0049 | 0 003 | 0.0033 | 0.003 | 0 0031 | | | |
| Barium | 2 | 2 | mg/L | .069 | 0.071 | 0 076 | 0.062 | 0.048 | 0.04 | 0 046 | 0.055 | 0.062 | 0.058 | | 0 045 | 0.04 | 0.049 | 0 047 | 0 042 | 0.041 | 0.029 | 0 034 | 0.039 | 0.036 | 0.035 | 0 059 | | | |
| Bery lium | 0 004 | 0.004 | mg/L | .00012 J | 9.1E-05 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | | | |
| Cadmium | 0 005 | 0.005 | mg/L | .00027 J | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | | | |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0 002 U | | 0.002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | | | |
| Coba t | | 0.006 | mg/L | .001 U | 0.001 U | 0 00069 J | 0.00028 J | 0.00045 J | 0.001 U | 0 00028 J | 0.00045 J | 0.00041 J | 0.00041 J | | 0 001 U | | 0.00058 J | 0 00028 J | 0 00022 J | 0.00025 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | |
| Fluor de | 4 | 4 | mg/L | .54 J | 0.55 J | 0 67 J | 0.68 J | 0.1 J | 1.3 J | 1 2 J | 1.4 J | 1.2 J | 0.37 J | 1.5 J | 1.4 J | 1.6 J | 1.8 J | 1 6 | 1 6 | 1.6 | 1.5 | 1.3 | 1. | 1. | 1. | 1 3 | | | |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0.001 U | 0 001 U | 0.00017 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | |
| Lithium | | 0.04 | mg/L | .0055 J | 0.0065 J | 0 008 U | 0.008 U | 0.0049 J | 0.0045 J | 0 0056 J | 0.0054 J | 0.0047 J | 0.0042 J | | 0 0031 J | | 0.0037 J | 0 0052 J | 0 0053 J | 0.0055 J | 0.0033 J | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0 0095 | | | |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | | | |
| Molybdenum | | 0.1 | mg/L | .01 U | 0.0079 J | 0 0075 J | 0.0097 J | 0.013 | 0.015 | 0 015 | 0.013 | 0.0094 J | 0.01 | | 0 014 | 0.012 | 0.01 | 0 011 | 0 012 | 0.012 | 0.0096 J | 0.013 | 0 011 | 0.012 | 0.012 | 0 015 | | | |
| Radium 226 228 | 5 | | pCi/L | .12 | 1.86 | 1 65 | 1.14 | 0.453 | 1.09 | 0.774 | 1.85 | 1.01 | 1.27 | | 1 18 J | 0.868 | 1.04 | 1 24 J | 1 03 | 1.01 | | 1 28 U | | 0.92 U | 1.67 U | | | | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0.005 U | 0 005 U | 0.005 U | 0.002 J | 0.005 U | 0 0014 J | 0.001 J | 0.0015 J | 0.0016 J | | 0 005 U | | 0.002 J | 0 0019 J | 0 005 U | 0.005 U | 0.0011 J | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | |
| Thallium | 0 002 | 0.002 | mg/L | .0003 J | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0 001 U | 0 001 U | 0.0002 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | | 0.44 | 1 06 | 0.43 | 0.38 | 0.44 | 0 61 | 0.71 | | 0.57 | 0.45 | 0 1 | 0.04 | 0.61 | 0 28 | | 0.04 | 0.35 | 0 17 | 0.3 | | 0.2 | 0 31 | | | |
| Ox dation Reduct on Potential | | | millivolts | | -57.7 | 67.3 | -76.4 | -100.1 | -80 6 | -102.6 | 68.2 | | 19.7 | -46 8 | -121 6 | -130 5 | -100.5 | -101.1 | | -16.8 | 131.8 | -106 | -29.9 | | -113.1 | 0 20 | | | |
| pH | | | SU | | 7.08 | 7 15 | 6.96 | 7.36 | 7.44 | 7 29 | 7.36 | | 7.46 | 7.36 | 7 56 | 7.43 | 7.32 | 7.46 | | 7.49 | 7.56 | 7 65 | 8 | | 10 9 | 7 56 | | | |
| Specif c Conductivity | | | uS/cm | | 2356 | 2435 | 2088 | 1559 | 1352 | 1592 | 1561 | | 1922 | 1722 | 1053 | 1301 | 1556 | 1693 | | 1165 | 9 24 | 1419 | 1513 | | 1 59 | 201.2 | | | |
| Temperature | | | deg C | | 14.1 | 14.7 | 15 1 | 13.6 | 13.45 | 14.5 | 14.8 | | 15.5 | 16 | 14 | 14.4 | 16.1 | 16 | | 14 2 | 14.4 | 13.3 | 15. | | 13. | 16. | | | |
| Turbidity | | | NTU | | 3.48 | 4 29 | 2.17 | 0.99 | 2.58 | 1 88 | 1.69 | | 2.54 | 1.96 | 4 18 | 4.11 | 2.96 | 1 39 | | 4.7 | 3.36 | 4 8 | 2.76 | | 26 | 3 02 | | | |

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mg/L = mil igrams per iter
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**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW15 | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-03 | 2018-03-15 | 2018-04-24 | 2018-10-26 | 2019-05-06 | 2019-11-08 | 2020-04-27 | 2020-10-27 | 2021-0 -16 | 2021-09-22 |
| | | | | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | .75 | 0.45 J | 1 J | 1.1 | 0.6 | 0.44 | 0.45 | 0.87 | 0.91 | 0.66 | | 0.72 | 0.76 | 0.71 | 0.73 | 0.68 | 0. 7 O | 8 O | 3.5 | |
| Calcium | | | mg/L | 00 | 130 | 120 | 100 | 82 | 81 | 95 | 160 | 150 | 77 | | 170 | 120 | 140 | 100 | 128 | 122 O | 160 O | 136 | |
| Chlor de | | | mg/L | 28 | 31 | 31 | 27 | 28 | 27 | 27 | 27 | 25 | 19 | | 24 | 21 | 22 | 28 | 25.2 | 95.7 O | 99 3 O | 9 8 | |
| Fluor de | 4 | 4 | mg/L | .2 J | 0 85 J | 0.85 J | 0.74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.93 J | 0.67 J | 0.76 J | 0.69 | 0.52 | 0.73 | 0.6 | 0.85 O | 0.76 O | 0.77 J- | |
| pH | | | SU | 6.88 | | 6.98 | 6.83 | 6.96 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7 34 | 7 34 | 7.02 O | 7.1 O | 7.12 | |
| Sulfate | | | mg/L | 60 J- | 260 | 260 | 150 | 140 | 140 | 160 | 300 | 330 | 260 | | 410 | 240 | 380 | 260 | 227 | 153 O | 371 O | 265 | |
| Total Dissolved Sol ds | | | mg/L | 70 | 660 | 630 | 520 | 400 | 400 | 420 | 780 | 750 | 660 | | 790 | 5900 O | 740 | 640 | S72 | 556 O | 770 O | 675 | |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 00041 J | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | 0 002 U | 0.001 U | 0.001 UO | 0.001 UO | 0.001 U | |
| Arsenic | 0 01 | 0.01 | mg/L | .056 | 0 072 | 0.069 | 0.078 | 0.076 | 0 054 | 0 062 | 0.059 | 0.066 | | 0 058 | | 0.091 | 0.081 | 0 075 | 0.061 | 0.078 O | 0.0 6 O | 0.09 | |
| Barium | 2 | 2 | mg/L | .044 | 0 053 | 0.053 | 0.039 | 0.032 | 0 031 | 0 034 | 0.054 | 0.058 | | 0 047 | | 0.046 | 0.047 | 0 037 | 0.039 | 0.053 O | 0.058 O | 0.05 | |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0 001 U | 0.0002 U | 0.0002 UO | 0.0002 UO | 0.0002 U | |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0 001 U | 0.0002 U | 0.0002 UO | 0.0002 UO | 0.0002 U | |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0.002 U | 0 00027 J | 0 00028 J | 0 00029 J | 0 002 U | 0.002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 UO | 0.002 UO | 0.002 U | |
| Coba t | | 0.006 | mg/L | .0019 | 0 0022 | 0.0022 | 0.0021 | 0.0019 | 0 0018 | 0 0022 | 0.0029 | 0.0027 | | 0 0025 | | 0.0023 | 0.0035 | 0 0017 | 0.0018 | 0.0019 O | 0.003 O | 0.0021 | |
| Fluor de | 4 | 4 | mg/L | .2 J | 0 85 J | 0.85 J | 0.74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.93 J | 0 67 J | 0.76 J | 0.69 | 0.52 | 0.73 | 0.6 | 0.85 O | 0.76 O | 0.77 J- | |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 UO | 0.001 UO | 0.001 U | |
| Lithium | | 0.04 | mg/L | .0053 J | 0 008 U | 0.008 U | 0.008 U | 0.004 J | 0 0024 J | 0 0041 J | 0.0058 J | 0.005 J | | 0 0023 J | | 0.0054 J | 0.0053 J | 0 0027 J | 0.008 U | 0.008 UO | 0.008 UO | 0.01 | |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 UO | 0.0002 UO | 0.0002 U | |
| Molybdenum | | 0.1 | mg/L | .02 | 0 027 | 0.026 | 0.023 | 0.022 | 0 022 | 0 026 | 0.017 | 0.019 | | 0 029 | | 0.016 | 0.017 | 0 029 | 0.031 | 0.031 O | 0.028 O | 0.027 | |
| Radium 226 228 | 5 | | pCi/L | U | 0.479 | 0.513 | 0.646 U | 0.555 J | 0 339 U | 0.483 U | 0.335 | 0.342 U | | 0 657 J | | 0.858 J | 0.476 U | | 1.72 U | | 0.191 UO | | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0 005 U | 0.005 U | 0.005 U | | 0 005 U | | 0.005 U | 0.005 U | 0 005 U | 0.001 U | 0.001 UO | 0.0036 O | 0.001 U | |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 UO | 0.001 UO | 0.001 U | |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .48 | | 0.48 | 0.14 | 0.25 | 0.16 | 0.19 | 1 | 0.32 | 0.29 | 0 06 | 0.02 | 1.97 | 0.15 | 0.12 | 0.09 | 0.3 | 0.2 | 0.28 | |
| Ox dation Reduct on Potential | | | millivolts | 79 2 | | -60.1 | -111 | -114.3 | -104.1 | -104.4 | -46.9 | -43.7 | -13 8 | -56.8 | -99.1 | -254.7 | -27 5 | -100 | -103.9 | - 5.8 | -6 .1 | 0.193 | |
| pH | | | SU | 6.88 | | 6.98 | 6.83 | 6.96 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7.34 | 7.34 | 7.02 | 7.1 | 7.12 | |
| Specif c Conductivity | | | uS/cm | 779 | | 909 | 733 | 594 | 584 | 674 | 9.32 | 1004 | 901 | 581 | 933 | 855 | 730 | 598 | 950 | 9 1 | 1153 | 10 .8 | |
| Temperature | | | deg C | 5.3 | | 20.3 | 19.9 | 14.6 | 12.1 | 11.6 | 14 6 | 16 6 | 18.1 | 10.8 | 10.6 | 17.1 | 8.3 | 15.8 | 11.5 | 22.3 | 1 38 | 19 2 | |
| Turbidity | | | NTU | .48 | | 2.96 | 3.41 | 3.98 | 4.4 | 4.92 | 4.2 | 3.1 | 4.11 | 3.98 | 4.29 | 3.1 | 4.9 | 6.9 | 4.51 | 15 | 9.82 | 6.36 | |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW15B | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-03 | 2018-03-15 | 2018-04-24 | 2018-09-06 | | 2018-10-26 | 2019-05-08 | 2019-11-08 | | 2020-04-27 | 2020-10-27 | 2021-0 -16 | | 2021-09-22 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | N | FD | N | N | N | FD | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | _1 | 1.7 | 2 | 3.7 | 3.3 | 3.6 | 3 1 | 2.1 | 2.1 | | 4.4 | | 4.1 | 4.9 | 10 | | 6.2 | 7 9 | 2.5 O | 32.7 O | 32 5 O | 28 1 |
| Calcium | | | mg/L | 60 | 160 | 160 | 180 | 160 | 170 | 190 | 170 | 73 | | 230 | | 200 | 210 | 280 | | 280 | 273 | 6 O | 335 O | 321 O | 352 |
| Chlor de | | | mg/L | 2 | 58 | 62 | 81 | 64 | 65 | 71 | 64 | 64 | | 87 | | 89 | 93 | 110 | | 80 | 104 | 613 O | 372 O | 396 O | 269 |
| Fluor de | 4 | 4 | mg/L | _65 J | 0 62 J | 0.46 J | 0.74 J | 0.77 J | 0.75 J | 0 72 J | 0.61 J | 0.5 J | 0.69 J | 0.79 J | | 0 6 J | 0.6 | 0.84 J | | 0.89 | 0 84 | 0. 1 O | 0.37 O | 0 35 O | 0. J- |
| pH | | | SU | 7.81 | 7.49 | 7 04 | 7.52 | 7.48 | 7.11 | 7 26 | 7.37 | 7.42 | 7.45 | 7 36 | | 7 8 | 6.74 | 7.43 | | 7.57 | 7 56 | 6.6 O | | 7.15 O | 7.08 |
| Sulfate | | | mg/L | 80 J- | 390 | 340 | 500 | 390 | 460 | 530 | 540 | 500 | | 790 | | 720 | 770 | 1300 | | 940 | 912 | 68 O | 596 O | 6 3 O | 900 |
| Total Dissolved Sol ds | | | mg/L | 830 | 800 | 840 | 1000 | 890 | 980 | 1200 | 1100 | 1100 | | 1400 | | 1400 | 1400 | 2100 | | 1600 | 1720 | 2170 O | 17 0 O | 1870 O | 2030 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | _002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | | 0 002 U | 0.002 U | 0.002 U | | 0.002 U | 0 001 U | 0.001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| Arsenic | 0 01 | 0.01 | mg/L | _003 J | 0 0011 J | 0 0014 J | 0.0022 J | 0.0011 J | 0.00098 J | 0 00084 J | 0.00081 J | | 0.005 U | | | 0 005 U | 0.005 U | 0.00098 J | | 0.005 U | 0 001 U | 0.001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| Barium | 2 | 2 | mg/L | _054 | 0 053 | 0 056 | 0.056 | 0.051 | 0.052 | 0 064 | 0.069 | | 0.068 | | | 0 07 | 0.064 | 0.081 | | 0.054 | 0 054 | 0.21 O | 0.18 O | 0.18 O | 0.17 |
| Bery lium | 0 004 | 0.004 | mg/L | 7.8E-05 J | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0 0002 U | 0.0002 UO | 0.0002 UO | 0 0002 UO | 0.0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0 0002 U | 0.0002 UO | 0.0002 UO | 0 0002 UO | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | _00062 J | 0 002 U | 0 002 U | 0.00033 J | 0.00034 J | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | | 0 002 U | 0.002 U | 0.002 U | | 0.002 U | 0 002 U | 0.002 UO | 0.002 UO | 0 002 UO | 0.002 U |
| Coba t | | 0.006 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.00016 J | 0.001 U | 0 001 U | 0.001 U | | 0.00029 J | | | 0 00037 J | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | 0.001 UO | 0.0011 O | 0 001 O | 0.001 U |
| Fluor de | 4 | 4 | mg/L | _65 J | 0 62 J | 0.46 J | 0.74 J | 0.77 J | 0.75 J | 0 72 J | 0.61 J | 0.5 J | 0.69 J | 0.79 J | | 0 6 J | 0.6 | 0.84 J | | 0.89 | 0 84 | 0. 1 O | 0.37 O | 0 35 O | 0. J- |
| Lead | 0 015 | 0.015 | mg/L | _001 U | 0 001 U | 0 00023 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | 0.001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| Lithium | | 0.04 | mg/L | _0069 J | 0 008 U | 0 008 U | 0.0077 J | 0.0053 J | 0.0082 | 0 0082 | 0.0077 J | | 0.007 J | | | 0 008 | 0.0096 | 0.012 | | 0.0085 | 0 0086 | 0.015 O | 0.011 O | 0 012 O | 0.026 |
| Mercury | 0 002 | 0.002 | mg/L | _0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | | | 0 0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0 0002 U | 0.0002 UO | 0.0002 UO | 0 0002 UO | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | _011 | 0 013 | 0 01 | 0.012 | 0.015 | 0.014 | 0 014 | 0.012 | | 0.011 | | | 0 01 | 0.011 | 0.012 | | 0.01 | 0 012 | 0.001 UO | 0.0012 O | 0 0012 O | 0.0029 |
| Radium 226 228 | 5 | | pCi/L | _26 | 0 594 | 0 61 | 1.14 J | 0.876 | 0.687 | 0 789 | 0.872 | | 1.69 J | | | 1 31 | 1.51 J | 1.61 | | | 1 63 U | | 2.96 O | 2.15 O | |
| Selenium | 0 05 | 0.05 | mg/L | _005 U | 0 005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | | 0.005 U | | | 0 0017 J | 0.005 U | 0.005 U | | 0.005 U | 0 001 U | 0.001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| Thallium | 0 002 | 0.002 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0 001 U | 0.001 U | 0.0003 J | | 0.001 U | 0 001 U | 0.001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | _22 | 0.91 | 0 56 | 0.22 | 0.46 | 0.3 | 0.43 | 0.64 | 0.23 | 0.08 | 0 04 | | 0 29 | 2.06 | 0.23 | | 0.16 | 0.16 | 0.36 | | 0 26 | 0.32 |
| Ox dation Reduct on Potential | | | millivolts | 129.7 | -21.6 | -94.6 | -132 6 | -81.7 | -79 6 | -21.3 | -36.5 | -42.6 | -64 | -102.4 | | -91.2 | -256 1 | 46 3 | | -189.2 | -98.1 | -7 2 | | -65.7 | 0.16 |
| pH | | | SU | 7.81 | 7.49 | 7 04 | 7.52 | 7.48 | 7.11 | 7 26 | 7.37 | 7.42 | 7.45 | 7.36 | | 7 8 | 6.74 | 7.43 | | 7.57 | 7 56 | 6.6 | | 7.15 | 7.08 |
| Specif c Conductivity | | | uS/cm | 834 | 1049 | 1060 | 1237 | 940 | 1096 | 1099 | 1110 | 1294 | 1255 | 1612 | | 2757 | 1889 | 1798 | | 1384 | 2359 | 3077 | | 2 91 | 286 6 |
| Temperature | | | deg C | 2.71 | 15.9 | 16.1 | 13.9 | 13 6 | 13 | 13.8 | 14.2 | 14.5 | 13.3 | 13 | | 14.13 | 13.6 | 8.1 | | 13 8 | 13.9 | 19.8 | | 17.6 | 17 |
| Turbidity | | | NTU | _72 | 1 56 | 1.48 | 3.8 | 2.23 | 3.65 | 3 16 | 1.78 | 0.4 | 4.59 | 4 88 | | 3 59 | 1.35 | 3.56 | | 1.49 | 4 3 | 2.06 | | 1.1 | 1.7 |

Notes:
DEM RCG= Ind ana Department of Environmental Management Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW16 | | | | | | | | | | | | | | | | | | GAMW16R | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-15 | 2018-04-24 | 2018-10-29 | | 2019-05-03 | 2019-11-08 | | 2020-04-23 | 2020-10-29 | | 2021-0 -22 | 2021-09-21 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | FD | N | N | FD | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | _1 | 1 8 | 1 6 | 1.2 | 0.89 | 1.3 | 1 | 1.4 | 1.1 | | 1.4 | 1.4 | 1.4 | 1.6 | | 1.9 | 1.1 | 9.6 O | 9.7 O | 3 6 O | _1 |
| Calcium | | | mg/L | 230 | 180 | 170 | 120 | 160 | 210 | 220 | 240 | 57 | | 220 | 160 | 160 | 210 | | 210 | 302 | 312 O | 313 O | 10 O | 275 |
| Chlor de | | | mg/L | 3 | 37 | 30 | 28 | 24 | 25 | 28 | 31 | 42 | | 58 | 36 | 36 | 28 | | 59 | 21.9 | 55 O | 155 O | 81.1 O | 112 |
| Fluor de | 4 | 4 | mg/L | _4 J | 1 6 J | 1 3 J | 1.5 | 1.3 J | 1.3 J | 1 2 J | 1.3 J | 1.5 J | 1 J | 1 2 J | 1.1 | 1.1 | 0.99 | | 1.1 | 0.88 | 5 O | 0.5 O | 0 39 O | 0.57 |
| pH | | | SU | 7.92 | 7.18 | 7.48 | 7.5 | 7.58 | 7.17 | 7 36 | 7.06 | 7.62 | 7.41 | 7 67 | | 7 28 | 7.46 | | 7.8 | 7.79 | | 7.21 O | 7.16 O | 7.1 |
| Sulfate | | | mg/L | 30 J- | 400 | 320 | 47 O | 300 | 500 | 480 | 630 | 520 | | 530 | 340 | 350 | 570 | | 530 | 757 | 20 O | 698 O | 1060 O | 633 |
| Total Dissolved Sol ds | | | mg/L | 100 | 810 | 790 | 570 | 670 | 930 | 1000 | 1100 | 980 | | 1100 | 740 | 730 | 1100 | | 1100 | 1290 | 600 O | 15 0 O | 1850 O | 1370 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | _002 U | 0 002 U | 0 00028 J | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.001 U | _001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| Arsenic | 0 01 | 0.01 | mg/L | _011 | 0 0077 | 0 012 | 0.0084 | 0.0079 | 0.006 | 0 008 | 0.0096 | | 0.002 J | 0 0065 | 0.01 | 0 0098 | 0.005 | | 0.0082 | 0.009 | _0059 O | 0.0058 O | 0 00 2 O | 0.0088 |
| Barium | 2 | 2 | mg/L | _049 | 0 042 | 0 035 | 0.024 | 0.029 | 0.043 | 0 044 | 0.054 | | 0.057 | 0 045 | 0.035 | 0 035 | 0.034 | | 0.034 | 0.046 | _097 O | 0.097 O | 0 07 O | 0.06 |
| Bery lium | 0 004 | 0.004 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.0002 U | _0002 U | 0.0002 UO | 0 0002 UO | 0.0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.0002 U | _0002 U | 0.0002 UO | 0 0002 UO | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | _00062 J | 0 002 U | 0 002 U | 0.0031 | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | 0.002 U | _002 UO | 0.002 UO | 0 002 UO | 0.002 U |
| Coba t | | 0.006 | mg/L | _001 U | 0 00068 J | 0 00051 J | 0.00046 J | 0.00055 J | 0.00092 J | 0 00094 J | 0.0011 | | 0.0013 | | 0.00059 J | 0.00061 J | 0.00066 J | | 0.00061 J | 0.0012 | _0039 O | 0.00 O | 0 006 O | 0.0038 |
| Fluor de | 4 | 4 | mg/L | _4 J | 1 6 J | 1 3 J | 1.5 | 1.3 J | 1.3 J | 1 2 J | 1.3 J | 1.5 J | 1 J | 1 2 J | 1.1 | 1.1 | 0.99 | | 1.1 | 0.88 | 5 O | 0.5 O | 0 39 O | 0.57 |
| Lead | 0 015 | 0.015 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | _001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| Lithium | | 0.04 | mg/L | _00043 J | 0 008 U | 0 008 U | 0.00023 J | 0.008 U | 0.008 U | 0 008 U | 0.008 U | | 0.008 U | | 0.008 U | 0 008 U | 0.008 U | | 0.008 U | 0.008 U | _008 UO | 0.008 UO | 0 008 UO | 0.011 |
| Mercury | 0 002 | 0.002 | mg/L | _0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0 0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | _0002 U | 0.0002 UO | 0 0002 UO | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | _024 | 0 036 | 0 045 | 0.044 | 0.03 | 0.027 | 0 023 | 0.024 | | 0.027 | 0 031 | 0.033 | 0 033 | 0.027 | | 0.028 | 0.022 | _019 O | 0.019 O | 0 027 O | 0.019 |
| Radium 226 228 | 5 | | pCi/L | _68 | 0 543 | 0 527 U | 0.829 U | 0.648 | 0.392 U | 0 339 U | 0.429 | | 0.862 J | 0 29 | 0.862 J | 1 32 J | 0.685 U | | | 1.69 U | | | 0 968 UO | |
| Selenium | 0 05 | 0.05 | mg/L | _005 U | 0 005 U | 0 0005 J | 0.0005 J | 0.005 U | 0.0012 J | 0 005 U | 0.005 U | | 0.0015 J | | 0.005 U | 0 005 U | 0.005 U | | 0.0015 J | 0.001 U | _0 2 O | 0.0 3 O | 0 001 UO | 0.001 U |
| Thallium | 0 002 | 0.002 | mg/L | _001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | _001 UO | 0.001 UO | 0 001 UO | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | _16 | 0 27 | 0.48 | 0.31 | 0.36 | 0.14 | 0 5 | 0.14 | 0.06 | 0.22 | 0 22 | | 1 27 | 0.29 | | 4.02 | 0.19 | | 0. 8 | 0 27 | 0.29 |
| Ox dation Reduct on Potential | | | millivolts | 18 06 | 711 6 | -124.8 | -78.8 | -136.9 | -73 6 | -114.2 | 9.6 | -158.4 | -55.9 | -106.5 | | -216.8 | 8 | | -2 | -124.3 | | 39.1 | -78.9 | 0.208 |
| pH | | | SU | 7.92 | 7.18 | 7.48 | 7.5 | 7.58 | 7.17 | 7 36 | 7.06 | 7.62 | 7.41 | 7 67 | | 7 28 | 7.46 | | 7.8 | 7.79 | | 7.21 | 7.16 | 7.1 |
| Specif c Conductivity | | | uS/cm | 331 | 1112 | 927 | 751 | 821 | 1257 | 1123 | 1406 | 1254 | 1029 | 1239 | | 1046 | 1001 | | 1014 | 1680 | | 2098 | 2025 | 185 |
| Temperature | | | deg C | 5.02 | 18.8 | 18.15 | 12.1 | 9.72 | 10.6 | 15.41 | 18 | 17.8 | 8.71 | 9 2 | | 17.81 | 10.5 | | 17.52 | 10 3 | | 20. | 15.08 | 25 |
| Turbidity | | | NTU | _89 | 2.16 | 1.93 | 3.16 | 4.14 | 3.25 | 4 33 | 2.45 | 4.95 | 4.62 | 12.81 | | 3.64 | 4.65 | | 3.98 | 8.11 | | 2.69 | 65 | 1.79 |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Table 2: Analytical Results for MW31 Monitoring Wells**
**WBSGD Rolla M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW10B | | | | | | | | | | | | | | | | | | GAMW10BR | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 4/24/2007 | 10/29/2007 | 3/26/2008 | 10/21/2008 | 3/31/2009 | 10/26/2009 | 4/13/2010 | 10/27/2010 | 3/30/2011 | 10/27/2011 | 3/28/2012 | 10/23/2012 | 3/26/2013 | 10/28/2013 | 4/28/2014 | 10/27/2014 | 3/30/2015 | 10/26/2015 | 3/29/2016 | 10/25/2016 | 4/26/2007 | 10/29/2007 | 3/26/2008 | 10/21/2008 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 1 | mg/L | 0.6 | 0.6 | 0.6 | 0.7 | 0.8 | 0.8 | 0.9 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 | 0.8 | 0.7 | 0.7 | 0.7 | 0.8 | 44 D | 34.8 D | 25.3 |
| Calcium | | | mg/L | 530 | 540 | 560 | 590 | 560 | 560 | 540 | 530 | 540 | 530 | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 560 | 380 D | 380 D | 350 |
| Chloride | | | mg/L | 65 | 50 | 57 | 55 | 52 | 47 | 51 | 51 | 170 | 26 | 160 | 160 | 150 | 190 | 220 | 210 | 170 | 190 | 190 | 190 | 930 D | 930 D | 790 |
| Fluoride | 4 | 4 | mg/L | 0.2 J+ | 0.2 J | 0.2 J | 0.2 J | 0.24 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 J | 0.2 D | 0.2 D | 0.2 |
| pH | | | SU | 7.26 | 7.47 | | 7.11 | 7.23 | 7.55 | 7.5 | 7.22 | 7.15 | 7.21 | 7.6 | 7.03 | 7.07 | 7.03 | 7.09 | | 7.35 | 7.28 | 7.3 | 7.3 | 7.3 | 7.4 |
| Sulfate | | | mg/L | 500 J+ | 490 | 500 | 440 | 59 D | 470 | 490 | 480 | 490 | 530 | | 590 | 560 | 590 | 590 | 1500 | 1500 | 1500 | 1500 | 1500 | 1100 D | 1100 D | 1000 |
| Total Dissolved Solids | | | mg/L | 1100 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1000 | 1200 | 1100 | 1400 | 1400 | 1400 | 1400 | 20 UD | 1600 | 1800 | 1400 | 2100 | 1800 | 2100 D | 2000 D | 1800 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.00027 J | 0.002 UJ | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.00003 J | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.004 U | 0.004 UD | 0.004 UD | 0.004 U |
| Arsenic | 0.01 | 0.01 | mg/L | 0.00094 | 0.0004 | 0.0013 | 0.0013 | 0.0022 | 0.0026 | 0.0026 | 0.0024 | 0.0026 | 0.0048 | | 0.00084 | 0.00097 | 0.0031 | 0.0021 | 0.0024 | 0.0026 | 0.0016 | 0.0016 | 0.0018 | 0.004 UD | 0.004 UD | 0.0042 |
| Barium | 2 | 2 | mg/L | 0.072 | 0.04 | 0.106 | 0.035 | 0.0578 | 0.029 | 0.065 | 0.041 | 0.049 | | 0.059 | 0.058 | 0.068 | 0.07 | 0.079 | 0.055 | 0.054 | 0.043 | | | 0.054 D | 0.033 D | 0.041 |
| Beryllium | 0.004 | 0.004 | mg/L | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | | 0.00007 J | | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0005 U | 0.0025 UD | 0.0025 UD | 0.0025 U |
| Cadmium | 0.005 | 0.005 | mg/L | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | | 0.00002 J | | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0001 U | 0.0025 UD | 0.0025 UD | 0.0025 U |
| Chromium | 0.1 D | 0.1 | mg/L | 0.0025 U | 0.0025 U | 0.00029 J | 0.0025 U | 0.00029 J | 0.002 U | 0.0025 U | 0.0025 U | 0.0025 U | | 0.0025 U | | 0.0025 U | 0.0025 U | 0.0025 U | 0.0025 U | 0.0025 U | 0.0025 U | 0.0025 U | 0.0025 U | 0.0025 UD | 0.0025 UD | 0.0025 U |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.00016 J | 0.00018 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.00003 J | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0025 UD | 0.0025 UD | 0.0025 U |
| Fluoride | 4 | 4 | mg/L | 0.2 J+ | 0.2 J | 0.6 D | 0.23 J | 0.0513 | 0.872 | 0.89 J | 0.76 J | 0.78 J | 1.2 | 0.83 J | 0.76 J | 0.93 J | 0.81 | 0.76 | 1 J | 1 | 0.78 J | | | 0.05 D | 0.41 D | 2.6 |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.005 UD | 0.005 UD | 0.005 U |
| Lithium | | 0.04 | mg/L | 0.00053 J | 0.005 U | 0.0032 J | 0.0022 J | 0.00038 J | 0.0015 J | 0.0072 J | 0.005 U | 0.0006 J | | 0.0007 J | | 0.0009 J | 0.0025 J | 0.0072 J | 0.0025 J | 0.0025 J | 0.008 U | | | 0.013 D | 0.003 D | 0.031 |
| Mercury | 0.002 | 0.002 | mg/L | 0.00046 U | 0.00012 U | 0.00062 U | 0.00028 U | 0.00028 U | 0.00021 U | 0.00019 U | 0.00019 U | 0.00019 U | | 0.00019 U | | 0.00019 U | 0.00019 U | 0.00019 U | 0.00019 U | 0.00019 U | 0.00019 U | | | 0.00025 UD | 0.00025 UD | 0.00025 U |
| Molybdenum | | 0.1 | mg/L | 0.0035 | 0.0031 | 0.0037 | 0.0032 | 0.0032 | 0.0014 | 0.0025 | 0.0025 | 0.0025 | | 0.0006 | 0.0005 | 0.0022 | 0.0025 | 0.0025 | 0.0025 | 0.0025 | 0.0025 | | | 0.0075 UD | 0.005 UD | 0.005 |
| Selenium 226 + 228 | 5 | | mg/L | 0.19 | 0.05 | 0.0965 | 0.0748 | 0.0588 J+ | 0.572 | 0.23 | 0.255 | 0.25 | | 0.11 J+ | 0.09 | 0.1 J+ | 0.0441 J+ | 0.0498 | | 0 | 0.0 U | | | | 0.0813 | |
| Selenium | 0.05 | 0.05 | mg/L | 0.005 U | 0.005 U | 0.0006 J | 0.0025 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | | 0.01 UD | 0.01 UD | 0.01 U |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.002 UD | 0.002 UD | 0.002 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.24 | 1.61 | | 0.19 | 0.3 | 0.71 | 0.32 | 0.22 | 0.26 | 0.25 | 0.24 | 0.25 | 1.09 | 0.37 | 0.31 | | 0.41 | 0.14 | 0.47 | 0.28 | 0.28 | 0.31 |
| Oxidation Reduction Potential | | | millivolts | 122.6 | 89 | | 126.9 | 118.5 | 157.3 | 133.2 | 125.1 | 30.7 | 85.8 | 75.5 | 117.8 | 101.5 | 106.9 | 21.2 | | 99.5 | 129.6 | 71.2 | 99.1 | 6.212 | |
| pH | | | SU | 7.26 | 7.42 | | 7.47 | 7.69 | 7.76 | 7.8 | 7.91 | 7.94 | 7.96 | 7.89 | 7.89 | 7.82 | 7.87 | 7.99 | | 7.95 | 7.91 | 7.2 | 7.21 | 7.5 | |
| Specific Conductance | | | uS/cm | 1142 | 1102 | | 1186 | 1201 | 1193 | 1645 | 1035 | 1663 | 1461 | 1143 | 1453 | 1344 | 1368 | 1497 | | 1734 | 1835 | 1561 | 1615 | 1586.5 | |
| Temperature | | | deg C | 10.08 | 14.44 | | 15.07 | 13.96 | 13.07 | 10.3 | 13.65 | 14.2 | 15 | 16.6 | 12.41 | 13 | 17.4 | 11.2 | | 14.63 | 12 | 17.2 | 13.84 | 16.2 | |
| Turbidity | | | NTU | 3.6 | 8.29 | | 0.8 | 2.76 | 1.21 | 1.58 | 0.37 | 0.48 | 0.8 | 0.98 | 0.2 | 1.66 | 0.49 | 0.22 | | 0.81 | 0.6 | 0.53 | 0.17 | 0.19 | |

Notes:
IDEM RCG - Indiana Department of Environmental Management
Remediation Closure Guidance Table A-5 Screening Levels - 2021 Revision

MCL - Maximum Contaminant Level
mg/L - milligrams per liter
SU - standard units
pCi/L - picoCuries per liter
uS/cm - microSiemens per centimeter
deg C - degrees Celsius
NTU - Nephelometric Turbidity Units

"U" - Indicates the result was not detected above the method detection limit (MDL) for the sample. The associated limit (LOQ) is provided.
"D" - Indicates the result is estimated.
"J" - Indicates the result is estimated and may be biased low.
"J+" - Indicates the result is estimated and may be biased high.
"UJ" - Indicates the result was not detected above the MDL. The estimated MDL is provided.
"R" - Indicates the result was identified as an outlier and removed from the data set.

Table 2: Analytical Results for MW31 Monitoring Wells
WTPSOD Rollin M. Schahfer Generating Station
Wheatfield, Indiana

| Analyte | MCL | IDEM RCG | Unit | GMW31 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2014-10-13 | 2015-05-04 | 2015-11-05 | 2016-04-13 | 2016-10-19 | 2017-04-18 | 2017-09-27 | 2018-04-16 | 2018-10-15 | 2019-04-15 | 2019-10-08 | 2020-04-13 | 2020-10-05 | 2021-04-12 | 2021-10-25 | 2022-04-25 | 2022-10-24 | 2023-04-24 | 2023-10-23 | 2024-04-22 | 2024-10-21 | 2025-04-21 | 2025-10-20 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 13 | 12 | 14 | 11 | 11 | 8.8 | 7.6 | 13 | 12 | | | 5.8 | 5.9 | 16 | 7.2 | 4.8 | 7.6 | 4.2 | 4.3 | 12.5 | | |
| Calcium | | | mg/L | 268 | 165 | 330 | 160 | 200 | 170 | 160 | 330 | ns | | | 110 | 170 | 340 | 130 | 120 | 160 | 164 | 135 | 340 | | |
| Chloride | | | mg/L | 110 | 160 | 130 | 150 | 140 | 61 | 170 | 130 | 160 | | | 78 | 98 | 150 | 90 | 92 | 150 | 78.4 | 75 | 170 | | |
| Fluoride | 4 | 4 | mg/L | 0.8 J+ | 0.7 J | 0.7 | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J+ | 0.9 J+ | 0.7 | 1.0 J | 1.0 | 0.9 J+ | 0.8 J+ | 1.0 | 0.9 | 0.8 J+ | |
| pH | | | SU | 7.56 | 7.27 | 7.24 | 7.33 | 7.55 | 7.23 | 7.4 | 7.46 | 7.35 | 7.68 | | 7.82 | 7.65 | 7.23 | 7.35 | 7.54 | 7.38 | 7.6 | 7.16 | | | |
| Sulfate | | | mg/L | 330 J+ | 310 | 290 | 290 | 290 | 260 | 320 | 290 | 300 | | | 240 | 320 | 430 | 300 | 290 | 310 | 293 | 305 | 360 | | |
| Total Dissolved Solids | | | mg/L | 910 | 910 | 840 | 1000 | 1100 | 920 | 1000 | 800 | 1000 | | | 530 | 820 | 1100 | 800 | 860 | 1120 | 999 | 908 | 1180 | | |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.0005 | mg/L | 0.00081 J | 0.00032 J | 0.00032 J | 0.002 U | 0.00028 J | 0.001 U | 0.002 U | 0.001 U | | | 0.001 U | 0.002 U | | | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Arsenic | 0.01 | 0.01 | mg/L | 0.0104 | 0.0038 | 0.0047 J | 0.0185 | 0.0201 | 0.0194 | 0.0126 J | 0.0038 J | | | 0.0015 U | 0.0015 U | | | 0.0021 J | 0.0022 J | 0.0018 U | 0.0021 | 0.0022 | 0.0024 | 0.0027 | |
| Barium | 2 | 2 | mg/L | 0.047 | 0.058 | 0.054 | 0.05 | 0.054 | 0.041 | 0.054 | 0.06 | | | 0.041 | 0.058 | | | 0.073 | 0.041 | 0.052 | 0.052 | 0.074 | 0.064 | 0.17 | |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Chromium | 0.1 | 0.1 | mg/L | 0.001 J | 0.002 U | 0.0011 J | 0.003 U | 0.0012 J | 0.002 U | 0.002 U | | | | 0.002 J | 0.0014 J | | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | |
| Cobalt | | 0.006 | mg/L | 0.0019 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Fluoride | 4 | 4 | mg/L | 0.8 J+ | 0.7 J | 0.7 | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J | 0.8 J+ | 0.9 J+ | 0.7 | 1.0 J | 1.0 | 0.9 J+ | 0.8 J+ | 1.0 | 0.9 | 0.8 J+ | |
| Lead | 0.015 | 0.015 | mg/L | 0.0001 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Lithium | | 0.04 | mg/L | 0.0017 J | 0.008 U | 0.0036 J | 0.0017 J | 0.0041 J | 0.0015 J | 0.0028 J | 0.0076 J | | | 0.008 U | 0.0025 J | | | 0.0066 J | 0.0032 J | 0.0052 J | 0.008 U | 0.008 U | 0.008 U | 0.021 | |
| Mercury | 0.002 | 0.002 | mg/L | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | | | 0.00007 U | 0.00007 U | | | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | |
| Molybdenum | | 0.1 | mg/L | 0.025 | 0.021 | 0.013 | 0.05 U | 0.01 | 0.012 | 0.018 | 0.021 | | | 0.021 | 0.023 | | | 0.02 | 0.017 | 0.012 | 0.012 | 0.02 | 0.015 | 0.013 | 0.01 |
| Selenium 326 + 327 | 0.05 | 0.05 | mg/L | 0.559 | 0.457 | 0.44 J+ | 0.531 | 0.418 | 0.422 | 0.448 | 0.37 | | | 0.376 J+ | 0.794 | | | 0.915 | 0.57 J+ | 0.57 J+ | | 0.503 | | 0.45 | |
| Selenium | 0.05 | 0.05 | mg/L | 0.518 | 0.43 | 0.418 | 0.493 | 0.428 | 0.396 | 0.4081 | 0.0032 J | | | 0.0071 | 0.011 | | | 0.015 | 0.023 | 0.0012 J | 0.011 | 0.0011 | 0.0042 | 0.011 | 0.00286 |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.005 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0.00062 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.71 | 1.7 | 1.6 | 1.01 | 0.35 | 1.11 | 1.78 | 4.01 | 1.1 | | | 5.49 | | | 1.76 | 1.16 | 1.15 | 0.47 | 1.31 | 1.14 | 2.02 | 3.75 |
| Oxidation Reduction Potential | | | millivolts | 79.8 | 375.9 | 6.1 | 83.3 | 6.6 | 69.9 | 23.3 | 8 | 70.9 | | | 79.2 | | | 70.2 | 237 | 33.6 | 35 | 97.9 | 234.5 | 25.8 | 18.2 |
| pH | | | SU | 7.56 | 7.27 | 7.21 | 7.33 | 7.55 | 7.23 | 7.4 | 7.46 | 7.35 | | | 7.82 | | | 7.65 | 7.23 | 7.35 | 7.54 | 7.38 | 7.6 | 7.16 | |
| Specific Conductivity | | | uS/cm | 1889 | 1787 | 1447 | 1777 | 1521 | 1705 | 1661 | 1151 | 1353 | | | 855 | | | 675 | 1511 | 1014 | 1561 | 1617 | 1130 | 1152 | 958.5 |
| Temperature | | | deg C | 17.22 | 20.6 | 10.86 | 10.9 | 10.46 | 13.4 | 17.21 | 8.44 | 20.2 | | | 10.8 | | | 12.4 | 20 | 12.6 | 17.62 | 9.41 | 20.4 | 11.95 | 21.9 |
| Turbidity | | | NTU | 1.56 | 1.29 | 0.58 | 5.38 | 0.41 | 2.23 | 1.02 | 1.01 | 2.21 | | | 0.51 | | | 0.19 | 0.75 | 0.41 | 0.86 | 0.73 | 0.15 | 1.25 | 1.41 |

Notes:
IDEM RCG - Indiana Department of Environmental Management's Remediation Closure Guidance Table A.5 Screening Levels - 2021 Revision

MCL - Maximum Contaminant Level
mg/L - milligrams per liter
SU - standard units
pCi/L - picoCuries per liter
uS/cm - microSiemens per centimeter
deg C - degrees Celsius
NTU - Nephelometric Turbidity Units

"U" - Indicates the result was not detected above the method detection limit (MDL) for the sample, the practical quantitation limit (PQL) is presented
"N" - Indicates the result is estimated.
"J" - Indicates the result is estimated and may be biased.
"J+" - Indicates the result is estimated and may be biased high.
"UJ" - Indicates the result was not detected above the MDL, the estimated PQL is provided
"R" - Indicates the result was identified as an outlier and removed from the statistical

**Table 2: Analytical Results for MW31 Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | SAMPLES | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | MW-31-181 | MW-31-06 | MW-31-08 | MW-31-10 | MW-31-12 | MW-31-14 | MW-31-16 | MW-31-18 | MW-31-20 | MW-31-22 | MW-31-24 | MW-31-26 | MW-31-28 | MW-31-30 | MW-31-32 | MW-31-34 | MW-31-36 | MW-31-38 | MW-31-40 | MW-31-42 | MW-31-44 | MW-31-46 | MW-31-48 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 1 | mg/L | 38 | 35 | 20 | 32 | 22 | 20 | 26 | 18 | 13 | 18 | | | 15 | 16 | 12 | 12 | 11 | 8.7 | 7.8 | 10.2 | 7.3 | |
| Calcium | | | mg/L | 230 | 260 | 140 | 250 | 210 | 210 | 240 | 140 | 150 | 170 | | | 110 | 120 | 110 | 130 | 110 | 110 | 110 | 150 | 150 | |
| Chloride | | | mg/L | 180 | 220 | 180 | 190 | 200 | 200 | 210 | 91 | 130 | | | | 110 | 120 | 110 | 120 | 110 | 110 | 110 | 110 | 105 | |
| Fluoride | 4 | 4 | mg/L | 0.18 J+ | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | | | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | 0.58 U | |
| pH | | | SU | 7.15 | 7.37 | 7.1 | 7.24 | 7.41 | 7.42 | 7.25 | 7.43 | 7.36 | 7.48 | 7.39 | 7.38 | 7.1 | 7.5 | 7.56 | 7.23 | 7.23 | 7.23 | 7.23 | 7.23 | 7.23 | |
| Sulfate | | | mg/L | 1,100 J+ | 900 | 700 | 740 | 730 | 690 | 840 | 580 | 450 | | | | 590 | 550 | 560 | 570 | 560 | 550 | 550 | 550 | 550 | |
| Total Dissolved Solids | | | mg/L | 1600 | 1400 | 1100 | 1200 | 1200 | 1100 | 1300 | 800 | 800 | | | | 1000 | 940 | 950 | 980 | 950 | 930 | 900 | 930 | 900 | |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0.006 | 0.006 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | |
| Arsenic | 0.01 | 0.01 | mg/L | 0.00064 J | 0.0017 J | 0.00061 J | 0.0015 J | 0.00053 J | 0.00074 J | 0.00078 J | 0.00084 J | | | | | 0.0017 J | 0.00054 J | 0.00051 J | 0.00078 J | 0.0015 | 0.0022 | 0.0012 | 0.0021 | | |
| Barium | 2 | 2 | mg/L | 0.078 | 0.079 | 0.056 | 0.062 | 0.1 | 0.089 | 0.068 | 0.068 | | | | | 0.035 | 0.046 | 0.0 | 0.11 | 0.054 | 0.065 | 0.051 | 0.064 | 0.053 | |
| Beryllium | 0.004 | 0.004 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Cadmium | 0.005 | 0.005 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Chromium | 0.1 | 0.1 | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | | | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | |
| Cobalt | | 0.006 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | | | 0.001 U | | 0.0003 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Fluoride | 4 | 4 | mg/L | 0.63 J | 0.58 U | 0.58 U | 0.58 U | 0.63 J | 0.63 J | 2.2 J | 2.31 J | 1.2 J | | | | 0.23 J | 0.58 U | 0.84 J | 0.71 J | 0.62 J | 0.67 J | 0.68 J | 0.61 J | 0.8 J | |
| Lead | 0.015 | 0.015 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| Lithium | | 0.04 | mg/L | 0.00073 J | 0.008 U | 0.008 U | 0.008 U | 0.0016 J | 0.0022 J | 0.0018 J | 0.008 U | | | | | 0.008 U | | 0.005 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | 0.008 U | |
| Mercury | 0.002 | 0.001 | mg/L | 0.00007 U | 0.00008 U | 0.00009 U | 0.00012 U | 0.00009 U | 0.00007 U | 0.00009 U | 0.00007 U | | | | | 0.00007 U | | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | 0.00007 U | |
| Molybdenum | | 0.1 | mg/L | 0.005 | 0.005 | 0.013 | 0.015 | 0.012 | 0.0011 J | 0.012 | 0.025 | | | | | 0.013 J | 0.026 | 0.02 | 0.021 | 0.0074 J | 0.01 | 0.013 | 0.0062 | 0.0052 | |
| Selenium 2% + SD | 5 | | mg/L | 0.79 | 0.82 | 0.53 | 0.58 | 0.75 | 0.58 | 0.55 | 0.8 | | | | | 0.64 | 0.71 | 0.49 | 0.48 | 0.71 | | 0.29 | | 0.15 | |
| Selenium | 0.05 | 0.05 | mg/L | 0.016 U | 0.002 U | 0.005 U | 0.005 U | 0.00033 J | 0.00021 J | 0.002 U | 0.005 U | 0.005 U | | | | 0.002 U | | 0.0011 J | 0.005 U | 0.005 U | 0.005 U | 0.002 U | 0.001 U | 0.001 U | |
| Thallium | 0.002 | 0.002 | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | | | | 0.001 U | | 0.001 U | 0.001 U | 0.00022 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | 0.51 | 0.24 | 0.47 | 0.36 | 0.11 | 0.31 | 0.16 | 0.14 | 0.59 | 0.16 | 0.71 | 0.2 | 0.09 | 0.21 | 4.5 | 0.2 | 0.4 | 0.21 | 0.29 | | | |
| Oxidation Reduction Potential | | | millivolts | 110 | 651 | 109.8 | 113.6 | 91.8 | 107.3 | 98.6 | 91 | 129.4 | 93.2 | 131.5 | 79.5 | 240.5 | 11.9 | 3.6 | 99.1 | 69.5 | 137.5 | 0.317 | | | |
| pH | | | SU | 6.48 | 7.16 | 6.7 | 6.24 | 6.46 | 6.82 | 6.75 | 6.79 | 7.16 | 6.78 | 7.19 | 7.61 | 7.4 | 6.75 | 6.86 | 7.22 | 8.21 | 7.84 | 7.6 | | | |
| Specific Conductivity | | | uS/cm | 1525 | 1734 | 1566 | 1716 | 1551 | 1561 | 1705 | 1405 | 1344 | 1370 | 1318 | 1405 | 1077 | 1308 | 1065 | 890 | 905 | 1094 | 1122 | 1301 | | |
| Temperature | | | deg C | 10.29 | 10.26 | 10.72 | 10 | 10.6 | 10.6 | 10.61 | 10.6 | 10.6 | 10.6 | 10.2 | 10.3 | 10.35 | 10.3 | 10.5 | 10.48 | 10.43 | 10.8 | 10.59 | 10.7 | | |
| Turbidity | | | NTU | 5.09 | 2.48 | 0.05 | 0.92 | 0.38 | 2.11 | 2.35 | 1.89 | 2.45 | 3.06 | 8.88 | 8.75 | 1.85 | 8.61 | 2.58 | 4.58 | 8 | 1.44 | 1.22 | | | |

Notes:
IDEM RCG - Indiana Department of Environmental Management Remediation Closure Guidance Table A-5 Screening Levels - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = milligrams per liter
SU = standard units
pCi/L = picocuries per liter
uS/cm = microSiemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units

"U" = Indicates the result was not detected above the method detection limit (MDL) for the sample. The quantitation limit (QL) is presented.
"J" = Indicates the result is estimated.
"J-" = Indicates the result is estimated and may be biased low.
"J+" = Indicates the result is estimated and may be biased high.
"UJ" = Indicates the analyte was not detected above the MDL. The estimated QL is provided.
"R" = Indicates the result was identified as an outlier and removed from the data set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW18 | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2016-07-13 | 2016-09-08 | 2016-11-09 | | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-07-12 | | 2017-08-23 | 2017-10-03 | | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-04-29 | 2019-11-07 | 2020-04-23 | 2020-10-23 | 2021-0 -20 | 2021-09-16 |
| | | | | N | N | FD | N | N | N | N | FD | N | N | FD | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | .8 | 3 5 | 1.9 | 1.8 | 1.3 | 1 | 0 77 | 1.2 | 1.2 | 1.5 | 1.9 | 1.9 | | 1 2 | 1.7 | 0.95 | 1.7 | 1 2 | 3.6 | 3.1 | 5.9 |
| Calcium | | | mg/L | 20 | 610 O | 370 | 360 | 330 | 280 | 210 | 280 | 290 | 300 | 380 J | 64 J | | 320 | 230 | 320 | 360 | 294 | 3 1 | 36 | 56 |
| Chlor de | | | mg/L | 7 | 39 | 17 | 17 | 9.3 | 5 | 4.3 | 10 | 10 | 11 | 23 | 23 | | 7.3 | 22 | 12 | 27 | 16.7 | 5 8 | 0 3 | 97 |
| Fluor de | 4 | 4 | mg/L | .047 J | 0 036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0.057 | 0.074 | 0.15 | 0.17 | .19 | 0.16 | 0.16 J- |
| pH | | | SU | 6.95 | 6 83 | | 6.7 | 6.88 | 7.11 | 6.6 | | 6.96 | 7 02 | | 6.91 | 7.2 | 7.21 | 6.54 | 6.71 | 7.18 | 6.96 | .1 | 10 36 O | 7.1 |
| Sulfate | | | mg/L | 760 J- | 1400 | 850 | 830 | 640 | 540 | 370 | 600 | 610 | 690 | 960 | 950 | | 670 | 550 | 780 | 920 | 679 | 65 | 1310 | 1160 |
| Total Dissolved Sol ds | | | mg/L | 300 | 2200 | 1500 | 1500 | 1200 | 1000 | 730 | 1100 | 1100 | 1300 | 1600 | 1500 | | 2400 | 1100 | 1400 | 1500 | 1130 | 50 | 1 0 | 2020 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 002 U | 0 00096 J | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0 002 U | 0 001 U | .001 U | 0 001 U | 0.001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .0014 J | 0 0023 J | 0 0014 J | 0.00091 | 0.0014 J | 0.005 U | 0 0015 J | 0.0021 J | 0.0021 J | 0.0011 J | | | 0.005 U | | 0.005 U | 0.00079 J | 0 005 U | 0 001 U | .001 U | 0 001 U | 0.001 U |
| Barium | 2 | 2 | mg/L | .038 | 0 047 | 0 041 | 0.039 | 0.037 | 0.024 | 0 021 | 0.051 | 0.052 | 0 055 | | | 0.048 | 0.035 | 0.037 | 0.039 | 0 05 | 0 033 | .053 | 0 0 | 0.057 |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | 0 0002 U | .0002 U | 0 0002 U | 0.0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | 8.1E-05 J | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | 0 0002 U | .0002 U | 0 0002 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0 00067 J | 0.00048 J | 0.0005 J | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0 002 U | 0 002 U | .002 U | 0 002 U | 0.002 U |
| Coba t | | 0.006 | mg/L | .001 U | 0 00023 J | 0 00047 J | 0.0002 J | 0.00024 J | 0.001 U | 0 00023 J | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.00028 J | 0 001 U | 0 001 U | .001 U | 0 001 U | 0.0011 |
| Fluor de | 4 | 4 | mg/L | .047 J | 0 036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0.057 | 0.074 | 0.15 | 0.17 | .19 | 0.16 | 0.16 J- |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0 00051 J | 0.00025 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.00067 J | | 0.001 U | 0.001 U | 0 001 U | 0 001 U | .001 U | 0 001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | .00096 J | 0 008 U | 0 008 U | 0.008 U | 0.00042 J | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0.008 U | | | 0.008 U | | 0.008 U | 0.008 U | 0 008 U | 0 008 U | .008 U | 0 008 U | 0.011 |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | | 0.0002 U | | 0.0002 U | 0.0002 U | 0 0002 U | 0 0002 U | .0002 U | 0 0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | .11 | 0.18 O | 0.14 O | 0.13 O | 0.094 | 0.1 | 0 1 | 0.1 | 0.11 | 0.1 | | | 0.097 | 0 085 | 0.057 | 0.062 | 0 076 | 0 071 | .079 | 0 082 | 0.1 |
| Radium 226 228 | 5 | | pCi/L | U | 0 803 | 0.474 | 0.449 | 0.581 U | 0.398 U | 0 384 U | 0.493 | 0.327 U | 0 629 | | | 0.373 U | 0.259 | 0.477 | 0.365 U | | 1.74 U | | 0 538 U | |
| Selenium | 0 05 | 0.05 | mg/L | .01 | 0 018 | 0 0065 | 0.0052 | 0.0099 | 0.011 | 0 0053 | 0.012 | 0.012 | 0 006 | | | 0.009 | 0 0084 | 0.015 | 0.015 | 0 012 | 0 018 | .03 | 0 0 2 | 0.028 |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | 0 001 U | .001 U | 0 001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .83 | 4.77 | | 5.93 | 7.52 | 8.86 | 7.79 | | 6.04 | 4 52 | | 5.32 | 6.5 | 8.49 | 3.78 | 7.01 | 2.95 | 5.6 | 6.58 | 6 82 | 5.39 |
| Ox dation Reduct on Potential | | | millivolts | 98.9 | 76.8 | | 28.7 | 106.8 | 97.9 | 209.2 | | 203.2 | 24.7 | | 121.9 | -129.6 | -51.6 | -36.6 | 129.2 | -41 1 | 241 3 | 320 6 | -6 3 | 56.8 |
| pH | | | SU | 6.95 | 6 83 | | 6.7 | 6.88 | 7.11 | 6.6 | | 6.96 | 7 02 | | 6.91 | 7.2 | 7.21 | 6.54 | 6.71 | 7.18 | 6.96 | .1 | 10 36 | 7.1 |
| Specif c Conductivity | | | uS/cm | 474 | 2362 | | 1740 | 1255 | 986 | 970 | | 1299 | 1414 | | 1760 | 905 | 1170 | 1230 | 1060 | 1338 | 995 | 921 | 1699 | 2 5 9 |
| Temperature | | | deg C | 6.3 | 20.1 | | 16 6 | 9.65 | 8.47 | 11.2 | | 17.9 | 19.8 | | 19.3 | 8.1 | 8.9 | 17.4 | 8.8 | 14.2 | 9.18 | 7 | 10 29 | 21. |
| Turbidity | | | NTU | 32 | 1 63 | | 2.38 | 3.05 | 4.44 | 2.48 | | 1.71 | 1 03 | | 4.16 | 4.59 | 0.71 | 1.29 | 4.55 | 2 04 | 1 33 | 8 | 2 8 | 3.7 |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW18B | | | | | | | | | | | | GAMW46 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-10 | 2018-10-25 | | 2019-04-29 | 2019-11-07 | 2020-04-23 | 2020-10-23 | 2021-0 -21 | 2021-09-17 | | | | 2018-06-13 | 2019-03-01 | 2019-04-17 | 2019-06-06 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2020-04-21 | 2020-10-19 | 2021-0 -27 | 2021-09-15 | |
| | | | | N | FD | N | N | N | N | N | N | FD | N | | | N | N | N | N | N | N | N | N | N | N | N | N | |
| **Appendix III Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 3 | 12 | 13 | 14 | 11 | 10.9 | 9 | 8 | 8.2 | 8 2 | | | 0 055 JO | 0.1 U | 0.033 J | 0.1 U | 0 032 J | 0.053 J | 0.043 J | 0.049 J | 0.1 U | 0.1 U | 0.1 U | 0.1 U | |
| Calcium | | | mg/L | 260 | 200 | 220 | 240 | 180 | 299 | 301 | 317 | 325 | 323 | | | 56 O | 14 | 28 | 25 J- | 25 | 25 | 23 | 27 | 24.5 | 22.7 | 29.1 | 29 3 | |
| Chlor de | | | mg/L | 50 | 140 | 140 | 170 | 140 | 117 | 11 | 112 | 85.8 | 86 3 | | | 8.4 O | 2.4 | 1.9 | | 1 8 | 1.6 | 1.6 | 1.6 | 1 6 | 1.3 | 2.1 | 2.1 | |
| Fluor de | 4 | 4 | mg/L | .77 J | 0.74 | 0.73 | 0.88 | 0.99 | 0.91 | 0 8 | 0.35 | 0.6 | 0 6 | | | 0 052 JO | 0.068 | 0.063 | | 0 065 | 0.06 | 0.079 J | 0.062 | 0 062 | 0.05 U | 0.078 | 0.11 | |
| pH | | | SU | 7.73 | | 6.86 | 7.15 | 7.68 | 7.21 | 7. 3 | 7 51 | | 7 3 | | | 7.93 | 8.17 | 8.23 | 7.52 | 8 15 | 7.9 | 7 81 | 7.77 | 8 64 | 8.67 | 8.36 | 8.16 | |
| Sulfate | | | mg/L | 100 | 1000 | 1100 | 1100 | 840 | 1220 | 12 0 | 1260 | 1100 | 1120 | | | 55 O | 34 | 30 | | 28 | 29 | 30 | 27 | 24.7 | 23 9 | 33 J | 31 8 | |
| Total Dissolved Sol ds | | | mg/L | 2100 | 2000 | 2000 | 2100 | 1500 | 2060 | 1830 | 33 0 | 1930 | 2010 | | | 260 O | 160 | 150 | | 130 | 150 | 140 J | 140 | 101 | 85 | 112 | 137 | |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | 0 002 UO | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | |
| Arsenic | 0 01 | 0.01 | mg/L | .0018 J | 0 0026 J | 0.0028 J | 0.0037 J | 0.0041 J | 0.0029 | 0 0025 | 0.0025 | 0.0028 | 0 0027 | | | 0 0014 JO | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.00086 J | 0.005 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | |
| Barium | 2 | 2 | mg/L | .048 | 0 035 | 0.039 | 0.039 | 0.024 | 0.041 | 0 032 | 0.0 1 | 0.028 | 0 029 | | | 0 027 O | 0.0028 J | 0.0059 | 0.0065 | 0 0054 | 0.0054 | 0.0049 J | 0.0059 | 0 0053 | 0.00 6 | 0.005 | 0.00 | |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | | 0 001 UO | 0.005 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.00054 J | 0.001 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | | 0 001 UO | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | | | 0 002 UO | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.0014 J | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | |
| Coba t | | 0.006 | mg/L | .00027 J | 0 00026 J | 0.00028 J | 0.00024 J | 0.00024 J | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | 0 0002 JO | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | |
| Fluor de | 4 | 4 | mg/L | .77 J | 0.74 | 0.73 | 0.88 | 0.99 | 0.91 | 0 8 | 0.35 | 0.6 | 0 6 | | | 0 052 JO | 0.068 | 0.063 | | 0 065 | 0.06 | 0.079 J | 0.062 | 0 062 | 0.05 U | 0.078 | 0.11 | |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | 0 001 UO | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | |
| Lithium | | 0.04 | mg/L | .025 | 0 015 | 0.016 | 0.023 | 0.015 | 0.026 | 0 03 | 0.037 | 0.031 | 0 028 | | | 0 008 UO | 0.04 U | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0.008 U | |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | | 0 0002 UO | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | |
| Molybdenum | | 0.1 | mg/L | .024 | 0 014 | 0.015 | 0.026 | 0.011 | 0.039 | 0 05 | 0.07 | 0.03 | 0 031 | | | 0 0031 JO | 0.01 | 0.01 U | 0.01 U | 0 01 U | 0.01 U | 0.0015 J | 0.01 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | |
| Radium 226 228 | 5 | | pCi/L | .7 | 1 28 | 1.46 | | | 1.7 U | | 2.1 | | | | | 0 384 UO | 0.486 U | 0.33 U | | 0 427 U | 0.505 U | 0.566 | | 1.7 U | | 1.28 U | | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | 0 001 JO | 0.025 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | | | 0 001 UO | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.00059 J | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .24 | | 0.29 | 0.92 | 0.36 | 0.18 | 0 35 | 0.25 | | 0.19 | | | 0.12 | 1.85 | 4.18 | 6.44 | 6 58 | 4.03 | 2.44 | 3.36 | 3.42 | .78 | 1.59 | 1.26 | |
| Ox dation Reduct on Potential | | | millivolts | 140.7 | | -103.4 | 109.2 | -144.8 | -77.7 | 15.9 | -10 5 | | 0.192 | | | -171.4 | 1.9 | 7.7 | 157 6 | 25.5 | 40.6 | 9.16 | -141.1 | 125 6 | 127 | 109.8 | -130 | |
| pH | | | SU | 7.73 | | 6.86 | 7.15 | 7.68 | 7.21 | 7. 3 | 7.51 | | 7 3 | | | 7.93 | 8.17 | 8.23 | 7.52 | 8 15 | 7.9 | 7.81 | 7.77 | 8 64 | 8.67 | 8.36 | 8.16 | |
| Specif c Conductivity | | | uS/cm | 311 | | 2147 | 1902 | 1475 | 1897 | 26 6 | 2 9 | | 2 7 3 | | | 367 | 155 | 161 | 179 | 153 | 153 | 152 | 132 | 208 | 175.1 | 238 2 | 238 | |
| Temperature | | | deg C | 5.39 | | 14.9 | 11 8 | 13.7 | 12.1 | 15.2 | 12.15 | | 15 8 | | | 11.4 | 8 | 9.1 | 11.1 | 13.2 | 14.2 | 14.8 | 11.7 | 8 3 | 13 5 | 10.7 | 15.1 | |
| Turbidity | | | NTU | 2.78 | | 3.58 | 3.21 | 3.14 | 2.35 | 3 28 | 19 | | 59 | | | 3.96 | 1.91 | 1.33 | 0.51 | 0 82 | 0.69 | 0.89 | 0.66 | 2.18 | 3.02 | 1.73 | 3.21 | |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW46B | | | | | | | | | | | | | GAMW52 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-06-13 | 2019-03-04 | 2019-04-17 | 2019-06-07 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2020-04-21 | 2020-10-19 | 2021-0 -27 | 2021-09-15 | 2018-09-10 | 2018-10-3 | 2019-05-09 | 019-11-1 | 2020-04-30 | 2020-10-22 | 2021-0 -16 | 2021-09-30 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | .05 JO | 0 05 J | 0 037 J | 0.047 J | 0.03 J | 0.05 J | 0 047 J | 0.046 J | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.34 | 0.17 | 0.077 J | 0.13 | 0.1 U | 0.1 | 0.1 | 0.1 |
| Calcium | | | mg/L | 25 O | 58 | 58 | 56 | 52 | 58 | 49 | 56 | 53.8 | 51 | 5 .3 | 51 | 75 | 59 | 52 | 72 | 48.3 | 71. | 59.9 | 62 5 |
| Chlor de | | | mg/L | O | 7.9 | 7.9 | | 7.2 | 8 | 7 1 | 6.9 | 5.5 | 6 | 5 5 | 5. | 34 | 9.1 | 5.5 | 37 | 8.2 | 9.1 | 18.7 | 15 9 |
| Fluor de | 4 | 4 | mg/L | .048 JO | 0 066 | 0 076 | | 0.072 | 0.069 | 0 073 J | 0.072 | 0.084 | 0 058 | 0 077 | 0.12 | 0.36 J | 0.3 | 0.25 J | 0.3 | 0.29 | 0.26 | 0.22 | 0 31 |
| pH | | | SU | 8.2 | 7.11 | 7.99 | 7.58 | 8.18 | 7.62 | 7.44 | 7.47 | 8.08 | 7 97 | 7 69 | 7.73 | 7.5 | 7.06 | 7.17 | 7.59 | 7.98 | 7.82 | 7.5 | 7 6 |
| Sulfate | | | mg/L | 29 O | 64 | 64 | | 64 | 68 | 65 | 64 | 58.8 | 60 5 | 61 6 J | 55 3 | 86 | 39 | 24 | 67 | 21.6 | 58.6 | 55.8 | 50.1 |
| Total Dissolved Sol ds | | | mg/L | 50 O | 260 | 290 | | 240 | 220 J | 250 | 240 | 209 | 197 | 190 | 2 3 | 400 | 250 | 240 | 350 | 205 | 336 | 269 | 276 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 UO | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .0015 JO | 0 0012 J | 0 00076 J | 0 005 U | 0.00091 J | 0 00095 J | 0 0013 J | 0.001 J | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Barium | 2 | 2 | mg/L | .0086 O | 0 027 | 0 026 | 0.025 | 0.023 | 0.024 | 0 021 | 0.025 | 0.025 | 0 023 | 0 025 | 0 023 | 0.039 | 0 019 | 0.015 | 0.02 | 0.013 | 0.01 | 0.011 | 0 01 |
| Bery lium | 0 004 | 0.004 | mg/L | .001 UO | 0 0011 | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.0011 | 0.0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | .001 UO | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0.001 U | 0.00024 J | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .0021 O | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Coba t | | 0.006 | mg/L | .00034 JO | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.00058 J | 0.00031 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Fluor de | 4 | 4 | mg/L | .048 JO | 0 066 | 0 076 | | 0.072 | 0.069 | 0 073 J | 0.072 | 0.084 | 0 058 | 0 077 | 0.12 | 0.36 J | 0.3 | 0.25 J | 0.3 | 0.29 | 0.26 | 0.22 | 0 31 |
| Lead | 0 015 | 0.015 | mg/L | .001 UO | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Lithium | | 0.04 | mg/L | .008 UO | 0 0017 J | 0 008 U | 0.008 U | 0.002 J | 0.008 U | 0 008 U | 0.003 J | 0.008 U | 0 008 U | 0 008 U | 0 008 U | 0.0017 J | 0.008 U | 0.008 U | 0.0025 J | 0.008 U | 0.008 U | 0.008 U | 0 008 U |
| Mercury | 0 002 | 0.002 | mg/L | .0002 UO | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | | 0.1 | mg/L | .0018 JO | 0 0024 J | 0 0022 J | 0.0025 J | 0.0028 J | 0.0028 J | 0 0025 J | 0.003 J | 0.0021 | 0 0022 | 0 0018 | 0 0018 | 0.005 J | 0.0035 J | 0.0016 J | 0.0017 J | 0.0012 | 0.0022 | 0.0021 | 0 0025 |
| Radium 226 228 | 5 | | pCi/L | .392 UO | 0.402 U | 0 308 U | | 0.427 U | 0.609 U | 0.408 U | | 1.68 U | | 1 65 U | | 0.796 | 1 1 | 0.53 U | | 1.64 U | | 0.23 U | |
| Selenium | 0 05 | 0.05 | mg/L | .0017 JO | 0 005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.0014 J | 0.0017 J | 0.0014 J | 0.0011 J | 0.001 U | 0.0011 | 0.0011 | 0 001 U |
| Thallium | 0 002 | 0.002 | mg/L | .001 UO | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00068 J | 0.001 U | 0 001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .59 | 0 08 | 1.9 | 0.3 | 1.4 | 1.25 | 0 31 | 0.3 | 0.17 | 1.1 | 0 6 | 0 2 | 0.48 | 0.21 | 6.42 | 2.2 | 6.9 | 0.35 | 0.91 | 0 56 |
| Ox dation Reduct on Potential | | | millivolts | 29.4 | 111.9 | -111.1 | -133 1 | -93.9 | -119.9 | 33.7 | -229 6 | -137.1 | - 0 5 | -101.3 | -2 1 | -30.3 | 85.1 | 108.2 | -43 2 | 165 6 | 227 8 | -23.1 | 0 38 |
| pH | | | SU | 8.2 | 7.11 | 7.99 | 7.58 | 8.18 | 7.62 | 7.44 | 7.47 | 8.08 | 7 97 | 7.69 | 7.73 | 7.5 | 7.06 | 7.17 | 7.59 | 7.98 | 7.82 | 7.5 | 7.6 |
| Specif c Conductivity | | | uS/cm | 211 | 268 | 294 | 282 | 274 | 284 | 260 | 242 | 405 | 358 9 | 351 | 388 | 0.896 | 448 | 308 | 320 | 389 | 6 1 | 5 5 | 501 |
| Temperature | | | deg C | 1.3 | 9 6 | 10.8 | 11 | 11.9 | 12.3 | 12.3 | 11.3 | 10 | 11 7 | 11 37 | 12 2 | 19 97 | 17.6 | 14.2 | 15.3 | 10.9 | 19 | 12 | 20 |
| Turbidity | | | NTU | .45 | 3 26 | 4 3 | 3.25 | 3.11 | 1.15 | 4 16 | 2.84 | 4.02 | 69 | 58 | 3 | 0.45 | 0.83 | 0.42 | 0.74 | 1.57 | 1.09 | 1.79 | 1 39 |

Notes:
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Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW52B | | | | | | | | GAMW53 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-11 | 2018-10-31 | 2019-05-09 | 2019-11-14 | 2020-04-30 | 2020-10-23 | 2021-0 -16 | 2021-09-30 | 2018-09-11 | 2018-10-30 | 2019-04-30 | 2019-11-14 | 2020-05-01 | 2020-10-23 | | 2021-0 -16 | 2021-09-30 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | .75 | 0 8 | 1 | 1.3 | 0.77 | 1.7 | 1 2 | 0.6 | 0.19 | 0.25 | 0 056 J | 0.13 | 0.1 U | 0.1 U | 0.1 U | 0.1 U | 0.1 U |
| Calcium | | | mg/L | 60 | 160 | 110 | 130 | 129 | 1 .2 | 9 .9 | 120 | 45 | 53 | 17 | 25 | 32 | 16.9 | 17 | 17.5 | 28.3 |
| Chlor de | | | mg/L | 30 | 470 | 380 | 370 | 496 | 2 .8 | 131 | 135 | 4.9 | 4.6 | 1.9 | 3.6 | 4.3 | 1.8 | 2 | 2. | 2 7 |
| Fluor de | 4 | 4 | mg/L | 0 U | 0.18 | 0 21 J | 0.23 | 0.26 | 0.26 | 0 2 | 0.38 | 0.17 J | 0.17 | 0 05 U | 0.05 U | 0.05 U | 0.05 U | 0.05 U | 0.05 U | 0.05 U |
| pH | | | SU | 8.3 | 7.1 | 7.42 | 7.34 | 7.6 | 7.29 | 7. 6 | 7.57 | 6 | 6.47 | 5.93 | 6.21 | 6.42 | | 5.88 | 5.76 | 6.17 |
| Sulfate | | | mg/L | 210 | 190 | 220 | 290 | 216 | 259 | 181 | 196 | 51 | 56 | 37 | 36 | 32 6 | 26 6 | 28 2 | 35.2 | 9. |
| Total Dissolved Sol ds | | | mg/L | 500 | 1300 | 1100 | 1100 | 1260 | 982 | 673 | 667 | 240 | 250 | 130 | 160 | 161 | 89 | 99 | 97 | 1 7 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 002 U | 0 002 U | 0.002 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.002 U | 0.002 U | 0 002 U | 0.00061 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .0013 J | 0 0016 J | 0 00083 J | 0 0012 J | 0.0011 | 0.001 U | 0 0011 | 0.0011 | 0.013 | 0.015 | 0 00097 J | 0 0018 J | 0.0015 | 0.001 | 0 001 | 0.0012 | 0 0012 |
| Barium | 2 | 2 | mg/L | .32 | 0 31 | 0 25 | 0.28 | 0.29 | 0.23 | 0.15 | 0.1 | 0.027 | 0.028 | 0 019 | 0.026 | 0.023 | 0.022 | 0 023 | 0.027 | 0 033 |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0 00042 J | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0 00029 J | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.0019 J | 0.0018 J | 0 0012 J | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U |
| Coba t | | 0.006 | mg/L | .001 U | 0 00032 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.00084 J | 0.00099 J | 0 0005 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Fluor de | 4 | 4 | mg/L | 0 U | 0.18 | 0 21 J | 0.23 | 0.26 | 0.26 | 0 2 | 0.38 | 0.17 J | 0.17 | 0 05 U | 0.05 U | 0.05 U | 0.05 U | 0 05 U | 0.05 U | 0 05 U |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.0014 | 0.00089 J | 0 00057 J | 0.00063 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| Lithium | | 0.04 | mg/L | .0041 J | 0 0031 J | 0 0033 J | 0.0071 J | 0.0086 | 0.008 U | 0 008 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U | 0.0021 J | 0.008 U | 0.008 U | 0 008 U | 0.008 U | 0 008 U |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | | 0.1 | mg/L | .014 | 0 015 | 0 0095 J | 0.0086 J | 0.016 | 0.015 | 0 013 | 0.011 | 0.012 | 0.015 | 0 0051 J | 0.011 | 0.0068 | 0.0066 | 0 0066 | 0.0052 | 0 0097 |
| Radium 226 228 | 5 | | pCi/L | .52 | 5 55 J | 2 63 | | 2.44 | | 1 05 U | | 0.547 U | 1.45 J | 0 344 U | | 1.9 U | | | 0 U | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0 005 U | 0 005 U | 0.005 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 0019 |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .44 | 0.1 | 0.15 | 0.19 | 0.09 | 1.02 | 0. .2 | 0.28 | 0.53 | 0.86 | 3.11 | 0.84 | 1.39 | | 1.16 | 1.99 | 0 92 |
| Ox dation Reduct on Potential | | | millivolts | 214.9 | -103.5 | 6 31 | -102.9 | -104.2 | -1 1 6 | -123.5 | 0.2 1 | -24.6 | -199.5 | 43.7 | -54.8 | 168 | | 122.8 | 111.7 | 9 .9 |
| pH | | | SU | 8.3 | 7.1 | 7.42 | 7.34 | 7.6 | 7.29 | 7. 6 | 7.57 | 6 | 6.47 | 5.93 | 6.21 | 6.42 | | 5.88 | 5.76 | 6.17 |
| Specif c Conductivity | | | uS/cm | 934 | 2005 | 1652 | 1353 | 2424 | 1 00 | 1159 | 110. | 307 | 400 | 125 | 155 | 260 | | 1 | 173 | 20 |
| Temperature | | | deg C | 7.26 | 16.6 | 15.3 | 16.1 | 15 3 | 17.1 | 15 8 | 18 | 21.3 | 20.1 | 11.4 | 17.5 | 13 3 | | 19 | 13 | 20. |
| Turbidity | | | NTU | .6 | 0 88 | 2 35 | 1.01 | 4.92 | 2.36 | 3 9 | 1.27 | 9.93 | 5.17 | 4.76 | 4.8 | 4.8 | | 2.19 | .56 | 51 |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW53B | | | | | | | | GAMW54 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-11 | 2018-10-3 | 2019-04-30 | 2019-11-14 | 2020-05-01 | 2020-10-23 | 2021-0 -16 | 2021-09-30 | 2018-09-10 | 2018-10-31 | 2019-04-30 | 2019-11-14 | 2020-05-04 | 2020-10-23 | 2021-0 -19 | 2021-10-01 |
| | | | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 2.5 | 3.1 | 2.2 | 0.73 | 3.3 | 2 5 | 1 9 | 2.7 | 0 84 | 0.77 | 0.39 | 0.37 | 0.42 | 0.72 | 0.5 | 0.63 |
| Calcium | | | mg/L | 80 | 190 | 150 | 140 | 180 | 136 | 1 .2 | 128 | 93 | 88 | 93 | 81 | 131 | 15 | 16 | 11 |
| Chlor de | | | mg/L | 90 | 85 | 81 | 74 | 107 | 8 .6 | 8 .8 | 66 | 15 | 10 | 10 | | 12.3 | 50.3 | 53.9 | 2 .6 |
| Fluor de | 4 | 4 | mg/L | .52 J | 0.46 | 0.51 | 0.7 | 0.46 | 0 58 | 0. | 0. .6 | 0.18 J | 0.17 | 0.14 | 0.28 | 0 18 | 0.28 | 0.2 | 0.3 |
| pH | | | SU | 7.3 | 7 35 | 7.41 | 7 52 | 7.48 | 7 39 | 7.28 | 7. .8 | 6 24 | 7 92 | 6.82 | 7.08 | 6 74 | 6.21 | 6.52 | 6.82 |
| Sulfate | | | mg/L | 30 | 510 | 340 | 320 | 488 | 327 | 30 | 295 | 190 | 150 | 190 | 76 | 284 | 3 .1 | 92 | 191 |
| Total Dissolved Sol ds | | | mg/L | 100 | 1100 | 900 | 770 | 1060 | 730 | 7 .8 | 802 | 500 | 400 | 470 | 50 | 618 | 689 | 735 | 506 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 002 U | 0.002 U | 0.002 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 0011 J | 0.00074 J | 0.00078 J | 0.001 J | 0 001 U | 0.0011 | 0.001 U | 0.001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .00079 J | 0 00083 J | 0.001 J | 0.0016 J | 0.0028 | 0 001 U | 0.001 U | 0 001 | 0 0024 J | 0.0028 J | 0.0022 J | 0.0045 J | 0 0045 | 0.0038 | 0.0075 | 0.02 |
| Barium | 2 | 2 | mg/L | .052 | 0 054 | 0.044 | 0.072 | 0.099 | 0 061 | 0.067 | 0 051 | 0 043 | 0.039 | 0.031 | 0.031 | 0 052 | 0.068 | 0.071 | 0.0 8 |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0 001 U | 0.00059 J | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U |
| Coba t | | 0.006 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 00053 J | 0.00052 J | 0.00062 J | 0.001 U | 0 001 U | 0.001 U | 0.0011 | 0.001 U |
| Fluor de | 4 | 4 | mg/L | .52 J | 0.46 | 0.51 | 0.7 | 0.46 | 0 58 | 0. | 0. .6 | 0.18 J | 0.17 | 0.14 | 0.28 | 0 18 | 0.28 | 0.2 | 0.3 |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | .0042 J | 0 0052 J | 0.005 J | 0.0066 J | 0.011 | 0 008 U | 0.008 U | 0 008 U | 0 008 U | 0.008 U | 0.008 U | 0.0023 J | 0 008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | .0083 J | 0 0075 J | 0.0098 J | 0.02 | 0.016 | 0 011 | 0.015 | 0 011 | 0 043 | 0.044 | 0.023 | 0.03 | 0 014 | 0.023 | 0.011 | 0.025 |
| Radium 226 228 | 5 | | pCi/L | .69 | 0.48 J | 1.26 | | 1.73 | | 1.21 U | | 0 5 | 1.08 J | 0.393 U | | 1 51 U | | 0.69 U | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0 005 U | 0.005 U | 0.005 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 0017 J | 0.0012 J | 0.0043 J | 0.0035 J | 0 0043 | 0.0029 | 0.00 | 0.001 U |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0.00049 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .26 | 0 8 | 0.36 | 0 09 | 0.12 | 0 65 | 0.39 | 0 2 | 0 61 | 1.41 | 0.72 | .26 | 0 65 | 1.0 | 0.68 | 0.29 |
| Ox dation Reduct on Potential | | | millivolts | 183.2 | -168 | 27.7 | -75 3 | -118.9 | -111 8 | -10 | -232 6 | 107.8 | -294 7 | 48.4 | -69 5 | 24.5 | 67.5 | 81.2 | -153 9 |
| pH | | | SU | 7.3 | 7 35 | 7.41 | 7 52 | 7.48 | 7 39 | 7.28 | 7. .8 | 6 24 | 7 92 | 6.82 | 7.08 | 6 74 | 6.21 | 6.52 | 6.82 |
| Specif c Conductivity | | | uS/cm | 954 | 1620 | 1160 | 870 | 1634 | 1091 | 1227 | 125 6 | 675 | 630 | 493 | .74 | 960 | 875 | 1097 | 782 |
| Temperature | | | deg C | 20.89 | 20.4 | 18.7 | 19.7 | 20.2 | 19.5 | 17 6 | 20 | 21.2 | 18.53 | 10 5 | 15.3 | 11.4 | 17 | 11.8 | 20.1 |
| Turbidity | | | NTU | 2.43 | 3 | 3.45 | 2 5 | 7.86 | .03 | 3.27 | 3 62 | 2 03 | 1 | 3.24 | 2.31 | 4.9 | 2. .5 | 6.79 | 3.79 |

Notes:
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mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW54B | | | | | | | | GAMW55 | | | | GAMW55R | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-10 | 018-10-3 | 2019-05-01 | 2019-11-15 | 020-05-0 | 2020-10-23 | 2021-0 -19 | 2021-10-01 | 2018-09-10 | | 2018-10-29 | | 2019-11-15 | 2020-05-05 | 2020-10-28 | 2021-0 -20 | 2021-10-01 |
| | | | | N | N | N | N | N | N | N | N | FD | N | FD | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | .6 | 6 5 | 5.9 | 6 | 2.7 | 2.2 | 3.1 | 3.1 | 1.9 | 1.9 | 1 8 | 1.8 | 1.1 | 0.96 | 0 95 | 0 87 | 1.7 |
| Calcium | | | mg/L | 210 | 220 | 200 | 240 | 214 | 195 | 236 | 190 | 260 | 250 | 270 | 260 | 180 | 169 | 170 | 237 | 197 |
| Chlor de | | | mg/L | 00 | 95 | 110 | 120 | 68.3 | 9 2 | 83 9 | 70 | 58 | 59 | 69 | 70 | 61 | 46 3 | 8 2 J- | 51. | ..1 |
| Fluor de | 4 | 4 | mg/L | .41 J | 0 52 | 0 59 | 0.58 | 0.54 | 0.59 | 0.53 | 0 52 | 0.51 J | 0 52 J | 0.47 | 0.47 | 0.62 | 0.52 | 0.63 | 0. 6 | 0.51 |
| pH | | | SU | 6.95 | 8.71 | 7 27 | 7 2 | 7.43 | 6.97 | 7.3 | 7 36 | | 6.77 | | 7.04 | 7.31 | 7.51 | 7.. 5 | 7 6 | 7.27 |
| Sulfate | | | mg/L | 750 | 730 | 710 | 720 | 470 | 38 | 891 | 501 | 590 | 600 | 630 | 620 | 480 | 345 | 351 | 867 | 389 |
| Total Dissolved Sol ds | | | mg/L | 600 | 1400 | 1500 | 1400 | 1000 | 878 | 1120 | 1030 | 1200 | 1300 | 1300 | 1300 | 950 | 846 | 789 | 8 2 | 9 8 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 002 U | 0 002 U | 0 002 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .0025 J | 0 0032 J | 0 0045 J | 0.005 | 0.0042 | 0 00 2 | 0.00 | 0 00 | 0.00683 J | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Barium | 2 | 2 | mg/L | .098 | 0 093 | 0 08 | 0.084 | 0.06 | 0.05 | 0.063 | 0 056 | 0.099 | 0 097 | 0 068 | 0.069 | 0.035 | 0.046 | 0.038 | 0 032 | 0.038 |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U |
| Coba t | | 0.006 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.0065 | 0 0058 | 0 0044 | 0.0044 | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Fluor de | 4 | 4 | mg/L | .41 J | 0 52 | 0 59 | 0.58 | 0.54 | 0.59 | 0.53 | 0 52 | 0.51 J | 0 52 J | 0.47 | 0.47 | 0.62 | 0.52 | 0.63 | 0. 6 | 0.51 |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | .0048 J | 0 0036 J | 0 0048 J | 0.0074 J | 0.008 U | 0 008 U | 0.008 U | 0 008 U | 0.0021 J | 0 0017 J | 0.008 U | 0.008 U | 0.0035 J | 0.008 U | 0.008 U | 0 008 U | 0.01 |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | .018 | 0 019 | 0 0085 J | 0.012 | 0.018 | 0.029 | 0.017 | 0 025 | 0.03 | 0 028 | 0 026 | 0.026 | 0.024 | 0.02 | 0.025 | 0 013 | 0.017 |
| Radium 226 228 | 5 | | pCi/L | 2.03 | 2.7 J | 1 82 | | 1.41 U | | 1. 3 | | 1.4 | 0 802 | 0.922 J | 1.24 J | | 1.58 U | | 1. 7 R | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0 005 U | 0 005 U | 0.005 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.0037 J | 0 0031 J | 0.0027 J | 0.0027 J | 0.0046 J | 0.0045 | 0.0028 | 0 0029 | 0.00 6 |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.00021 J | 0 001 U | 0.00023 J | 0.00022 J | 0.00022 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .42 | 2.12 | 0.42 | 0.31 | 0.1 | 0.72 | 0. .5 | 0 26 | | 1.73 | | 0.33 | 0.72 | 1.95 | 2.5 | 1.19 | 0. .7 |
| Ox dation Reduct on Potential | | | millivolts | 123.4 | -315.7 | -23.1 | -43.3 | 117.5 | -1 3.2 | -105.3 | -211.7 | | 21.6 | | -69.4 | -28.9 | 148.6 | 12 8 | 32 3 | -16.8 |
| pH | | | SU | 6.95 | 8.71 | 7 27 | 7 2 | 7.43 | 6.97 | 7.3 | 7 36 | | 6.77 | | 7.04 | 7.31 | 7.51 | 7.. 5 | 7 6 | 7.27 |
| Specif c Conductivity | | | uS/cm | 816 | 1983 | 1636 | 1310 | 0.63 | 1105 | 1626 | 1 9. | | 1493 | | 1574 | 1017 | 1270 | 99 | 1319 | 139.1 |
| Temperature | | | deg C | 7.6 | 17.29 | 15.5 | 15 8 | 15.6 | 16 2 | 1 3 | 17.3 | | 21.1 | | 19.4 | 16.7 | 12 8 | 17 6 | 11 3 | 20.6 |
| Turbidity | | | NTU | 2 | 1 64 | 4.49 | 1 67 | 4.31 | .6 | 6.7 | 3 5 | | 1.74 | | 0.66 | 2.26 | 2.4 | 1.2 | 2 35 | 1.59 |

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SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**N IPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW558 | | | | | | | | | | GAMW56 | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-11 | | 2018-10-29 | 2019-05-01 | 2019-11-15 | 2020-05-05 | | 2020-10-28 | 2021-0 -20 | 2021-10-01 | 2018-09-11 | 2018-10-26 | 2019-04-29 | 2019-11-15 | 020-05-0 | 2020-10-28 | 2021-0 -20 | 2021-10-0 |
| | | | | FD | N | N | N | N | FD | N | N | N | N | N | N | N | N | N | N | N | N |
| **Appendix I II Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Boron | | 4 | mg/L | 7.1 | 7.4 | 8 2 | 9.1 | 11 | 0.21 J | 10.9 J | 10 8 | 9 9 | 8 3 | 0.26 | 0.28 | 0.21 | 0.2 | 0.22 | 0.3 | 0.23 | 0.19 |
| Calcium | | | mg/L | 250 | 250 | 260 | 210 | 210 | 116 J | 219 J | 226 | 25 | 205 | 130 | 110 | 91 | 120 | 115 | 111 | 130 | 108 |
| Chlor de | | | mg/L | 220 | 220 | 190 | 170 | 150 | 119 | 119 | 120 J- | 120 | 79. | 3.1 | 2.4 | 3.2 | 2.1 | 2.8 | 3.2 J- | 2.9 | t 7 |
| Fluor de | 4 | 4 | mg/L | .29 J | 10 U | 0 25 | 0.31 | 0.31 | 0.33 | 0 32 | 0.28 | 0 3 | 0 3 | 1.2 J | 0.99 | 0.53 | 0.71 | 0.66 | 0.83 | 0.05 U | 1 |
| pH | | | SU | | 7.07 | 7.19 | 7.31 | 7.46 | | 7.45 | 7.56 | 7 7 | 7 | 6.82 | 7.17 | 6.83 | 7.06 | 7.05 | 7.07 | 7.05 | 7 09 |
| Sulfate | | | mg/L | 820 | 820 | 910 | 790 | 750 | 676 | 674 | 720 | 985 | 96 | 57 | 63 | 54 | 56 | 56.3 | 9 6 | 57 6 | 6 8 |
| Total Dissolved Sol ds | | | mg/L | 800 | 1900 | 1800 | 1700 | 1400 | 1400 | 1420 | 1380 | 1370 | 1120 | 470 | 480 | 420 | 440 | 456 | 390 | 80 | 379 |
| **Appendix IV Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .0014 J | 0 0011 J | 0 005 U | 0.005 U | 0.005 U | 0.0079 J | 0 001 UJ | 0.001 U | 0 001 U | 0 001 U | 0.019 | 0.022 | 0.011 | 0.0097 | 0.0076 | 0.0059 | 0.007 | 0 0018 |
| Barium | 2 | 2 | mg/L | .14 | 0.14 | 0 12 | 0.074 | 0.067 | 0.045 J | 0 067 J | 0.06 | 0 061 | 0 05 | 0.068 | 0.049 | 0.044 | 0.04 | 0 047 | 0.0 | 0.0 2 | 0 0 |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Coba t | | 0.006 | mg/L | .00034 J | 0.00028 J | 0 001 U | 0.001 U | 0.001 U | 0.0087 J | 0 001 UJ | 0.001 U | 0 001 U | 0 001 U | 0.0017 | 0.0053 | 0.0084 | 0.0081 | 0.0092 | 0.01 | 0.016 | 0 00 5 |
| Fluor de | 4 | 4 | mg/L | .29 J | 10 U | 0 25 | 0.31 | 0.31 | 0.33 | 0 32 | 0.28 | 0 3 | 0 3 | 1.2 J | 0.99 | 0.53 | 0.71 | 0.66 | 0.83 | 0.05 U | 1 |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Lithium | | 0.04 | mg/L | .0064 J | 0.0064 J | 0 0054 J | 0.0055 J | 0.0078 J | 0.008 U | 0 013 | 0.008 U | 0 008 U | 0 012 | 0.0034 J | 0.0039 J | 0.0023 J | 0.0053 J | 0 008 U | 0.008 U | 0.008 U | 0 008 U |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0 0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | | 0.1 | mg/L | .0057 J | 0.0055 J | 0 0055 J | 0.0046 J | 0.005 J | 0.009 J | 0 0053 J | 0.0062 | 0 0068 | 0 0058 | 0.013 | 0.0094 J | 0.0072 J | 0.0079 J | 0 0093 | 0.0093 | 0.0083 | 0 011 |
| Radium 226 228 | 5 | | pCi/L | .35 | 9.18 | 9 66 J | 2.08 | | 3.06 | 3 02 | | 1 . 9 U | | 0.728 | 0.698 J | | | 1.24 U | | 0.222 U | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.002 | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.0022 | 0.001 U | 0.0011 | 0 001 U |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| **Field Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | | 0.37 | 0 17 | 0.11 | 0.17 | | 0.1 | 1.37 | 0 65 | 0 26 | 0.99 | 0.28 | 1.3 | 0.34 | 0.21 | 1.88 | 1 | 0 37 |
| Ox dation Reduct on Potential | | | millivolts | | -129 5 | -115.9 | -57.5 | -137.9 | | -101.9 | -130.1 | -97 3 | -213.9 | -97.4 | -95.4 | 64 | -86.6 | -42.1 | -6 . | 85 9 | -133.7 |
| pH | | | SU | | 7.07 | 7 19 | 7.31 | 7.46 | | 7.45 | 7.56 | 7 7 | 7. | 6.82 | 7.17 | 6.83 | 7.06 | 7.05 | 7.07 | 7.05 | 7 09 |
| Specif c Conductivity | | | uS/cm | | 2109 | 2201 | 1967 | 1491 | | 2018 | 1588 | 1896 | 162 3 | 749 | 835 | 460 | 466 | 782 | 560 | 7 0 | 655 |
| Temperature | | | deg C | | 19 2 | 18 5 | 18.1 | 17 9 | | 17.1 | 17 2 | 15 3 | 18 7 | 17 | 15.7 | 8.7 | 14 | 9.6 | 1 . 7 | 9 | 17 2 |
| Turbidity | | | NTU | | 4.38 | 1 74 | 4.77 | 3.92 | | 4.11 | 3.22 | 78 | . 8 | 2.91 | 2.99 | 2.31 | 2.01 | 2.4 | 0.83 | 2.67 | 3. 8 |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

MCL= Maximum Contaminant Level
mg/L = mil igrams per iter
SU = standard units
pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the result is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

**Tab e 2: Analytical Results for MCU Monitoring Wells**
**NIPSCO Rollin M. Schahfer Generat ng Station**
**Wheatfield, Indiana**

| Analyte | MCL | IDEM RCG | Unit | GAMW56B | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 2018-09-11 | 2018-10-29 | 2019-04-29 | 2019-11-15 | 2020-05-05 | 2020-10-28 | 2021-0 -21 | 2021-10-0 |
| | | | | N | N | N | N | N | N | N | N |
| **Appendix I I I Parameters** | | | | | | | | | | | |
| Boron | | 4 | mg/L | .2 | 1 2 | 2 3 | 3.2 | 2.1 | 2 | 1 6 | 1. |
| Calcium | | | mg/L | 40 | 140 | 150 | 150 | 141 | 138 | 157 | 160 |
| Chlor de | | | mg/L | 0 | 36 | 55 | 64 | 50 8 | 5.7 J- | 70 8 | 73.7 |
| Fluor de | 4 | 4 | mg/L | .41 J | 0 33 | 0.4 | 0.44 | 0.55 | 0.51 | 0. 1 | 0. 6 |
| pH | | | SU | 6.95 | 6.91 | 7 08 | 7.21 | 7.52 | 7. 7 | 7 55 | 7.3 |
| Sulfate | | | mg/L | 70 | 130 | 260 | 360 | 280 | 275 | 277 | 268 |
| Total Dissolved Sol ds | | | mg/L | 740 | 690 | 830 | 860 | 753 | 696 | 738 | 802 |
| **Appendix IV Parameters** | | | | | | | | | | | |
| Antimony | 0 006 | 0.006 | mg/L | .002 U | 0 002 U | 0 002 | 0.002 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Arsenic | 0 01 | 0.01 | mg/L | .005 U | 0 005 U | 0 005 | 0.005 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Barium | 2 | 2 | mg/L | .076 | 0 072 | 0 082 | 0.076 | 0.071 | 0.066 | 0 071 | 0.081 |
| Bery lium | 0 004 | 0.004 | mg/L | .001 U | 0 001 U | 0 001 | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Cadmium | 0 005 | 0.005 | mg/L | .001 U | 0 001 U | 0 001 | 0.001 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Chromium | 0.1 | 0.1 | mg/L | .002 U | 0 002 U | 0 002 | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U |
| Coba t | | 0.006 | mg/L | .001 U | 0 001 U | 0 001 | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Fluor de | 4 | 4 | mg/L | .41 J | 0 33 | 0.4 | 0.44 | 0.55 | 0.51 | 0. 1 | 0. 6 |
| Lead | 0 015 | 0.015 | mg/L | .001 U | 0 001 U | 0 001 | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Lithium | | 0.04 | mg/L | .0051 J | 0 0035 J | 0 0044 | 0.0062 J | 0.0082 | 0.008 U | 0 008 U | 0.0091 |
| Mercury | 0 002 | 0.002 | mg/L | .0002 U | 0 0002 U | 0 0002 | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U |
| Molybdenum | | 0.1 | mg/L | .004 J | 0 003 J | 0 0031 | 0.0064 J | 0.0086 | 0.0075 | 0 007 | 0.0062 |
| Radium 226 228 | 5 | | pCi/L | .26 | 1 28 J | | | 2.11 | | 2 97 | |
| Selenium | 0 05 | 0.05 | mg/L | .005 U | 0 005 U | 0 005 | 0.005 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| Thallium | 0 002 | 0.002 | mg/L | .001 U | 0 001 U | 0 001 | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U |
| **Field Parameters** | | | | | | | | | | | |
| Dissolved Oxygen | | | mg/L | .29 | 0 26 | 0.79 | 0.18 | 0.09 | 1. .8 | 0 23 | 0.29 |
| Ox dation Reduct on Potential | | | millivolts | 102.8 | -44.4 | 31.8 | -105 7 | -105.5 | -123.9 | -110.5 | -21 .1 |
| pH | | | SU | 6.95 | 6.91 | 7.08 | 7.21 | 7.52 | 7. 7 | 7 55 | 7.3 |
| Specif c Conductivity | | | uS/cm | 928 | 1036 | 856 | 741 | 1179 | 772 | 1100 | 12 |
| Temperature | | | deg C | 13.9 | 13.8 | 11.6 | 12.9 | 11 8 | 12 9 | 12 | 1 .3 |
| Turbidity | | | NTU | 2.96 | 1.45 | 4.77 | 1.4 | 4.56 | 2.39 | 8.72 | .65 |

Notes:
DEM RCG= Ind ana Department of Environmental Management
Remed al on Closure Guidance Table A-6 Screening Leve s - 2021 Revision

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pCi/L = picoCuries per iter
uS cm = microSiemens per cen imeter
deg C = degrees Celsius
NTU = Nepholomet c Turbidity Units

U = Indicates the resu t was not detected above the method detection lim t (MDL) for the sample; the quanti ation lim t (RL) s prov ded.
J = Indicates the resul t is estimated.
J- = Indicates the result is estimated and may be biased low.
J = Indicates the resu t is estimated and may be biased high.

UJ = Indicates the result was not detected above the MDL, the estimated RL s provided.
O = Indicates te result was dentif ed as an outlier and removed from the da a set.

Prepared by: SLG
Checked by: DFSC
Reviewed by: MAH

**Table 3: General Groundwater Response Actions**
**CCR Unit Schahfer MSRB, MCWB, and DA**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| General Response Action | Comments | Corrective Measure Area | |
|---|---|---|---|
| | | Below CCR Unit | Downgradient of CCR Unit |
| Limited Action | Access Restrictions<br>Institutional Controls Use Restrictions<br>Environmental Monitoring<br>Monitored Natural Attenuation | X | X |
| Containment | Physical | X | |
| Removal | Extraction | X | X |
| Treatment | In-Situ<br>Ex-Situ | X | X |
| On-Site Disposal | Surface Water Discharge<br>Groundwater Discharge POTW Discharge | X | X |
| Off-Site Disposal | Permitted Disposal Facility | X | X |

Notes:
X - General Response Action Selected for further screening at the indicated Corrective Measure Area

Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

**Table 4 Initial Screening of Corrective Measure Alternatives / Process Options for Groundwater**
**CCR Unit Schahfer MSRB, MCWB, and DA**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| General Response Action | Remedial Technology | Process Option | Description | Screening Comments | Retained for Further Evaluation |
|---|---|---|---|---|---|
| Limited Action | Institutional Controls | Permitting and Notices | Administrative controls to restrict groundwater use. | Potentially implementable. | Yes |
| | | Access Restrictions | Physical restrictions or structures that prevent access by unauthorized persons. | Potentially implementable. | Yes |
| | Monitoring | Groundwater Monitoring | Periodic sampling and analyses of groundwater as a means of detecting unacceptable changes in constituent concentrations. | Potentially implementable. | Yes |
| | Use Restriction | Deed Restrictions | Administrative controls to provide future land use | Potentially implementable. | Yes |
| | Monitored Natural Attenuation | Monitored Natural Attenuation | Long-term monitoring of natural attenuation, including advection/dispersion/adsorption and biotic and abiotic degradation/transformation, of the inorganic constituents dissolved in groundwater; advection/dispersion/adsorption of inorganics. | Potentially implementable. | Yes |
| Containment | Physical Containment | Capping | Low-permeable cap covering the source area. | Potentially implementable, minimizes stormwater infiltration reducing the potential for plume migration. | No |
| | | Vertical Barriers | Vertical barriers including slurry walls and sheet piling placed around the area of contamination to contain groundwater. | Potentially implementable, reduces potential for plume migration. | No |
| Removal | Extraction | Extraction Wells | Use of extraction wells to extract contaminated groundwater and control groundwater movement within capture zone. | Potentially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration. | Yes |
| | | Extraction Trench | Removal of groundwater by pumping from extraction trenches. | Potentially implementable, results in physical removal of dissolved constituents of concern and reduces potential for plume migration. | Yes |
| *In Situ* Treatment | Stabilization/ Solidification | Solidification | Blending soil with grout to contain and immobilize contaminated groundwater. | Potentially implementable. Reduces potential for plume migration. | Yes |
| | Permeable Reactive Barrier | Vertical Reactive Barrier | Construction of vertical reactive barrier (e.g., zero-valent iron or carbon wall) to treat groundwater as it flows through the treatment zone. | Potentially implementable, results in physical removal of dissolved constituents of concern by treatment media changeout and reduces potential for plume migration. | Yes |
| *In Situ* Treatment | Chemical Addition/ Treatment | Chemical Precipitation | Increasing inorganic precipitation through chemical injection, either by changing site geochemical conditions (i e., pH, Eh, or ionic strength) or the addition of a co-precipitate that reacts with or acts as an adsorbent for the COC. | Non-permanent - does not remove contaminant mass. | No |
| | | Chemical Reduction | Injection of a reducing agent such as nanoscale or microscale zero valent iron into groundwater. Reduction reactions chemically convert constituents to non-hazardous or less toxic compounds that are more stable, less mobile, and/or inert. | Non-permanent - does not remove contaminant mass. | No |
| | Biological Treatment | Bioremediation | Use of microorganisms to oxidize/reduce metal contaminants directly or by the production of chemical oxidizing/reducing agents. | Not effective on all Site COCs. | No |
| *Ex Situ* Treatment | On-Site Treatment Facility | On-Site, Various Physical/chemical Process Options | Extracted groundwater is pumped to the on-Site treatment facility (physical/chemical treatment). | Potentially implementable to treat extracted contaminated groundwater. Treatment processes that could remediate the Site COCs include chemical/physical precipitation, activated carbon, and reverse osmosis. | Yes |
| Disposal | On-Site Discharge | On-Site Discharge to Surface Water | Treated groundwater discharged to local water body pursuant to updated NPDES permit. | Potentially implementable. Treated landfill leachate is currently discharged to a local water body pursuant to a NPDES permit. | Yes |
| | | On-Site Discharge to Groundwater | Treated groundwater discharged to groundwater within the Station Area. | Potentially implementable. | Yes |
| | | POTW Discharge | Discharge of treated groundwater to POTW under a discharge authorization. | No access to POTW. | No |
| | Off-Site Treatment | Off-Site Disposal/Treatment of Collected Groundwater | Transport and treatment of extracted groundwater at off-Site treatment facility. | Not retained due to higher safety concerns and much higher disposal costs. | No |

Notes
COC- constituent of concern
NPDES- National Pollutant Discharge Elimination System
POTW- publicly owned treatment works
NA- not applicable

Prepared by DFS
Checked by: KMC
Reviewed by: MAH

**Table 5: Summary of Groundwater Corrective Measure Alternatives
For Multi-Cell Unit (MSRB, MCWB, and DA)
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana**

| Alternative | | Key Components |
|---|---|---|
| A | Monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Environmental monitoring |
| B | Vertical barrier/hydraulic controls and monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Installation of hydraulic controls within existing vertical barrier wall<br>*Ex situ* treatment of pumped groundwater by an on-Site treatment facility<br>Disposal of treated groundwater to on-Site surface water or groundwater<br>NPDES permit or installation of injection wells and UIC permit<br>Long-term maintenance<br>Environmental monitoring |
| C | Pump-and-treat and monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Installation of monitoring wells or extraction trench immediately downgradient of the slurry wall<br>*Ex situ* treatment of pumped groundwater by an on-Site treatment facility<br>Disposal of treated groundwater to on-Site surface water or groundwater<br>NPDES permit or of injection wells and UIC permit<br>Long-term maintenance<br>Environmental monitoring |
| D | Vertical barrier and monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Installation of permeable reactive barrier – simple trench or funnel and gate<br>Long-term maintenance<br>Environmental monitoring |
| E | In-Situ Stabilization and monitored natural attenuation | Permitting<br>Implementation of deed restrictions<br>Stabilization of plume area using Portland cement, pozzolans, and/or bentonite<br>Environmental monitoring |

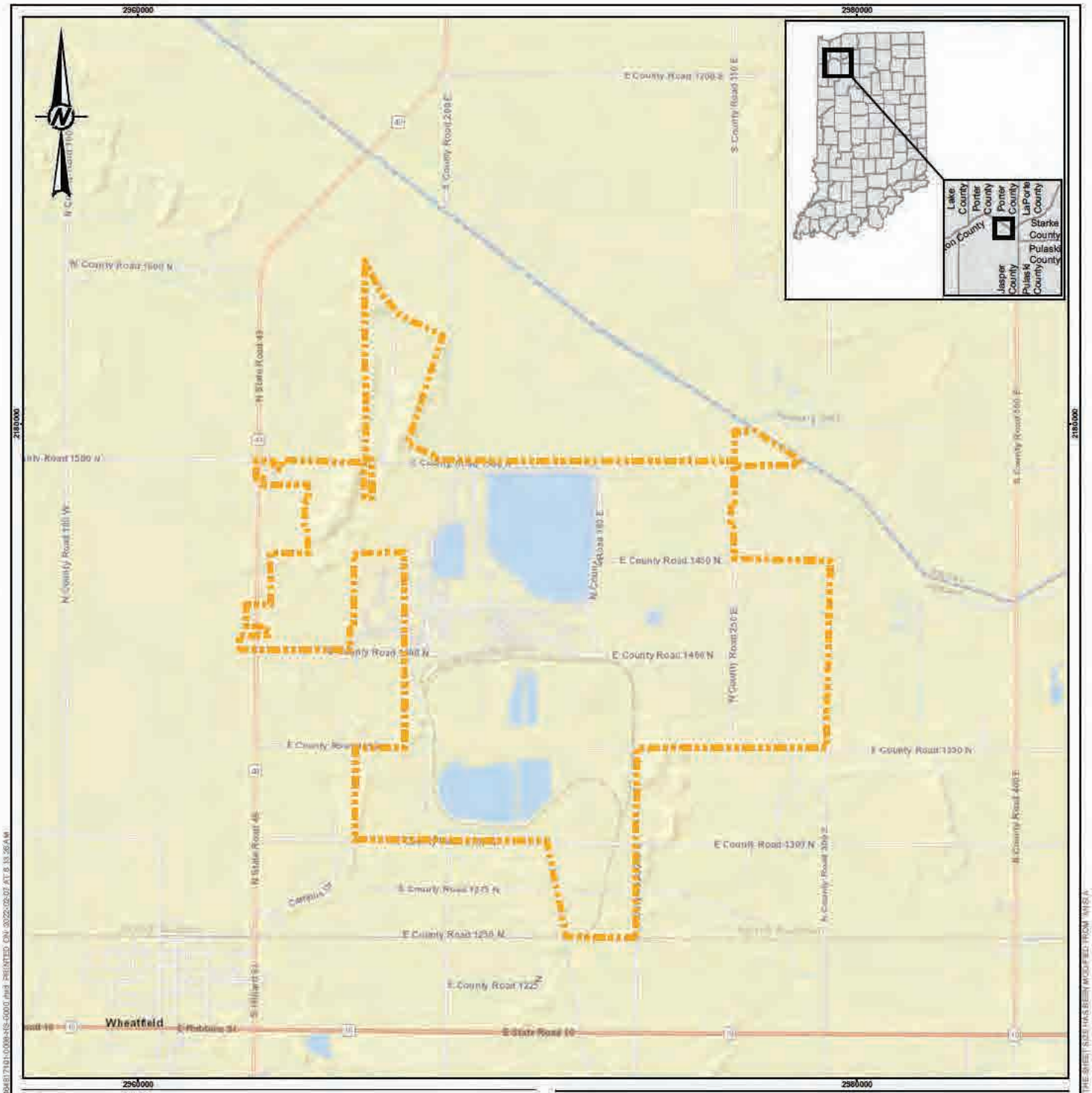
Note:
All alternatives also include impoundment closure by removal with associated dewatering

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG

**Table 6 Evaluation of Groundwater Corrective Measure Alternatives**
**For Multi-Cell Unit (MSRB, MCWB, and DA)**
**NIPSCO Rollin M. Schahfer Generating Station**
**Wheatfield, Indiana**

| | Corrective Measure Alternatives | | | | |
|---|---|---|---|---|---|
| | **Alternative A** | **Alternative B** | **Alternative C** | **Alternative D** | **Alternative E** |
| **Evaluation Criteria** | **Monitored natural attenuation** | **Vertical barrier/hydraulic controls and monitored natural attenuation** | **Pump-and-treat and monitored natural attenuation** | **Permeable reactive barrier and monitored natural attenuation** | **In-situ stabilization and monitored natural attenuation** |
| **Performance** | Initial review of site conditions indicates plume stability and confirmation of attenuation and immobilization, therefore, monitored natural attenuation could be effective in reducing the COC concentrations and mobility.<br><br>Relative short-term effectiveness varies depending on success of excavation to remove the source material and the low-permeability cap to reduce the mobility of residual COCs and potential for plume migration. Minimally effective short-term. Relatively effective long-term.<br><br>Functions through physical and chemical mechanisms. Contaminant mass is removed from groundwater through adsorption and co-precipitation, but is not removed from the environment and could be remobilized following changes to groundwater geochemistry. | Hydraulic controls generating an inward gradient within the existing vertical barrier (slurry wall) are an effective means of containing the source area and reducing/eliminating downgradient migration of cobalt-contaminated groundwater from the MCU.<br><br>Relatively effective both short-term and long-term. | Groundwater extraction of contaminated groundwater would be effective in reducing contaminant mass, volume, and mobility of dissolved COCs in groundwater.<br><br>Relatively effective both short-term and long-term. | A permeable reactive barrier installed with an appropriate treatment media placed downgradient of the MCU in the path of the cobalt groundwater plume would be effective at removing contaminant mass and preventing further downgradient migration. Contaminant mass is removed from the environment through media changeout.<br><br>Relatively effective both short-term and long-term. | In-situ stabilization of the groundwater plume would be effective at reducing mobility of contaminants. Contaminant mass is not removed, but is effectively permanently sequestered from the environment.<br><br>Relatively effective both short-term and long-term. |
| **Reliability** | Moderate to High. No O&M required, but long-term changes to geochemistry may impact attenuation. | Moderate. Some O&M required and potential treatment replacement. | Moderate, some O&M required and potential treatment replacement. | Moderate, some O&M required and potential treatment replacement. | High, no O&M required apart from monitoring. |
| **Ease of mplementation** | Already occurring. | Technology is common; some installation challenges expected based on existing slurry walls and proposed cap. | Technology is common, some installation and drilling challenges expected. | Technology is common; installation would be extremely challenging due to the high density of subsurface utilities to the north of the MCU. | Technology is common; installation would be extremely challenging due to the high density of subsurface utilities to the north of the MCU. |
| **Potential Impacts** | Minimal potential for impacts to surface water and off-site groundwater. | Hydraulic controls within an existing vertical barrier control cross media impacts outside of the wall. Some safety concerns related to drilling wells and operating treatment plant (e g., regenerating resin). | Groundwater collection and treatment will reduce long-term downgradient cross media impacts. Some safety concerns related to drilling wells and operating treatment plant (e.g., regenerating resin). | Groundwater treatment will reduce long-term downgradient cross media impacts. Safety concerns related to excavation for construction. | Subsurface agitation during installation could mobilize sorbed contaminants. Potential high pH conditions due to cement/bentonite required for stabilization. |
| **Time Requirements** | Relatively long, no active remediation. | Moderate, should be shorter than MNA alone. | Moderate, should be shorter than MNA alone. | Moderate, should be shorter than MNA alone, but longer than pump-and-treat as the PRB uses the natural groundwater gradient as a driving force compared to the higher induced gradient from the extraction wells. | Installation would be longer than any of the other alternatives, but implementation would then be substantially complete save for long-term monitoring. |
| **nstitutional Requirements** | Low permitting requirements | May require NPDES permit modifications or UIC permit, overall low permitting requirements | May require NPDES permit modifications or UIC permit, overall low permitting requirements | May require Underground Injection Control permit. | Low permitting requirements |

Prepared by: JBG
Checked by: CMJ
Reviewed by: JBG




**LEGEND**

Approximate Property Line

0 0.75 1.5

1 " = 0.75 miles Miles

**REFERENCE(S)**

SERVICE LAYER CREDITS: SOURCES: ESRI, HERE, GARMIN, USGS, NTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CH NA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, (C) OPENSTREETMAP CONTR BUTORS, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

**SITE LOCATION MAP**

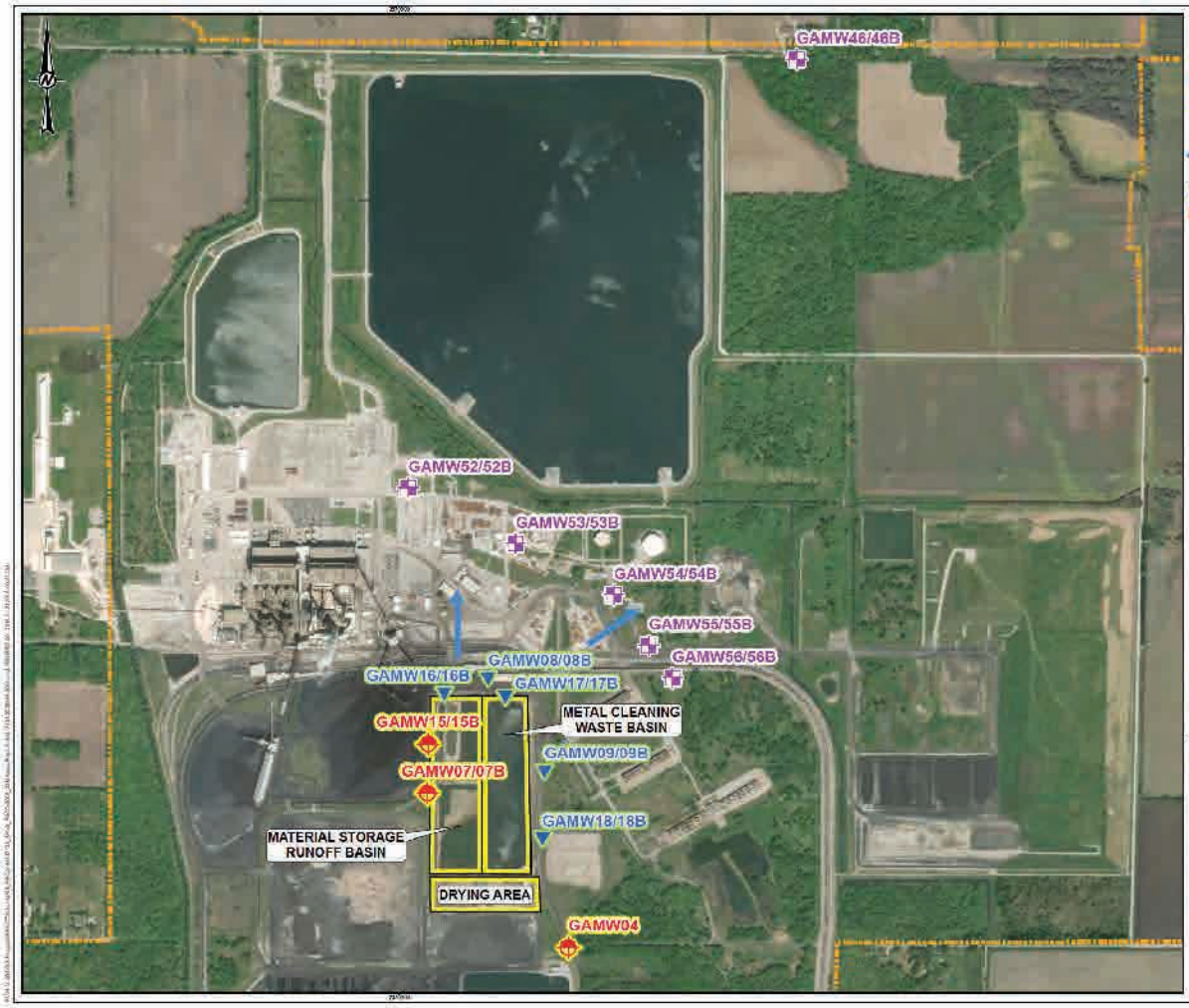
CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2/7/2022 |
| DESIGNED | DFS |
| PREPARED | SHL |
| REVIEWED | JSP |
| APPROVED | MAH |

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20447130 | A | 0 | 1 |

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI A




Legend

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

0 850 1,700

1" = 850 feet

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. ESRI (2012) - ARCGIS ONLINE - SOURCES: GEBCO, NOAA, CHS, OCEANWISE, DEPTH BY DEPTH, CARTOGRAPHY BY GEOGRAPHIC INFORMATION SYSTEMS, USGS, FEMA, INTERMAP, NRCAN, AND THE GIS USER COMMUNITY

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY

PROJECT

NORTHERN INDIANA PUBLIC SERVICE COMPANY
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

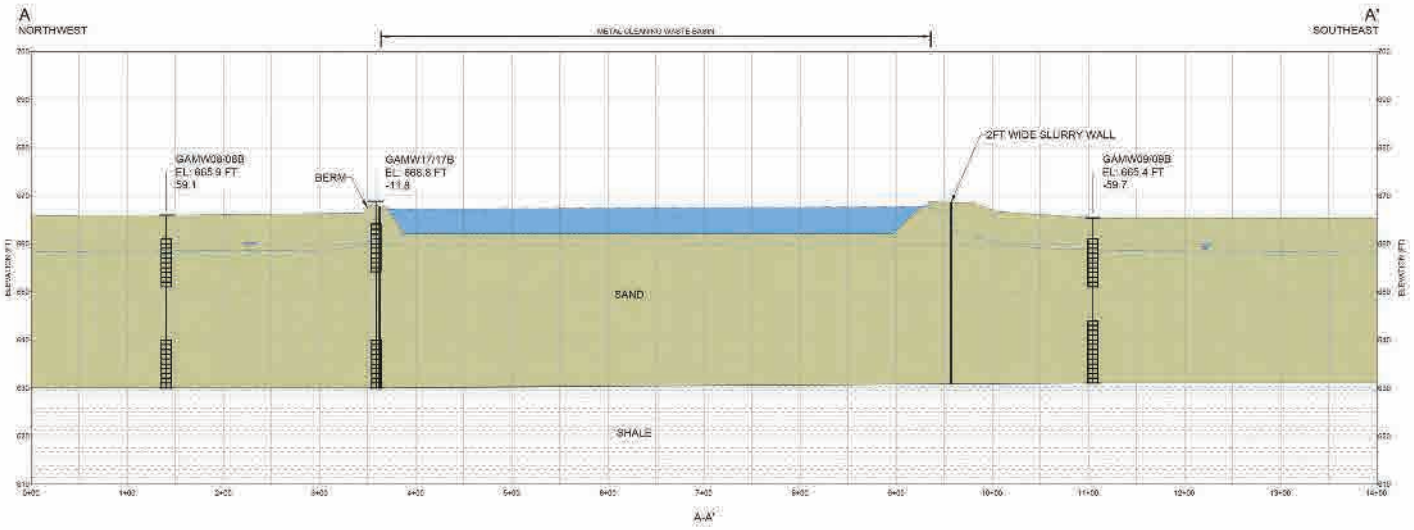
MONITORING WELL LOCATIONS
DRYING AREA, MSRB, AND MCWB

CONSULTANT

GOLDER
ASSOCIATES

| | |
|---|---|
| TYPED/MM/DD | 08/22/12 |
| DESIGNED | DPS |
| DRAWN | SR |
| REVIEWED | MAH |
| APPROVED | MHH |

PROJECT NO. 20447130 | CONTROL A | REV. 0 | FIGURE 2







VERTICAL SCALE: 0 10 20 FEET (1" = 10')

HORIZONTAL SCALE: 0 50 100 FEET (1" = 50')

LEGEND

GAMW-23/23B
EL: 663.8
59.1

- WELL ID
- GROUND SURFACE ELEVATION
- OFFSET DISTANCE
- C/L = CENTERLINE
- GROUNDWATER ELEVATION
- WELL SCREEN
- END OF BORING LOCATION

IMPOUNDMENT WATER

SAND

SHALE

NOTE(S)

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

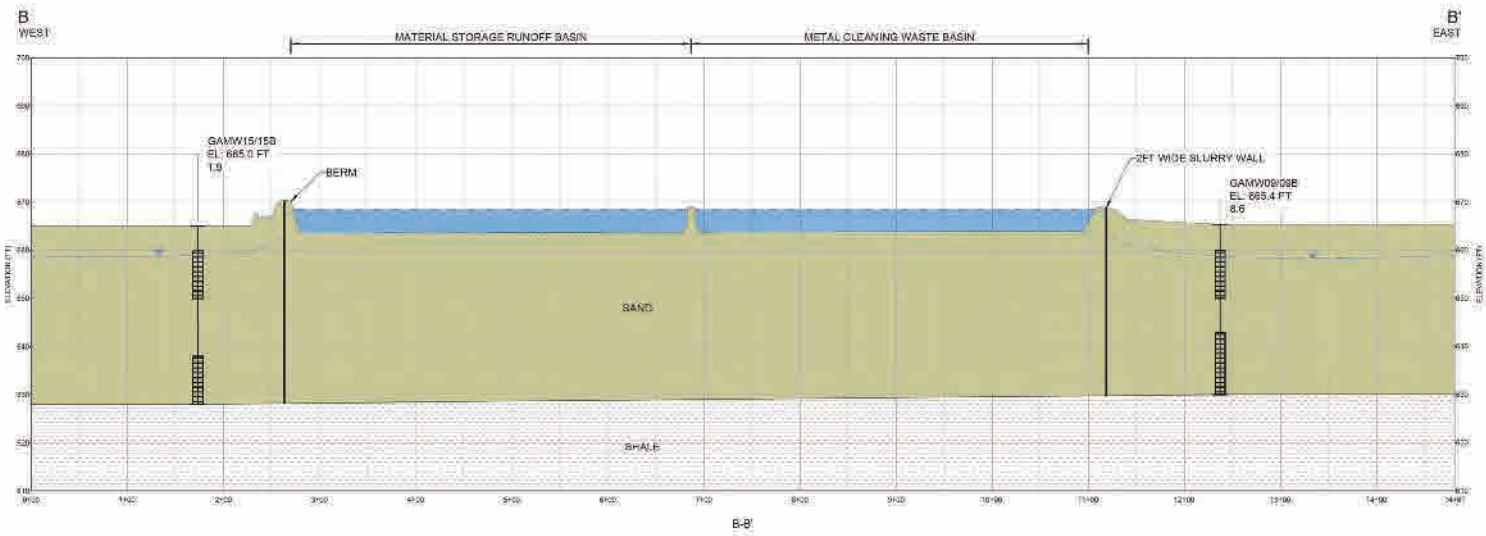
CONSULTANT
GOLDER
ASSOCIATES

| | |
|---|---|
| YYYY-MM-DD | 2020-03-27 |
| PREPARED | RWC |
| REVIEWED | RWC |
| REVIEWED | JBG |
| APPROVED | MAH |

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
**GEOLOGIC INTERPRETATION**
**CROSS SECTION A-A'**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20447130 | 03 | 0 | 3 |







VERTICAL SCALE: 0 10 20 FEET (1" = 10')

HORIZONTAL SCALE: 0 60 120 FEET (1" = 60')

LEGEND

GAMW-15/15B
EL. 665.0 ft
1.9

- WELL ID
- GROUND SURFACE ELEVATION
- OFFSET DISTANCE C/L = CENTERLINE
- GROUNDWATER ELEVATION
- WELL SCREEN
- END OF BORING LOCATION
- IMPOUNDMENT WATER
- SAND
- SHALE

NOTE(S)

1. GEOLOGIC CONTACTS ILLUSTRATED BETWEEN AND BELOW BORINGS ARE INFERRED AND SHOULD NOT BE INTERPRETED AS EXACT INDICATORS OF GEOLOGIC CONDITIONS AT, BETWEEN, OR BELOW BORINGS.

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY

CONSULTANT
GOLDER
MEMBER OF WSP

| | |
|---|---|
| YYYY-MM-DD | 2020-03-31 |
| DESIGNED | RWC |
| PREPARED | RWC |
| REVIEWED | JBC |
| APPROVED | MKH |

PROJECT
NORTHERN INDIANA PUBLIC SERVICE COMPANY
ROLLIN M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE
**GEOLOGIC INTERPRETATION**
**CROSS SECTION B-B'**

| PROJECT NO. | CONTROL | REV. | FIGURE |
|---|---|---|---|
| 20447130 | 03 | 0 | 4 |




LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Non-CCR Well
- Surface Water Location
- September 2021 Groundwater Elevation Contour (0.5 ft Interval)
- Slurry Wall
- Approximate Property Line
- CCR Units
- Inactive Retired Waste Disposal Basin
- Phase VII

0 500 1,000

1" = 958 feet

Feet

DATUM: NAVD 88

THIS FIGURE DEPICTS THE GROUNDWATER ELEVATION AS MEASURED AT MONITORING WELLS SCREENED WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER. NOTES REFERRED TO REPRESENT THE APPROXIMATE ELEVATION OF THE GROUNDWATER POTENTIOMETRIC SURFACE. THE POSTED DATA WERE CALCULATED FROM DEPTH TO WATER MEASUREMENTS MADE ON 9/9/2021 ON SEPTEMBER 9, 2021.

THE DIRECTION OF HORIZONTAL GROUNDWATER FLOW AT AND NEAR THE POTENTIOMETRIC SURFACE CAN BE GENERALLY INTERPRETED AS BEING PERPENDICULAR TO THE GROUNDWATER ELEVATION CONTOURS (SOLID OR INFERRED) REPRESENTED ON THIS DRAWING. BASED ON THE DATA USED HERE.

THE ACTUAL ELEVATION OF THE POTENTIOMETRIC SURFACE IS LIKELY MORE HETEROGENEOUS THAN SHOWN AND ACTUAL CONDITIONS MAY VARY. OTHER INTERPRETATIONS ARE POSSIBLE. THE EXTENT TO GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S):
1. "NS" INDICATES LOCATION WAS NOT SURVEYED.
2. "-" INDICATES NOT USED IN CONTOURING.

REFERENCE(S):
1. SURFACE WATER SOURCE: ESRI IMAGE SERVICE, ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY

CLIENT:
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT:
R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE:
**MONITORING WELL LOCATIONS AND GROUNDWATER ELEVATION CONTOURS (SEPTEMBER 2021)**

CONSULTANT:
GOLDER
MEMBER OF WSP

| | |
|---|---|
| DESIGNED: | DPS |
| PREPARED: | NH |
| REVIEWED: | EAA |
| APPROVED: | MAH |

PROJECT NO.: 20447130 | CONTROL: A | REV.: 0 | FIGURE: 5




0.015 September 2021 Cobalt Concentration (mg/L)

Assessment Monitoring Well

Background Monitoring Well

Downgradient Monitoring Well

Septemeber 2021 Shallow Cobalt Contour (mg/L)

Generalized Groundwater Flow Direction

Slurry Wall

CCR Units

FIGURE NARRATIVE

THIS FIGURE SHOWS THE INTERPRETED COBALT ISOCONCENTRATION CONTOURS WITH GROUNDWATER ANALYTICAL DATA FROM THE SEPTEMBER 2021 SAMPLING EVENT FOR SHALLOW WELLS SCREENED IN THE SURFICIAL AQUIFER. THE ISOCONCENTRATION CONTOURS ARE INTENDED TO DEPICT THE INTERPRETED DISTRIBUTION OF COBALT IN GROUNDWATER ON THE BASIS OF THE DATA PLOTTED. THE DISTRIBUTION IS LIKELY MORE HETEROGENEOUS THAN SHOWN, AND THE ACTUAL CONDITIONS WILL VARY. ALL INTERPRETATIONS ARE SUBJECT TO CHANGE AS DISTRIBUTION IS GROUNDWATER IS KNOWN TO VARY WITH TIME.

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.
2. ALL VALUES SHOWN ARE IN MILLIGRAMS PER LITER (MG/L).

REFERENCE(S)

1. DERIVED FROM SPECIFICATION SOURCE DATA, IMAGES, AND/OR OTHER ITEMS REFERENCED ON THIS SHEET, INCLUDING ITS TITLE, ISSUED BY DERIVED, AND ITS REVISED ELEMENTS.

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

R.M. SCHAHFER GENERATING STATION
WHEATFIELD, INDIANA

TITLE

COBALT ISOCONCENTRATION CONTOUR MAP
SEPTEMBER 2021 (SHALLOW)

CONSULTANT

GOLDER
MEMBER OF WSP

| | |
|---|---|
| DESIGNED | CMJ |
| PREPARED | AVJ |
| REVIEWED | DMJ |
| APPROVED | AMH |

PROJECT NO. 20447130 | CONTROL A | REV. 0 | FIGURE 6

**APPENDIX A**

# Volume Calculations

**Contaminant Mass Within Cobalt Plume**

Assumptions:

Plume extents are as shown on Figure 6.

Plume extends from average depth to water in September 2021 in nearby monitoring wells (GAMW-08, GAMW-17, etc…) at 8.50 feet bgs, to top of screened interval of deep wells (GAMW-08B, GAMW-17B, etc…) at 27.5 feet bgs for a asturated thickness of 18.37 feet.

Soil porosity estimated at 0.16 to 0.42.

Only the mass of contaminants in portions of the plume exceeding the GWPS (10 μg/l) estimated

1 cubic foot = 28.32 liters

Contour areas calculated by Surfer.

Volume calculation: Volume = Area between contours * saturated thickness * porosity

Mass calculation: Mass = volume * concentration * 28.32 liters/cubic foot * 1x10-9 kg/μg

| Contour Value (μg/l) | Area between contours ($ft^2$) | Volume at Porosity 0.16 ($ft^3$) | Volume at Porosity 0.42 ($ft^3$) | Cobalt Mass at Porosity 0.16 (kg) | Cobalt Mass at Porosity 0.42 (kg) |
|---|---|---|---|---|---|
| 10 | 19071 | 56052 | 147137 | 0.017 | 0.046 |
| 11 | 14287 | 41994 | 110233 | 0.014 | 0.037 |
| 12 | 10726 | 31527 | 82757 | 0.012 | 0.030 |
| 13 | 8256 | 24265 | 63695 | 0.010 | 0.025 |
| 14 | 7753 | 22788 | 59819 | 0.010 | 0.025 |
| 15 | 3611 | 10613 | 27858 | 0.005 | 0.013 |
| 16 | 536 | 1576 | 4137 | 0.001 | 0.002 |
| 17 | 472 | 1389 | 3645 | 0.001 | 0.002 |
| 18 | 75 | 221 | 581 | - | - |
| | | | **Total** | **0.07** | **0.18** |

**Volume of impacted material below the CCR Unit**

Assumptions:

Entire remaining volume of water within the slurry walls after excavation is impacting.
Area is estimated by the combined area of the three impoundments (Figure 6).
Depth is estimated by the approximate saturated thickness outside the slurry walls (Figure 3).

| | | | |
|---|---|---|---|
| Area | 36.2 acre | (A) | (Wood 2019) |
| Saturated depth | 32 feet | (D) | (Golder 2017) |

Estimated volume of impacted material was calculated using the following formula:

$Volume = A*D = V_1$ 1 acre = 43560 $ft^2$

$V_1$ 1158 acre-ft

$V_1$ 5.0E+07 $ft^3$

**Volume of impacted material downgradient of the CCR Unit**

Assumptions:

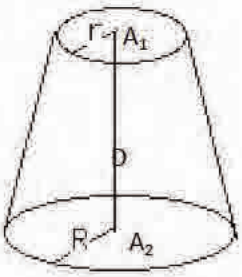
The volume is estimated by the volume with boron concentrations greater than 4 mg/L.
Plume areas are calculated based on the 4 mg/L contours displayed on Figure 6 and Figure 7.

| | | | |
|---|---|---|---|
| Shallow plume area | 21.75 acre | | |
| | 9.474E+05 $ft^2$ | (A1) | |
| Deep plume area | 87.40 acre | | |
| | 3.807E+06 $ft^2$ | (A2) | |
| Saturated depth | 32 feet | (D) | (Golder 2017) |
| Assumed effective porosity | 0.3 | (n) | (Golder 2017) |

The plume area were approximated as circles, and the volume of impacted material was estimated as a frustrum using the following formula:

$Volume = \pi*D/3*(R^2 + Rr + r^2) = V_2$

$r = (A_1/\pi)^{1/2}$, $R = (A_2/\pi)^{1/2}$




r 549.2 ft

R 1101 ft

$V_2$ 7.10E+07 $ft^3$

$V_2$ 1629 acre-ft

Estimated volume of impacted groundwater was calculated using the following forumula:

$Volume = V_2*n = V_{water}$

$V_{water}$ 2.13E+07 $ft^3$

$V_{water}$ 1.59E+08 gallons

Prepared by: DFS
Checked by: BPC
Reviewed by: JBG

Golder Associates. Groundwater Monitoring Program Implementation Manual, October 2017
Wood, 2019. Multi-Cell Unit Surface Impoundments (CCR Final Rule) Draft Closure Application. March 8, 2019.

**APPENDIX B**

# Slug Test Data and Calculations

**Appendix B**
**HYDRAULIC CONDUCTIVITY TESTING RESULTS**



| Well | Date | Screened Interval | Type | Test Duration | Test Number | Hvorslev Method | | Bouwer and Rice Method | | van der Kamp Method | | Hvorslev/Bouwer and Rice Arithmetic Mean | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | cm/sec | ft/day | cm/sec | ft/day | cm/sec | ft/day | cm/sec | ft/day |
| GAMW03 | 7/7/2016 | 5-15 | Transducer (Rising) | <2 min | 1 | 7.44E-03 | 2.11E+01 | 4.99E-03 | 1.42E+01 | n/a | n/a | 6.22E-03 | 1.77E+01 |
| | | | | | 2 | 7.45E-03 | 2.11E+01 | 5.22E-03 | 1.48E+01 | n/a | n/a | 6.34E-03 | 1.80E+01 |
| GAMW13 | 7/7/2016 | 5-15 | Transducer (Rising) | <2 min | 1 | 5.75E-02 | 1.63E+02 | 3.91E-02 | 1.11E+02 | n/a | n/a | 4.83E-02 | 1.37E+02 |
| | | | | | 2 | 6.50E-02 | 1.84E+02 | 4.81E-02 | 1.36E+02 | n/a | n/a | 5.66E-02 | 1.60E+02 |
| GAMW15 | 7/7/2016 | 5-15 | Transducer (Rising) | <2 min | 1 | 2.59E-02 | 7.34E+01 | 1.63E-02 | 4.63E+01 | n/a | n/a | 2.11E-02 | 5.99E+01 |
| | | | | | 2 | 1.11E-02 | 3.15E+01 | 1.08E-02 | 3.05E+01 | n/a | n/a | 1.10E-02 | 3.10E+01 |
| GAMW19 | 7/7/2016 | 6-16 | Transducer (Rising) | <2 min | 1 | 3.70E-02 | 1.05E+02 | 2.25E-02 | 6.38E+01 | n/a | n/a | 2.98E-02 | 8.44E+01 |
| | | | | | 2 | 1.01E-01 | 2.87E+02 | 6.85E-02 | 1.94E+02 | n/a | n/a | 8.48E-02 | 2.41E+02 |
| **Average Shallow (515 ftbgs)** | | | | | | **3.90E-02** | **1.11E+02** | **2.69E-02** | **7.63E+01** | **n/a** | **n/a** | **3.30E-02** | **9.35E+01** |
| GAMW03B | 7/6/2016 | 27-37 | Transducer (Falling) | <2 min | 1 | 6.78E-03 | 1.92E+01 | 5.81E-03 | 1.65E+01 | n/a | n/a | 6.30E-03 | 1.79E+01 |
| | | | | | 2 | 4.30E-03 | 1.22E+01 | 4.79E-03 | 1.36E+01 | n/a | n/a | 4.55E-03 | 1.29E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 5.65E-03 | 1.60E+01 | 6.42E-03 | 1.82E+01 | n/a | n/a | 6.04E-03 | 1.71E+01 |
| | | | | | 2 | 1.47E-02 | 4.16E+01 | 1.25E-02 | 3.55E+01 | 1.49E-02 | 4.22E+01 | 1.36E-02 | 3.86E+01 |
| GAMW13B | 7/7/2016 | 25-35 | Transducer (Falling) | <2 min | 1 | 8.48E-03 | 2.40E+01 | 9.27E-03 | 2.63E+01 | n/a | n/a | 8.88E-03 | 2.52E+01 |
| | | | | | 2 | 8.09E-03 | 2.29E+01 | 9.27E-03 | 2.63E+01 | n/a | n/a | 8.68E-03 | 2.46E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 1.11E-02 | 3.15E+01 | 1.16E-02 | 3.30E+01 | 2.73E-02 | 7.74E+01 | 1.14E-02 | 3.23E+01 |
| | | | | | 2 | 1.06E-02 | 3.00E+01 | 1.08E-02 | 3.06E+01 | 1.06E-02 | 3.01E+01 | 1.07E-02 | 3.03E+01 |
| GAMW15B | 7/7/2016 | 27.7-37.7 | Transducer (Falling) | <2 min | 1 | 4.50E-03 | 1.28E+01 | 3.45E-03 | 9.79E+00 | n/a | n/a | 3.98E-03 | 1.13E+01 |
| | | | | | 2 | 1.03E-02 | 2.91E+01 | 8.75E-03 | 2.48E+01 | 9.53E-03 | 2.70E+01 | 9.53E-03 | 2.70E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 1.17E-02 | 3.32E+01 | 1.06E-02 | 3.02E+01 | 1.24E-02 | 3.50E+01 | 1.12E-02 | 3.17E+01 |
| | | | | | 2 | 1.06E-02 | 3.02E+01 | 9.79E-03 | 2.77E+01 | 1.69E-02 | 4.80E+01 | 1.02E-02 | 2.90E+01 |
| GAMW19B | 7/7/2016 | 23-33 | Transducer (Falling) | <2 min | 1 | 1.37E-02 | 3.88E+01 | 1.44E-02 | 4.09E+01 | n/a | n/a | 1.41E-02 | 3.99E+01 |
| | | | | | 2 | 6.82E-03 | 1.93E+01 | 6.31E-03 | 1.79E+01 | n/a | n/a | 6.57E-03 | 1.86E+01 |
| | | | Transducer (Rising) | <2 min | 1 | 1.84E-02 | 5.21E+01 | 1.83E-02 | 5.18E+01 | 1.29E-02 | 3.67E+01 | 1.84E-02 | 5.20E+01 |
| | | | | | 2 | 1.21E-02 | 3.43E+01 | 1.03E-02 | 2.91E+01 | 1.21E-02 | 3.43E+01 | 1.12E-02 | 3.17E+01 |
| **Average Deep (2535 ftbgs)** | | | | | | **9.86E-03** | **2.80E+01** | **9.52E-03** | **2.70E+01** | **1.46E-02** | **4.13E+01** | **9.69E-03** | **2.75E+01** |

**Notes:**
ft/day = feet per day
cm/sec = centimeters per second
n/a = not analyzed

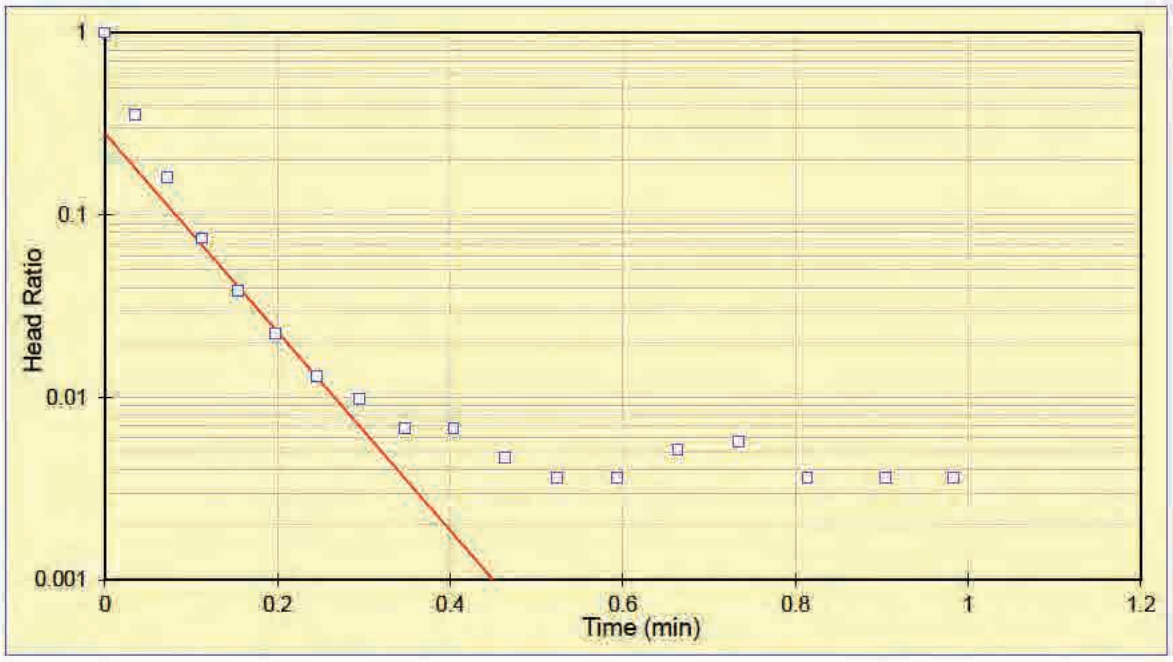
Prepared by: DFS
Checked by: KMC
Reviewed by: MAH

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 7.44E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.11E+01 | ft/day |
| $t_2$ = | 0.45 | | | |
| $h_1/h_0$ = | 0.28 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/25/2016

# BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

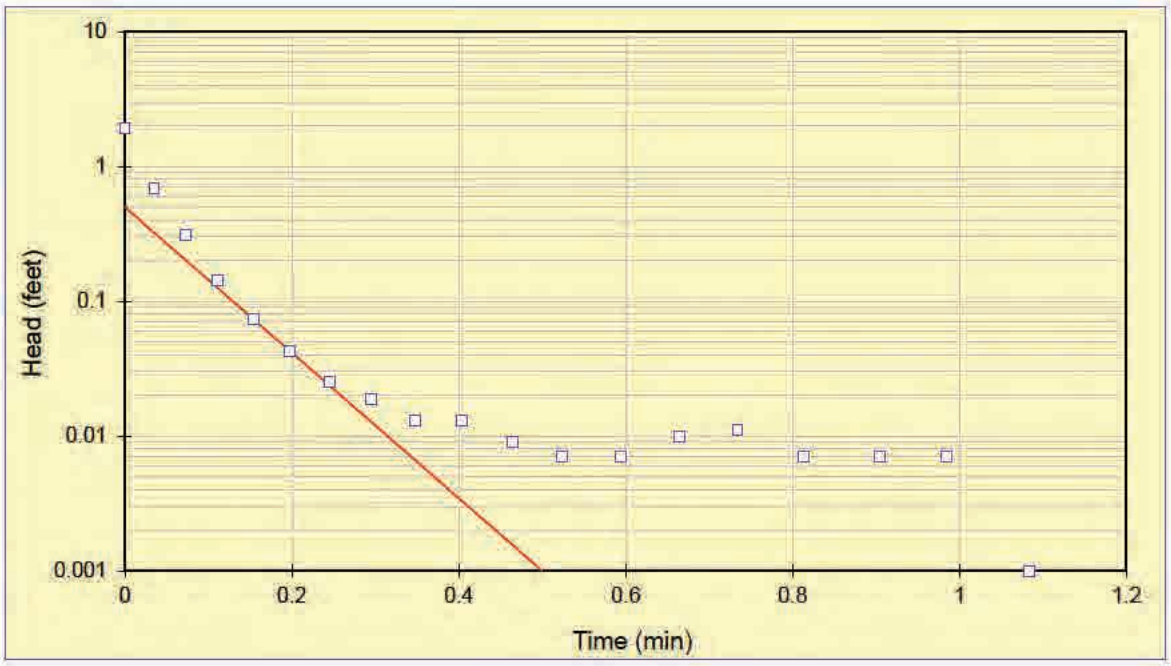
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.28 |
| $y_0$ = | 0.50 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 4.99E-03 | cm/sec |
| K= | 1.42E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

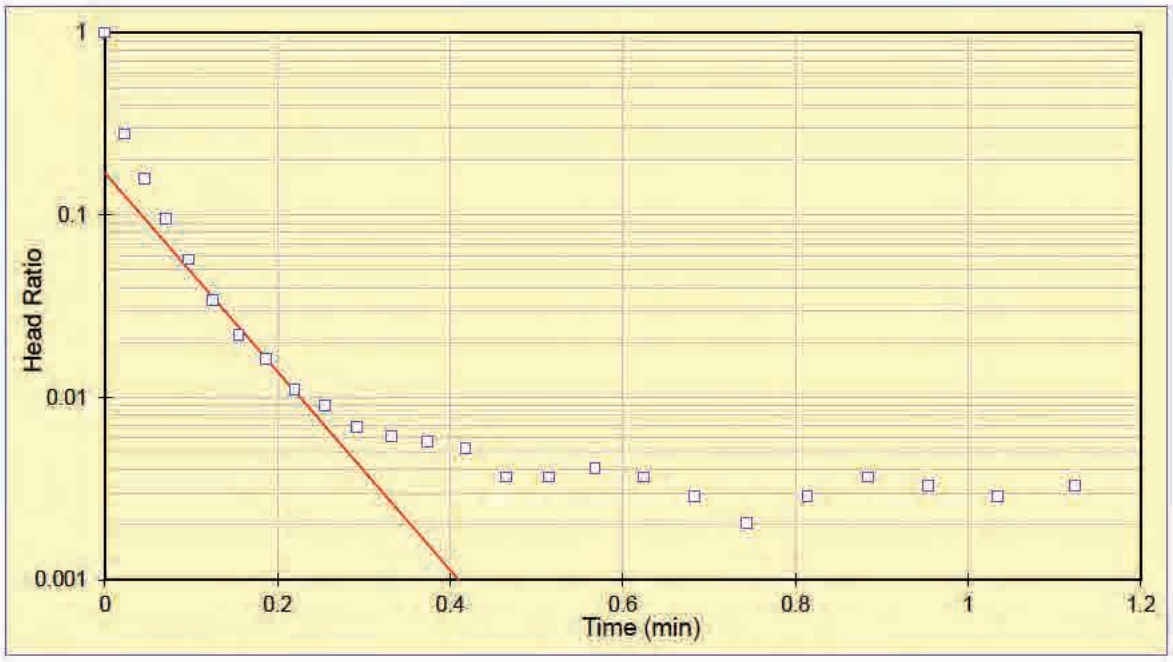
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 7.45E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.11E+01 | ft/day |
| $t_2$ = | 0.41 | | | |
| $h_1/h_0$ = | 0.17 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

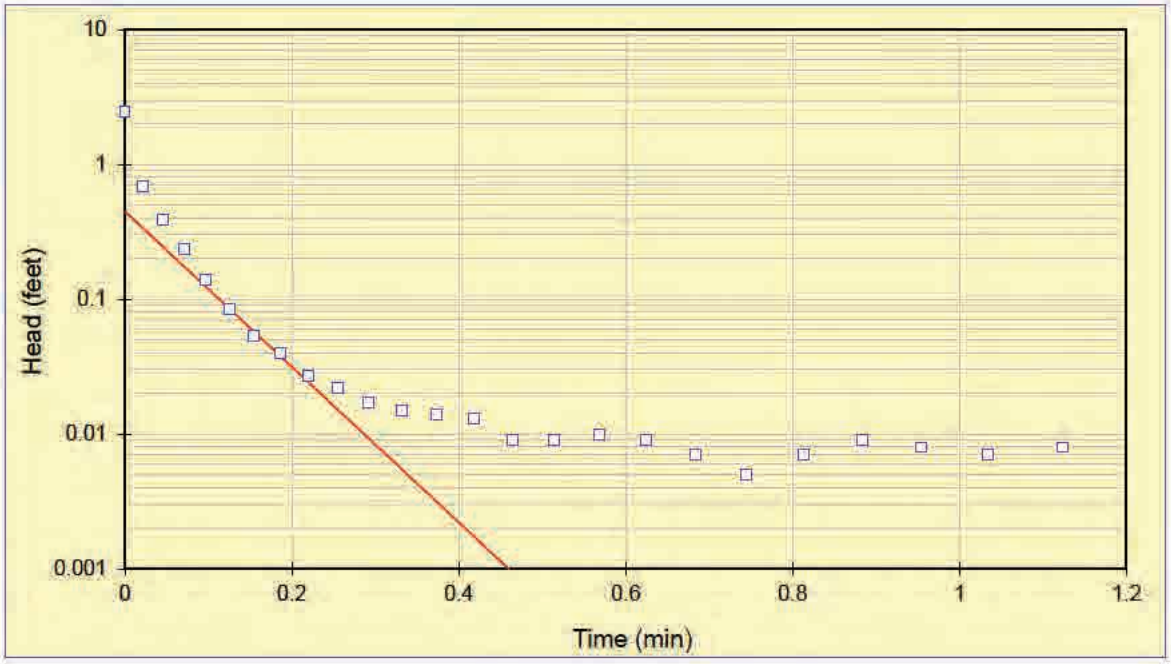
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.23 |
| $y_0$ = | 0.45 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 5.22E-03 | cm/sec |
| K= | 1.48E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

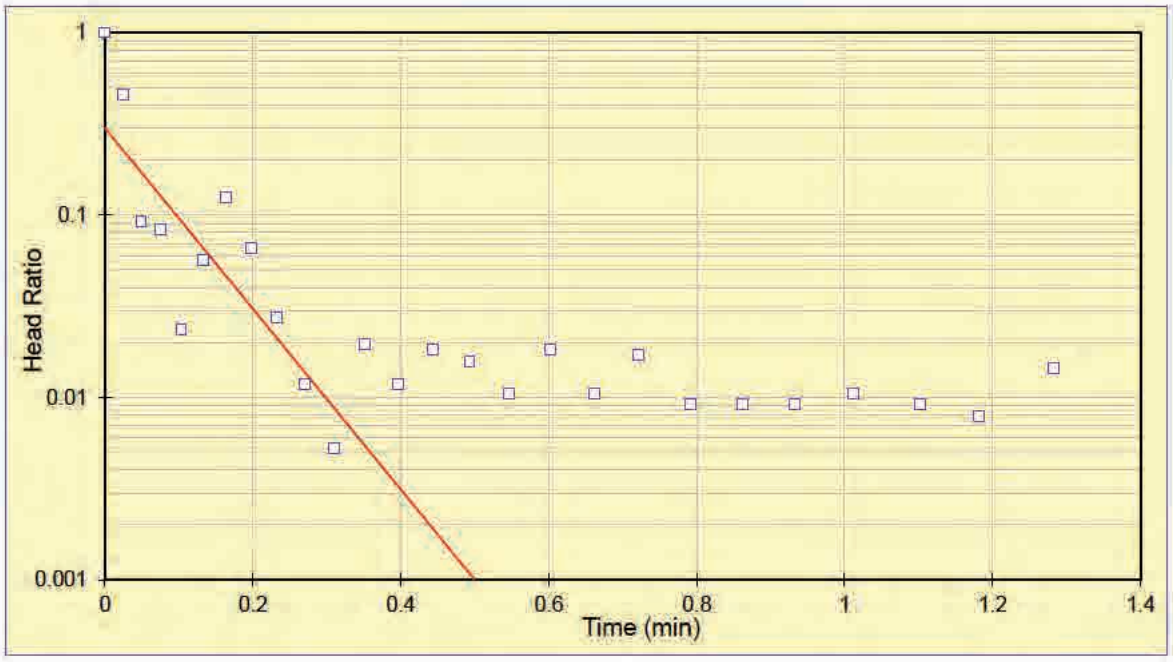
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 6.78E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.92E+01 | ft/day |
| $t_2$ = | 0.5 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

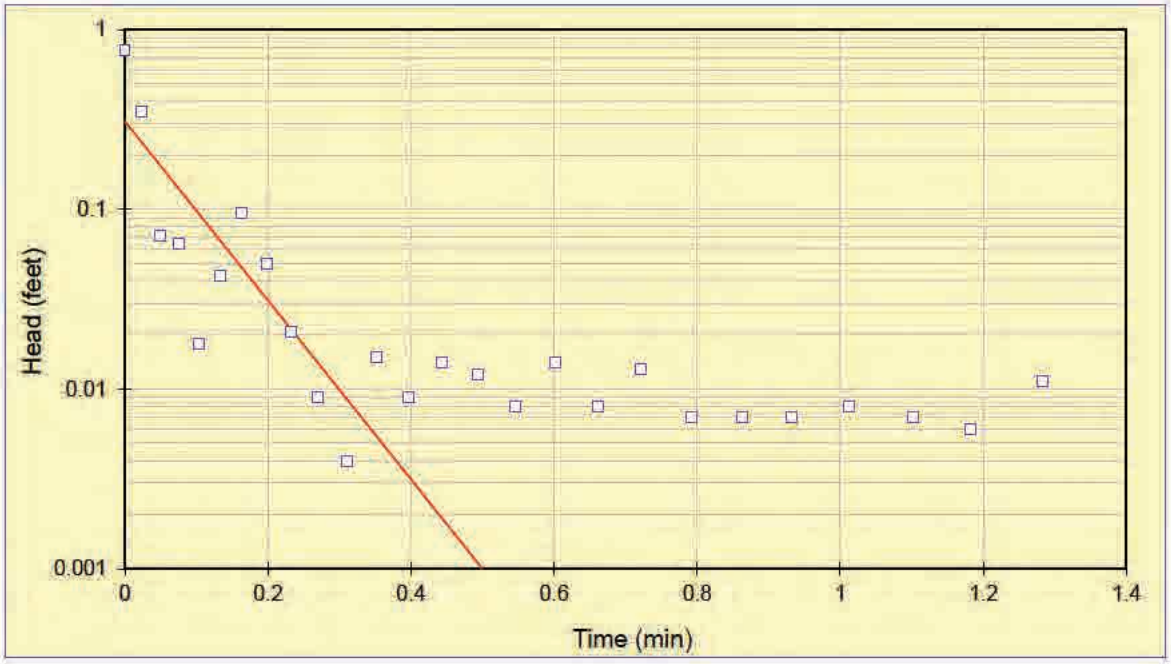
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.87 |
| $y_0$ = | 0.31 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 5.81E-03 | cm/sec |
| K= | 1.65E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

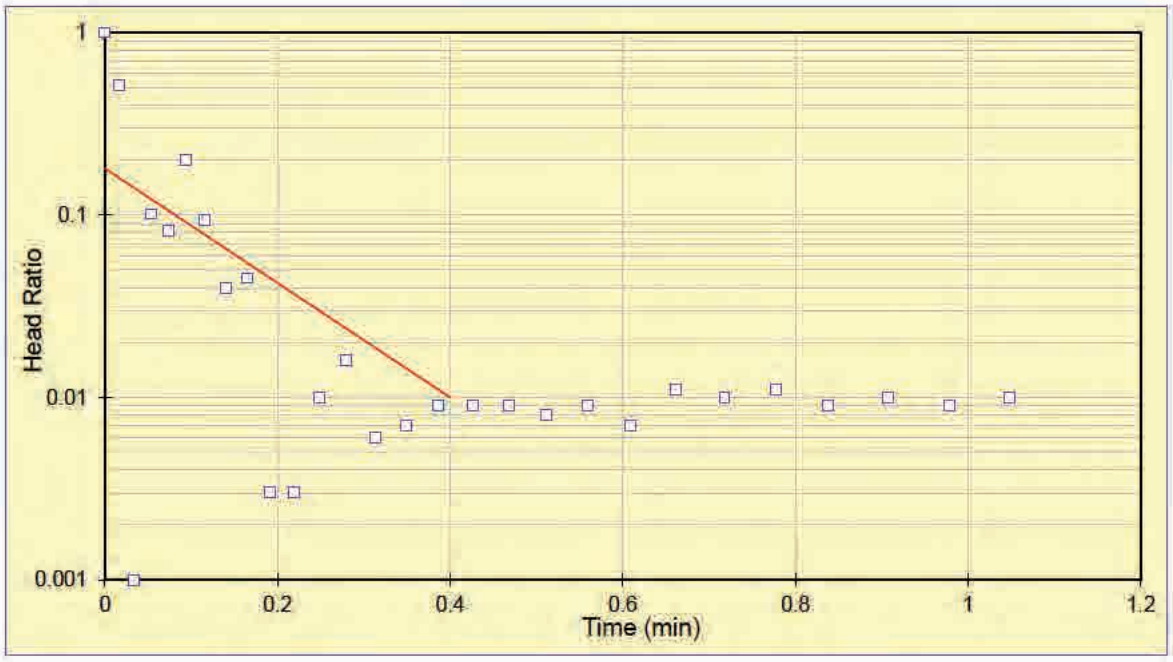
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 4.30E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.22E+01 | ft/day |
| $t_2$ = | 0.4 | | | |
| $h_1/h_0$ = | 0.18 | | | |
| $h_2/h_0$ = | 0.01 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-03B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

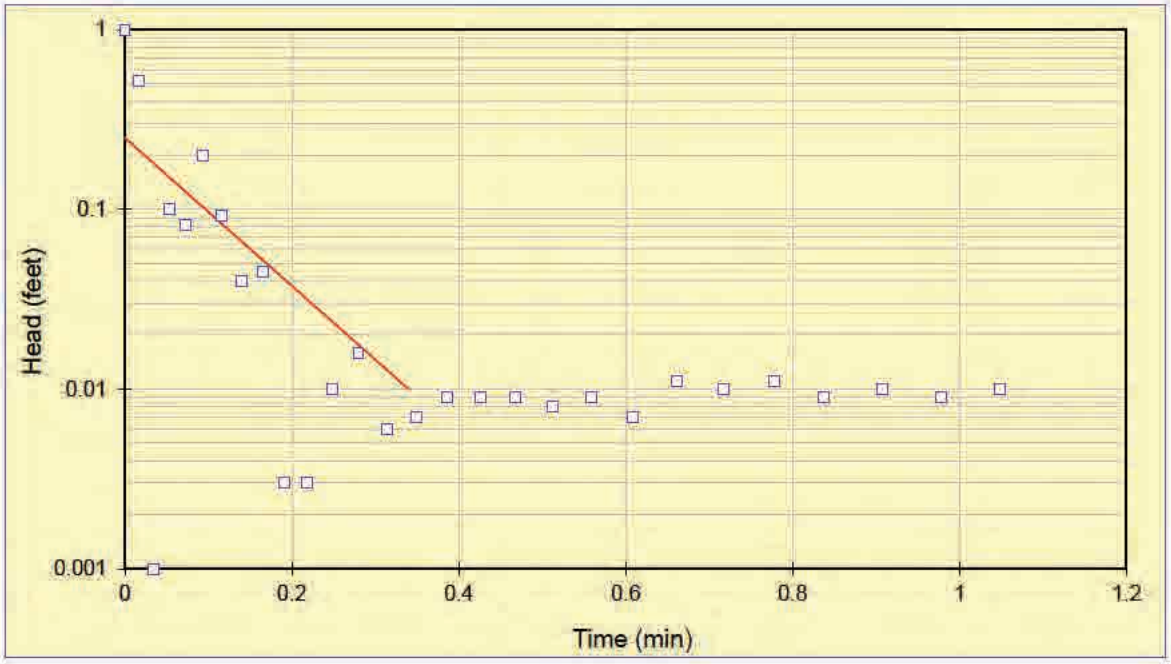
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.87 |
| $y_0$ = | 0.25 |
| $y_t$ = | 0.010 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 4.79E-03 | cm/sec |
| K= | 1.36E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

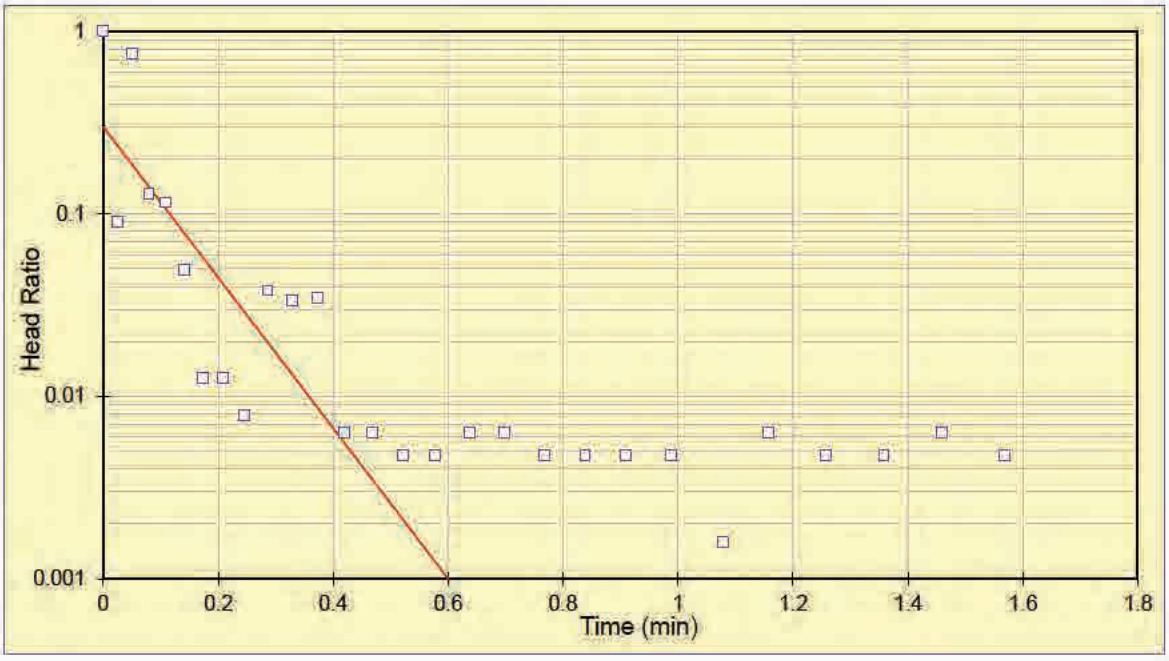
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 5.65E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.60E+01 | ft/day |
| $t_2$ = | 0.6 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

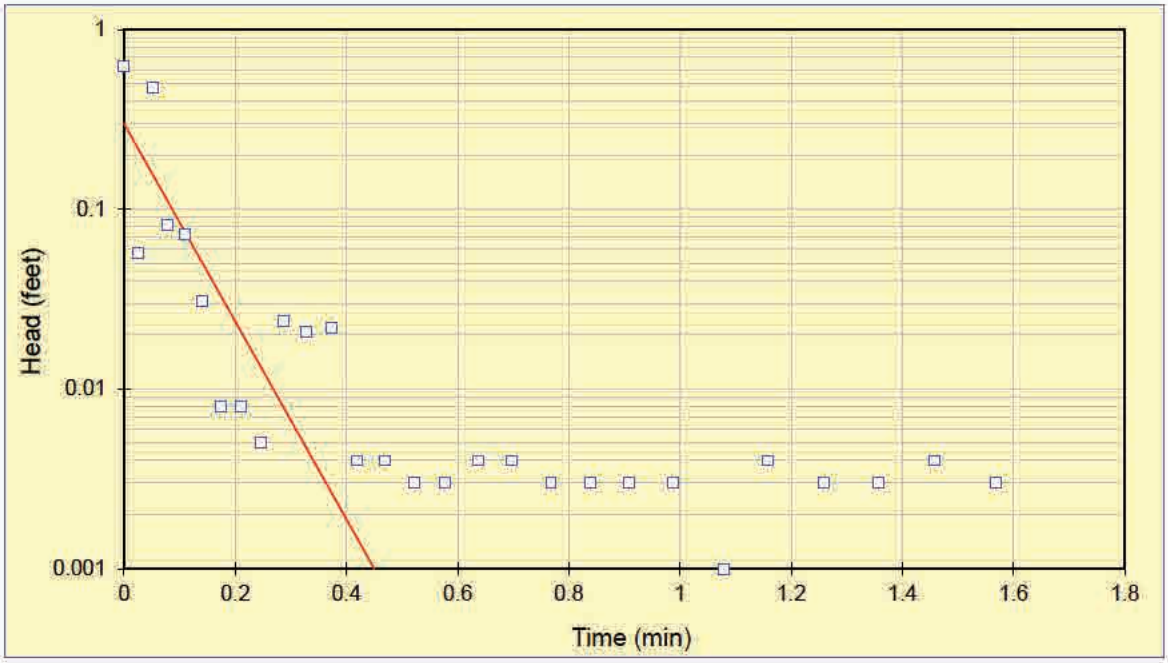
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.87 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.42E-03 | cm/sec |
| K= | 1.82E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-03B (TEST 2)

$$T = b + a \ln T$$

where:

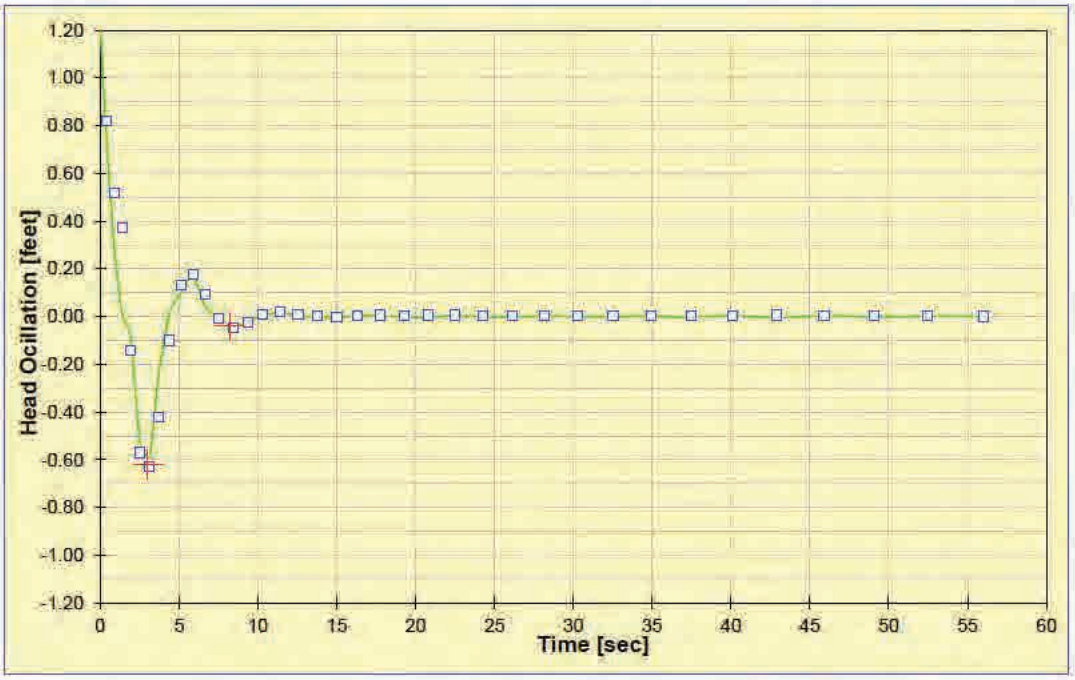
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g / L^{1/2}\right) / 8 d$$
$$d = \gamma / (g / L)^{1/2}$$
$$L = g / (\omega^2 + \gamma^2)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.31826 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.3998 | $ft^{-1}$ |
| $L_c$ = | 19.62 | ft | $a$ = | 0.00286 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 3.00 | sec |
| $\omega$ = | 1.2083 | $ft^{-1}$ | $t_2$ = | 8.20 | sec |
| $\gamma$ = | 0.5271 | $ft^{-1}$ | $h(t_1)$ = | 0.62 | ft |
| $L$ = | 18.52 | $ft^3/sec^2$ | $h(t_2)$ = | 0.04 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.73E-02 $ft^2/sec$ | $\alpha$ < 0.1? | YES |
| $T$ = | 1.53E-02 $ft^2/sec$ | $d$ < 0.7? | YES |
| $T$ = | 1.32E+03 $ft^2/day$ | $L_1$ = | 18.52 |
| $K$ = | 4.22E+01 ft/day | $L_2$ = | 24.62 |
| $K$ = | 1.49E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/08/16

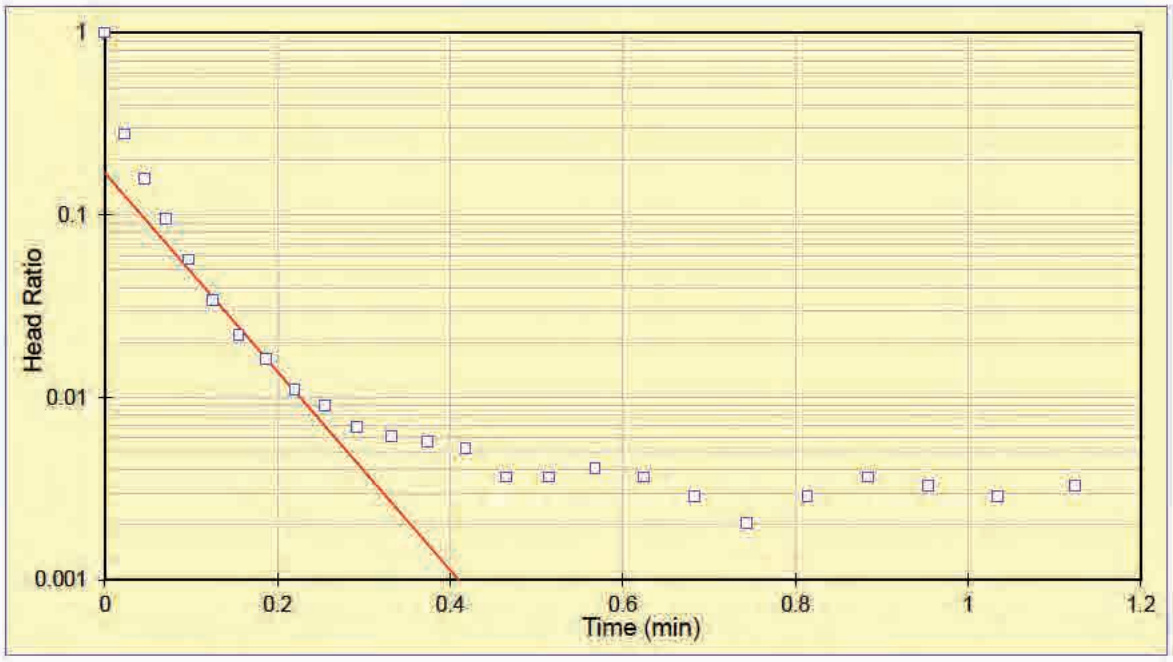
Analysis By: DFS
Checked By: JRS
Analysis Date: 8/8/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 7.45E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.11E+01 | ft/day |
| $t_2$ = | 0.41 | | | |
| $h_1/h_0$ = | 0.17 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-03 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

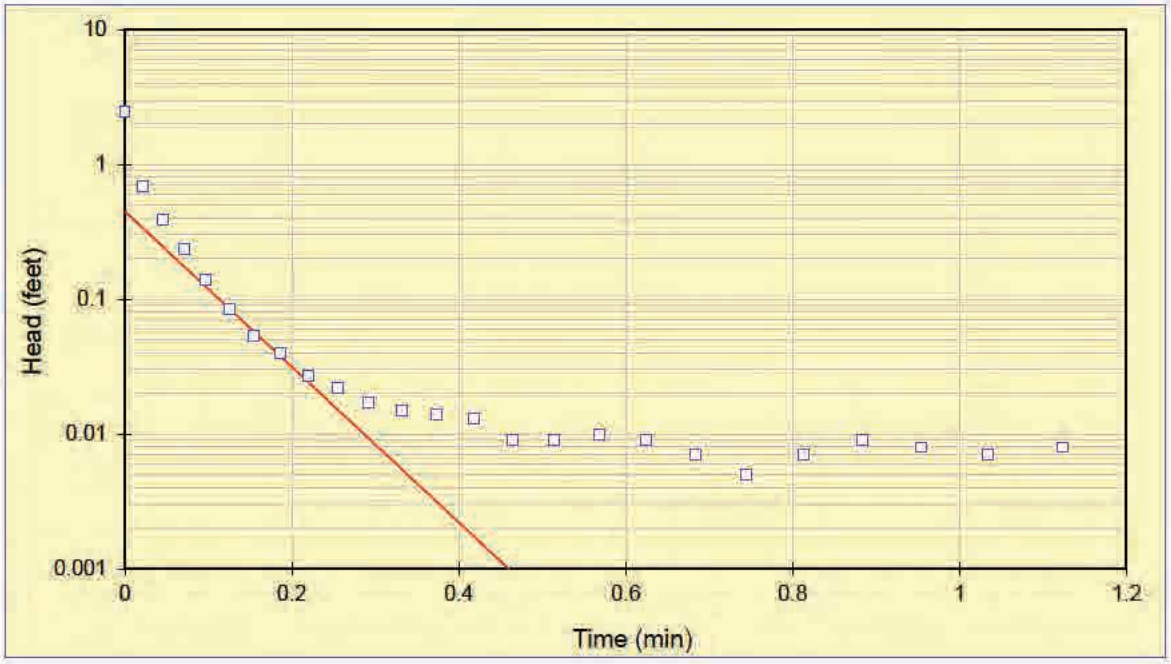
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.23 |
| $y_0$ = | 0.45 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 5.22E-03 | cm/sec |
| K= | 1.48E+01 | ft/day |




Project Name: NIPSCO Schahfer
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Test Date: 07/07/16

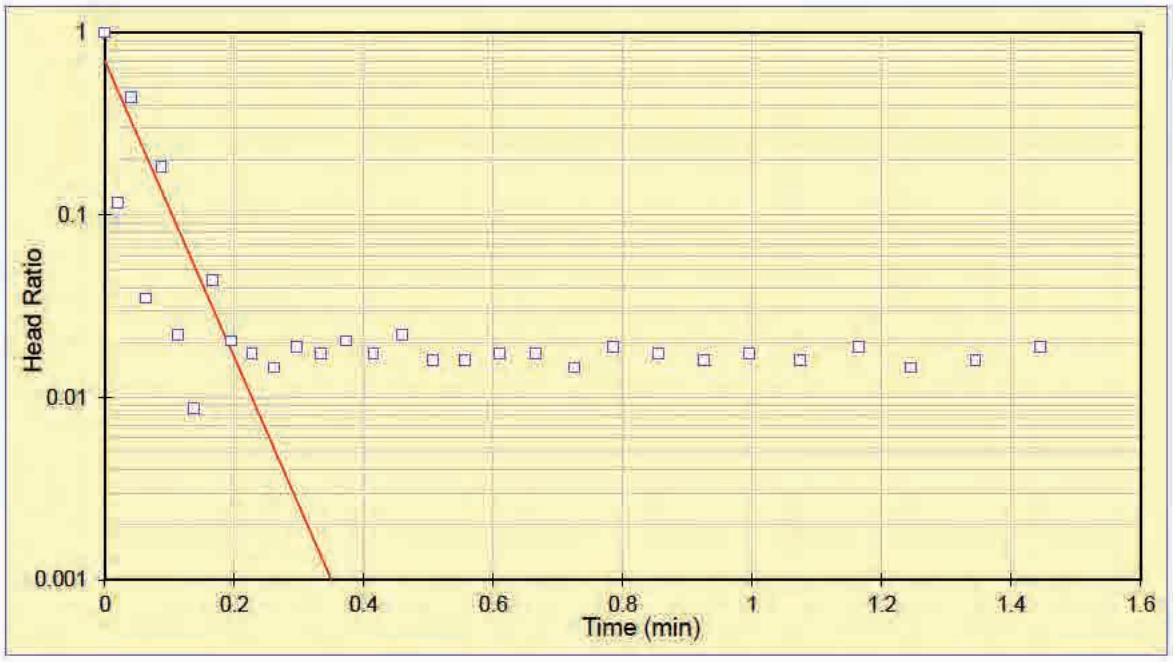
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.11E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.15E+01 | ft/day |
| $t_2$ = | 0.35 | | | |
| $h_1/h_0$ = | 0.70 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

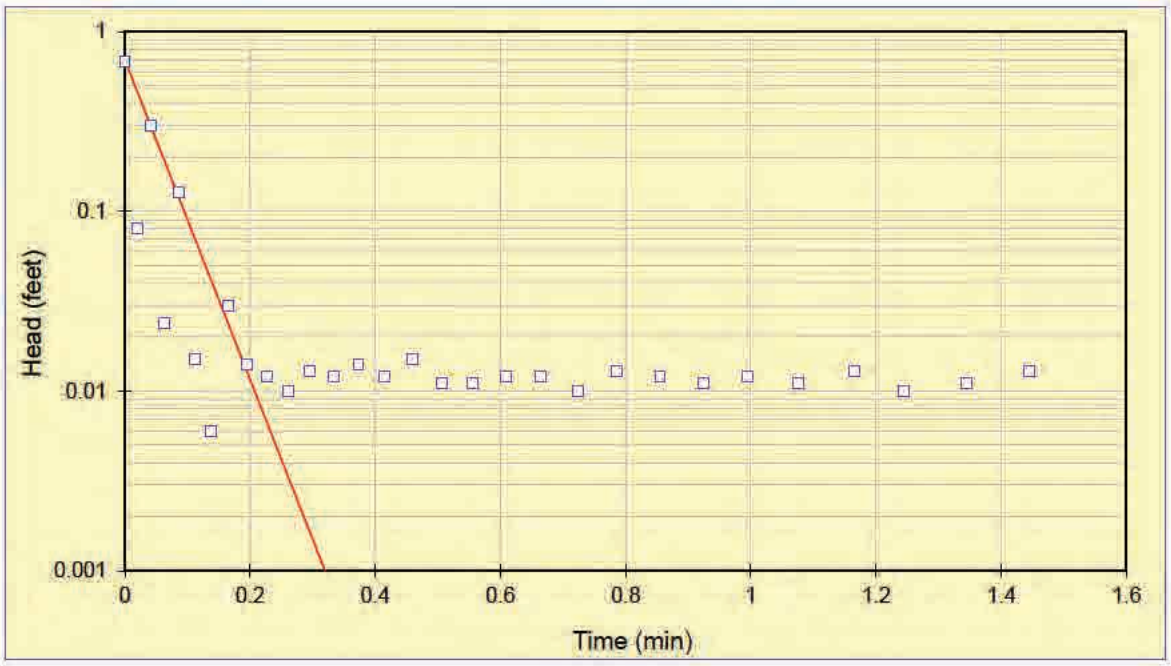
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.70 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.16E-02 | cm/sec |
| K= | 3.30E+01 | ft/day |




Project Name: NIPSCO Schahfer
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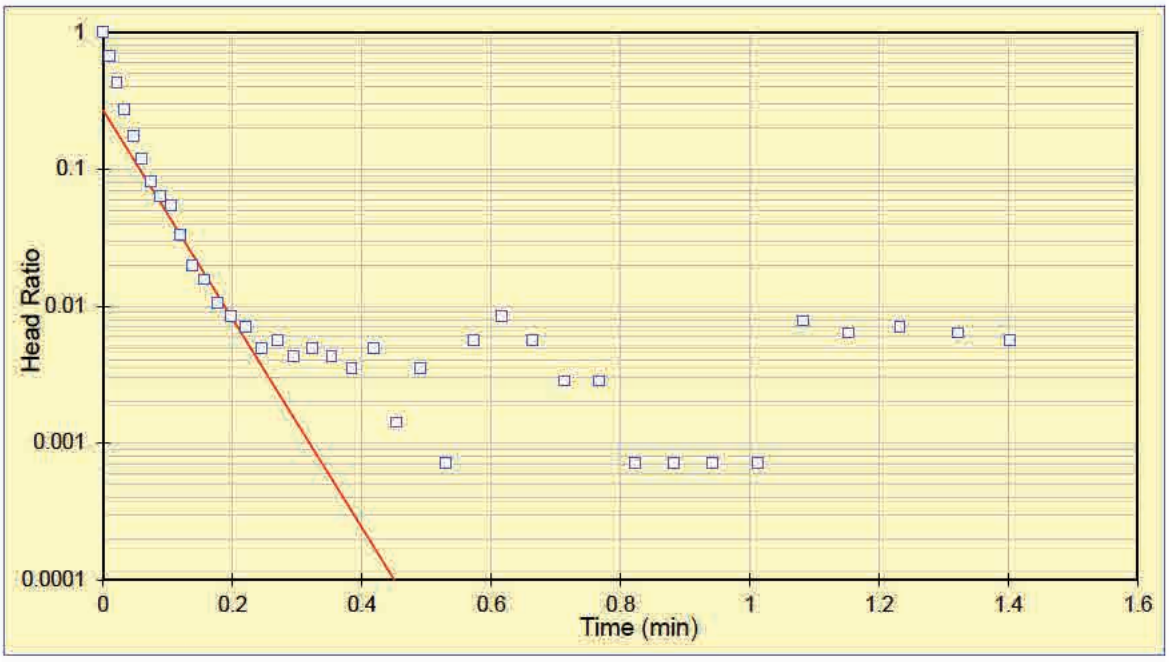
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.037 | K= | 6.50E-02 | cm/sec |
| $t_1$ = | 0 | K= | 1.84E+02 | ft/day |
| $t_2$ = | 0.45 | | | |
| $h_1/h_0$ = | 0.27 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

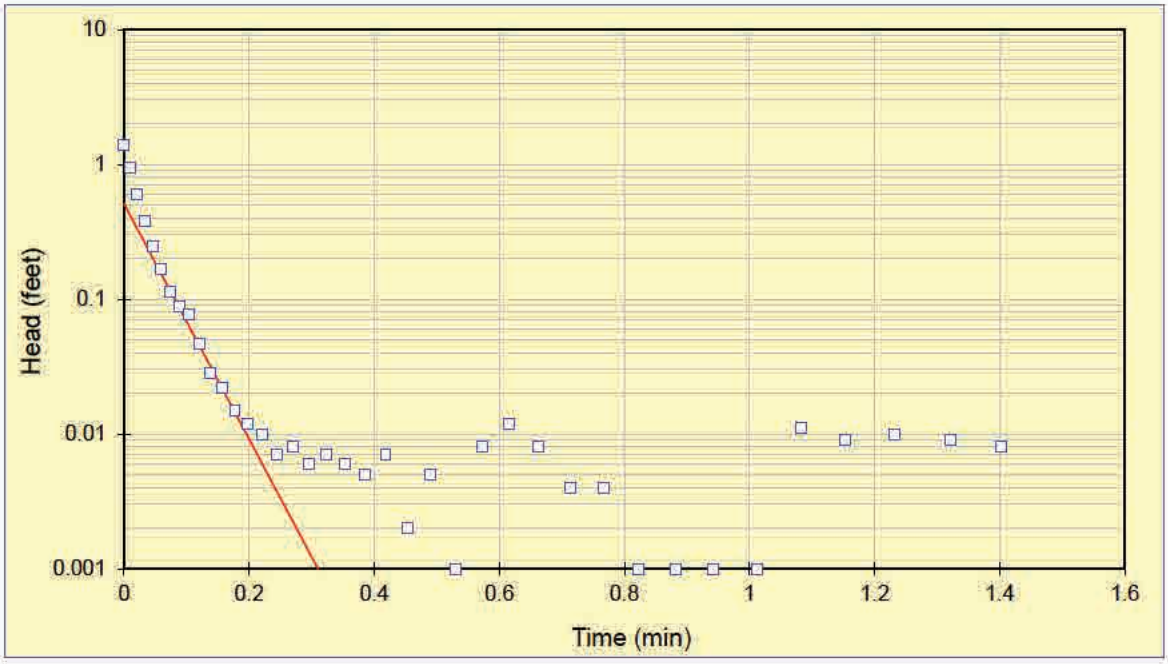
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.037 |
| $\ln(R_e/r_w)$= | 2.11 |
| $y_0$ = | 0.51 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 4.81E-02 | cm/sec |
| K= | 1.36E+02 | ft/day |




Project Name: NIPSCO Schahfer
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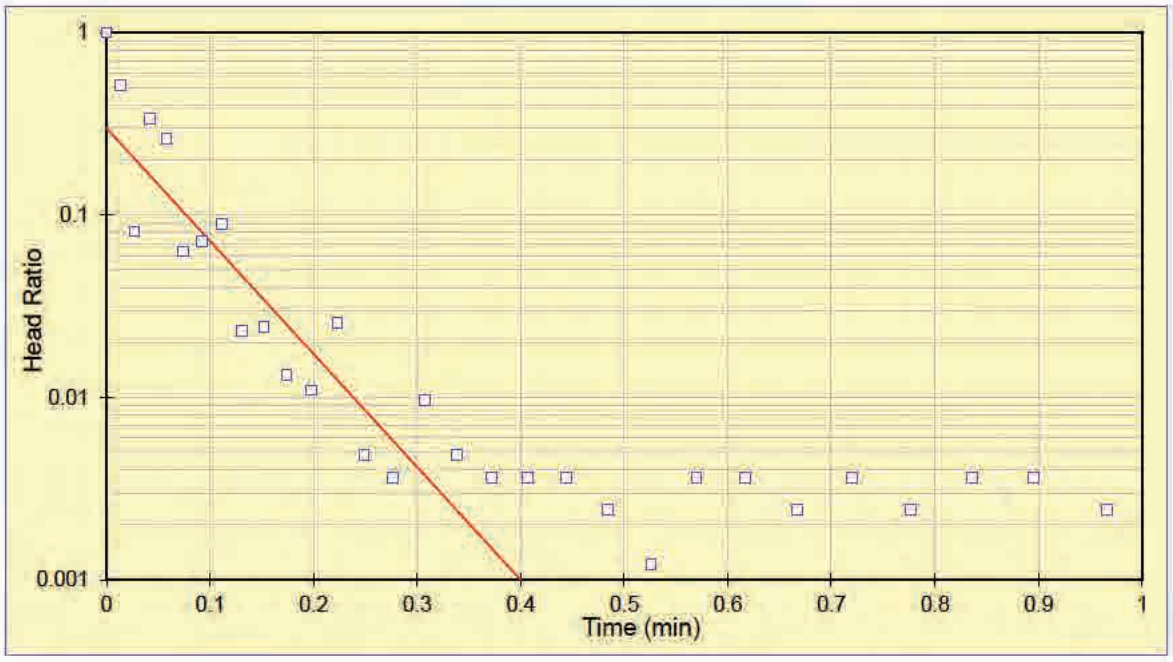
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 8.48E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.40E+01 | ft/day |
| $t_2$ = | 0.4 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

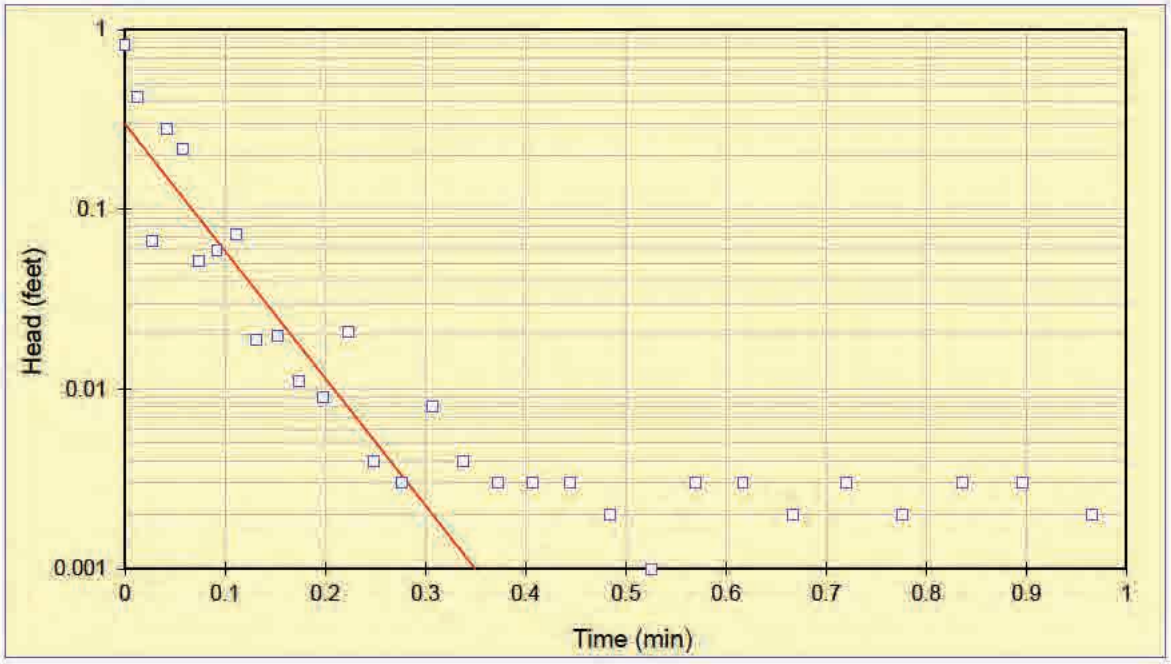
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 9.27E-03 | cm/sec |
| K= | 2.63E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

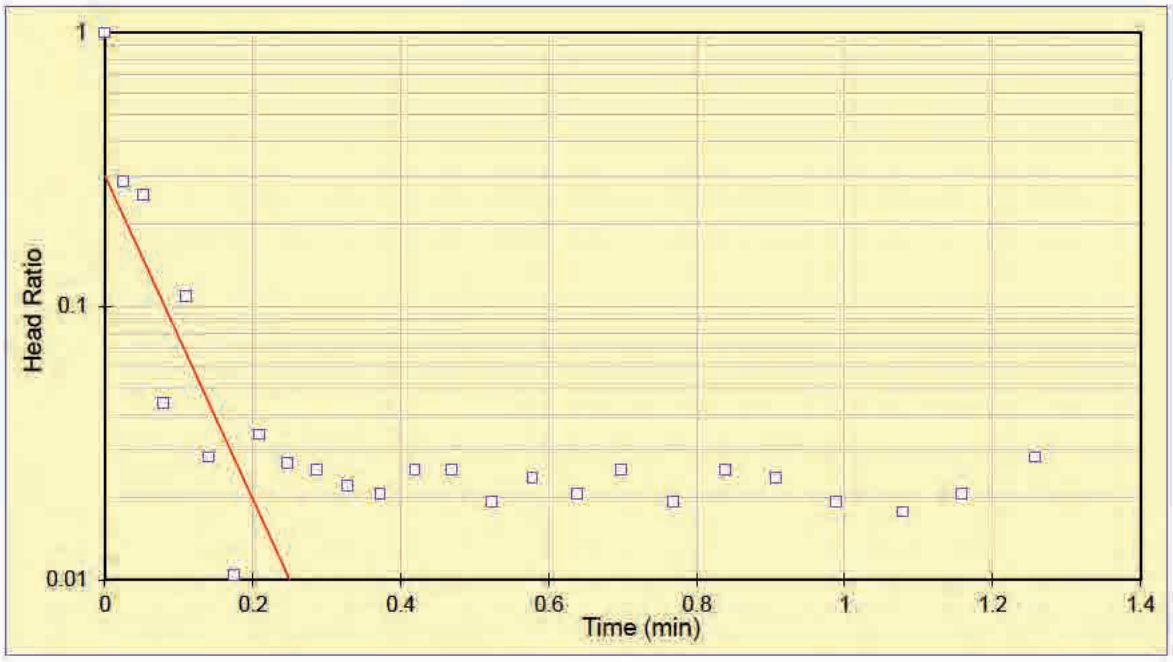
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 8.09E-03 | cm/sec |
| $t_1$ = | 0 | K= | 2.29E+01 | ft/day |
| $t_2$ = | 0.25 | | | |
| $h_1/h_0$ = | 0.30 | | | |
| $h_2/h_0$ = | 0.01 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

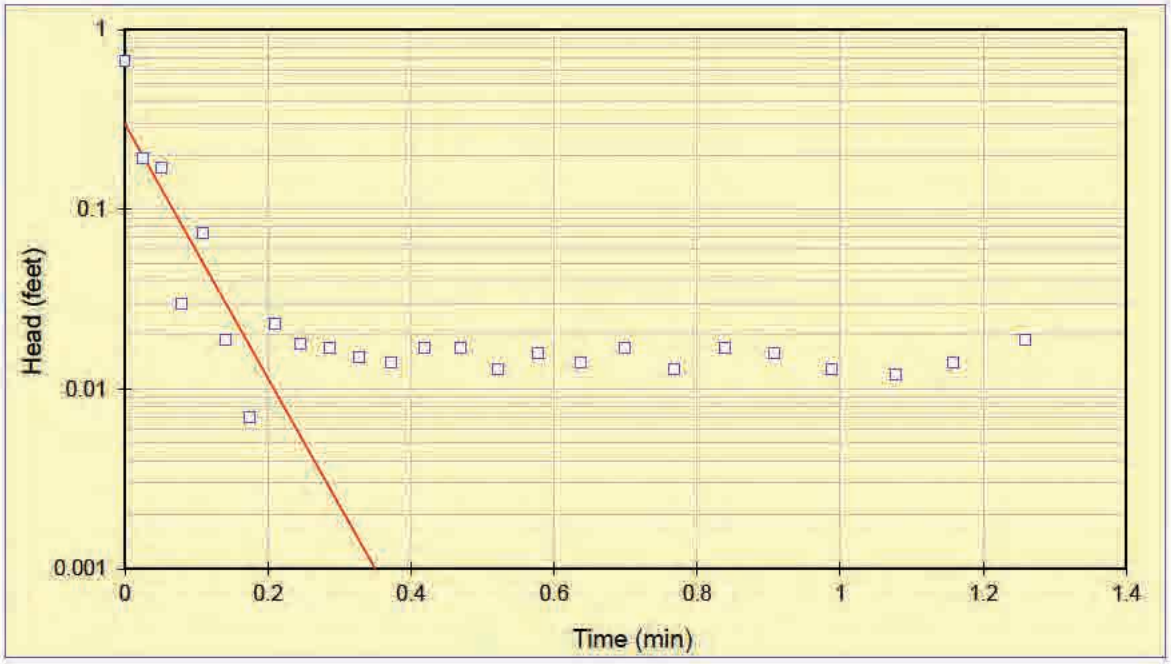
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 9.27E-03 | cm/sec |
| K= | 2.63E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-13B (TEST 1)

$$T = b + a \ln T$$

where:

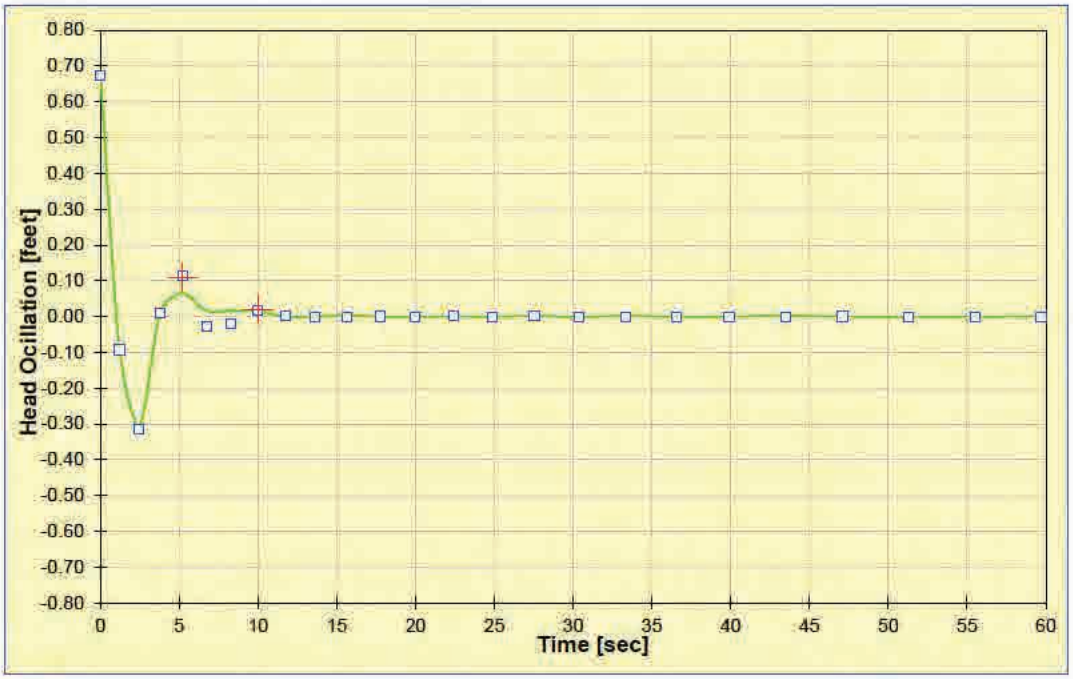
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.35632 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.2619 | $ft^{-1}$ |
| $L_c$ = | 19.45 | ft | $a$ = | 0.00450 | $ft^3$ |
| $L_s$ = | 9.98 | ft | $t_1$ = | 5.20 | sec |
| $w$ = | 1.3090 | $ft^{-1}$ | $t_2$ = | 10.00 | sec |
| $g$ = | 0.3552 | $ft^{-1}$ | $h(t_1)$ = | 0.11 | ft |
| $L$ = | 17.50 | $ft^3/sec^2$ | $h(t_2)$ = | 0.02 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 4.27E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 2.64E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 2.28E+03 $ft^2/day$ | $L_1$ = | 17.50 |
| $K$ = | 7.74E+01 ft/day | $L_2$ = | 24.44 |
| $K$ = | 2.73E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

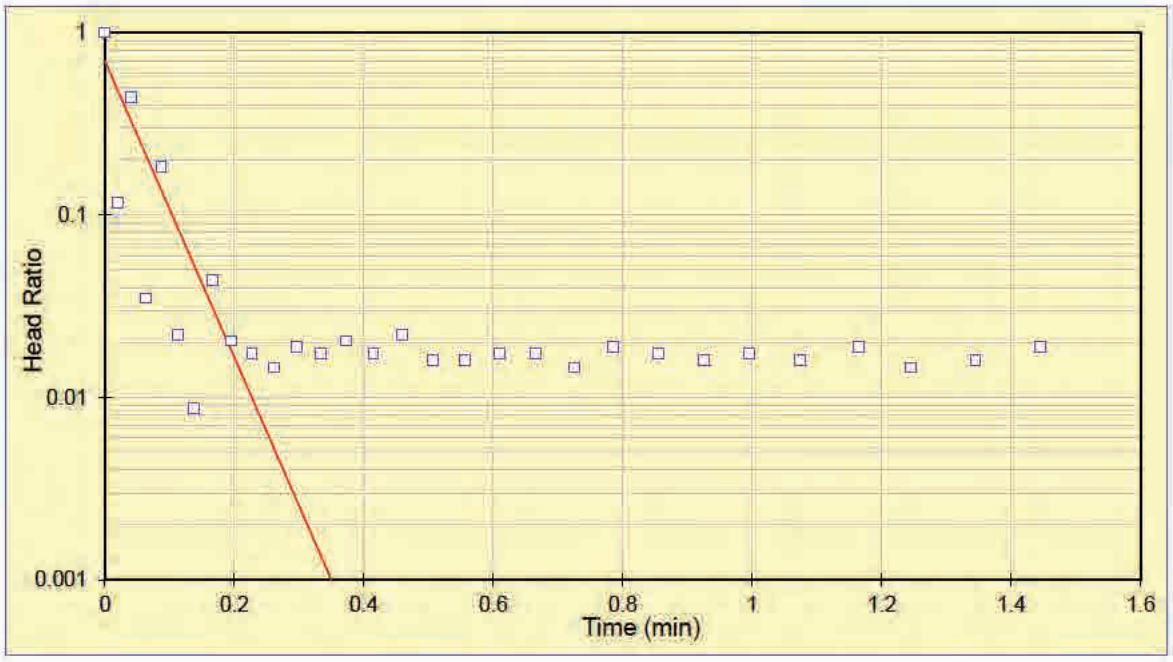
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.11E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.15E+01 | ft/day |
| $t_2$ = | 0.35 | | | |
| $h_1/h_0$ = | 0.70 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

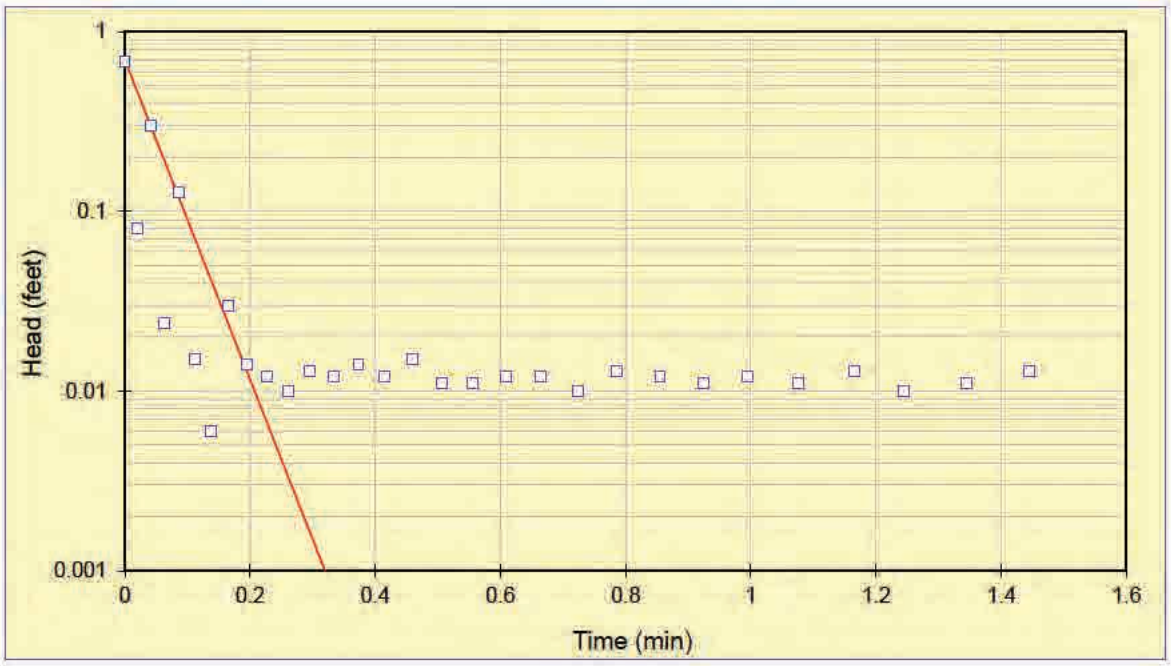
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.70 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.16E-02 | cm/sec |
| K= | 3.30E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-13B (TEST 2)

$$T = b + a \ln T$$

where:

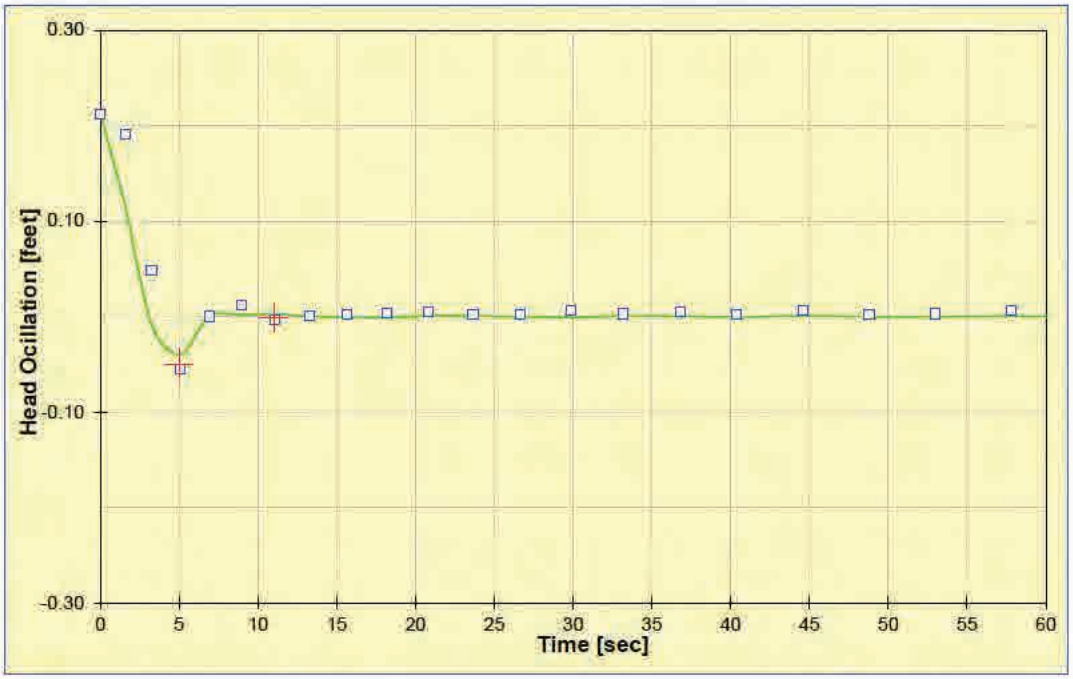
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.23358 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.5285 | $ft^{-1}$ |
| $L_c$ = | 19.14 | ft | $a$ = | 0.00203 | $ft^3$ |
| $L_s$ = | 9.98 | ft | $t_1$ = | 5.00 | sec |
| $w$ = | 1.0472 | $ft^{-1}$ | $t_2$ = | 11.00 | sec |
| $g$ = | 0.6520 | $ft^{-1}$ | $h(t_1)$ = | 0.05 | ft |
| $L$ = | 21.15 | $ft^3/sec^2$ | $h(t_2)$ = | 0.00 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 1.95E-02 $ft^2/sec$ | $a$ < 0.1? | YES |
| $T$ = | 1.02E-02 $ft^2/sec$ | $d$ < 0.7? | YES |
| $T$ = | 8.77E+02 $ft^2/day$ | $L_1$ = | 21.15 |
| $K$ = | 3.01E+01 ft/day | $L_2$ = | 24.13 |
| $K$ = | 1.06E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

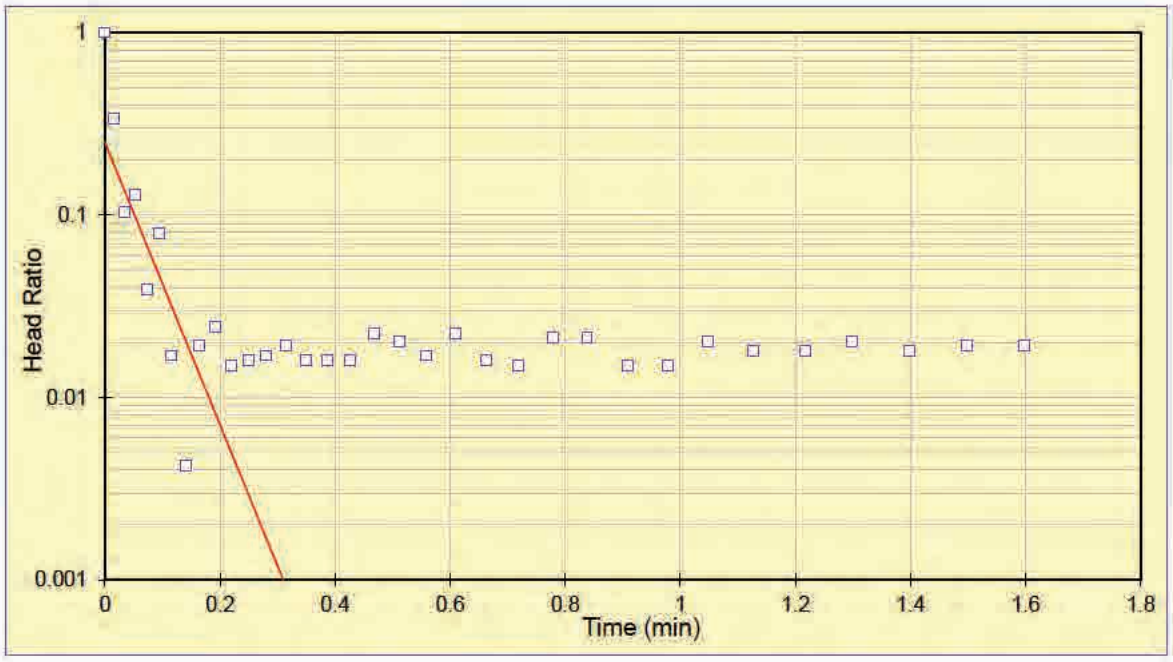
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.06E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.00E+01 | ft/day |
| $t_2$ = | 0.31 | | | |
| $h_1/h_0$ = | 0.25 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-13B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

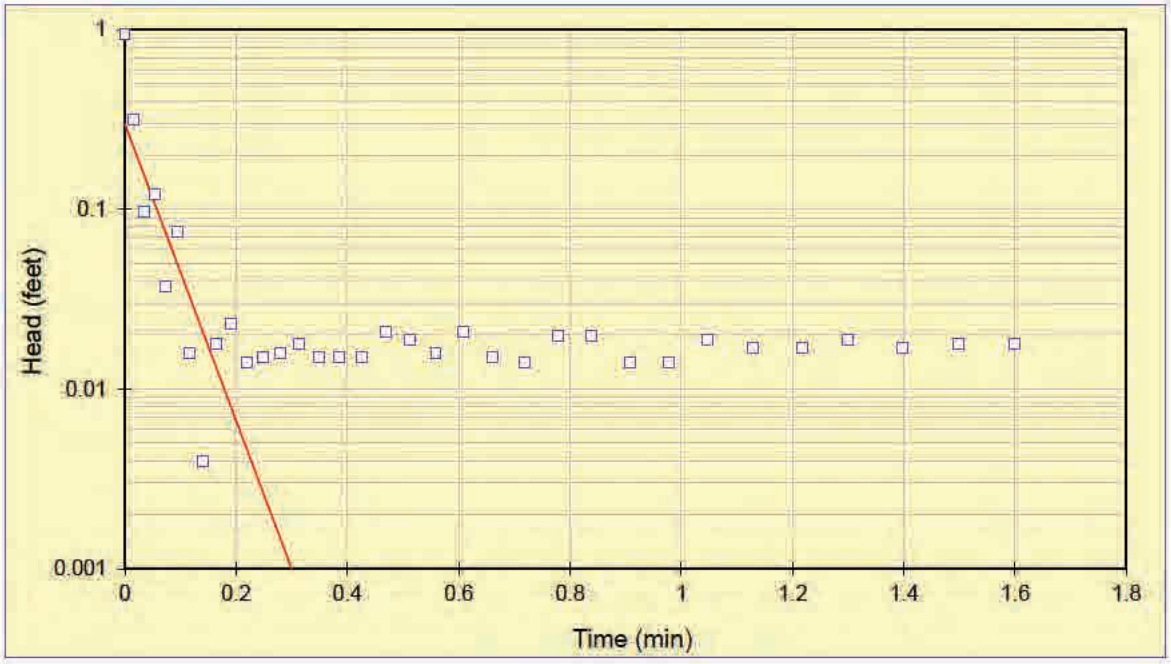
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.22 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.08E-02 | cm/sec |
| K= | 3.06E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

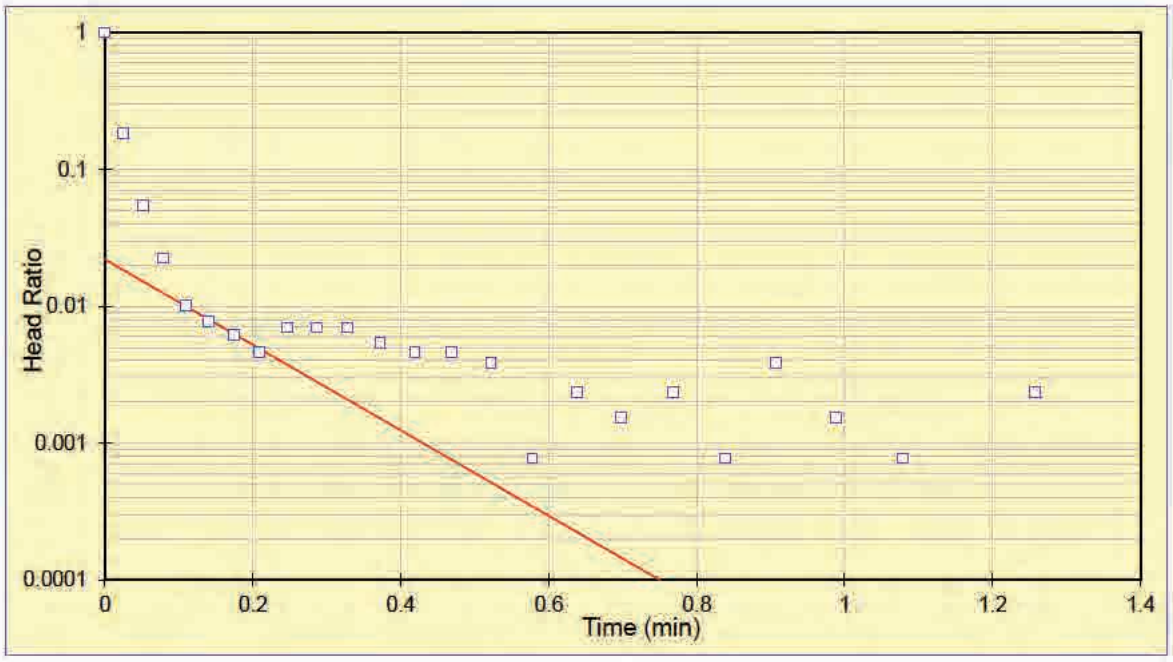
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.417 | K= | 2.59E-02 | cm/sec |
| $t_1$ = | 0 | K= | 7.34E+01 | ft/day |
| $t_2$ = | 0.75 | | | |
| $h_1/h_0$ = | 0.02 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

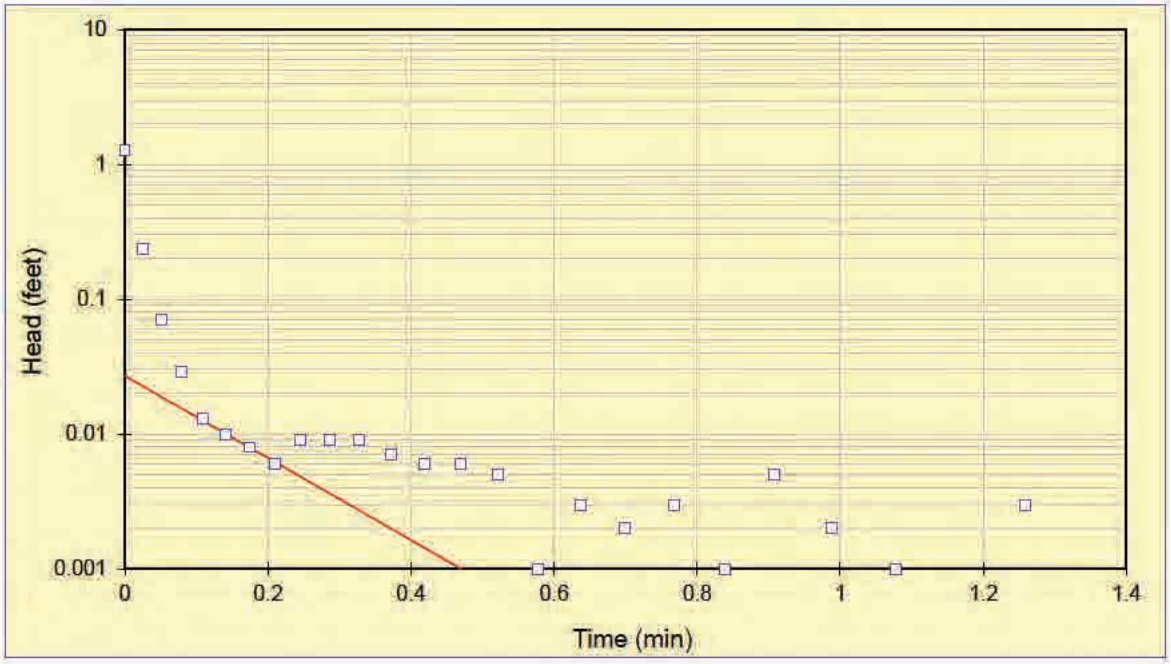
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.417 |
| $\ln(R_e/r_w)$= | 2.14 |
| $y_0$ = | 0.03 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.63E-02 | cm/sec |
| K= | 4.63E+01 | ft/day |




Project Name: NIPSCO Schahfer
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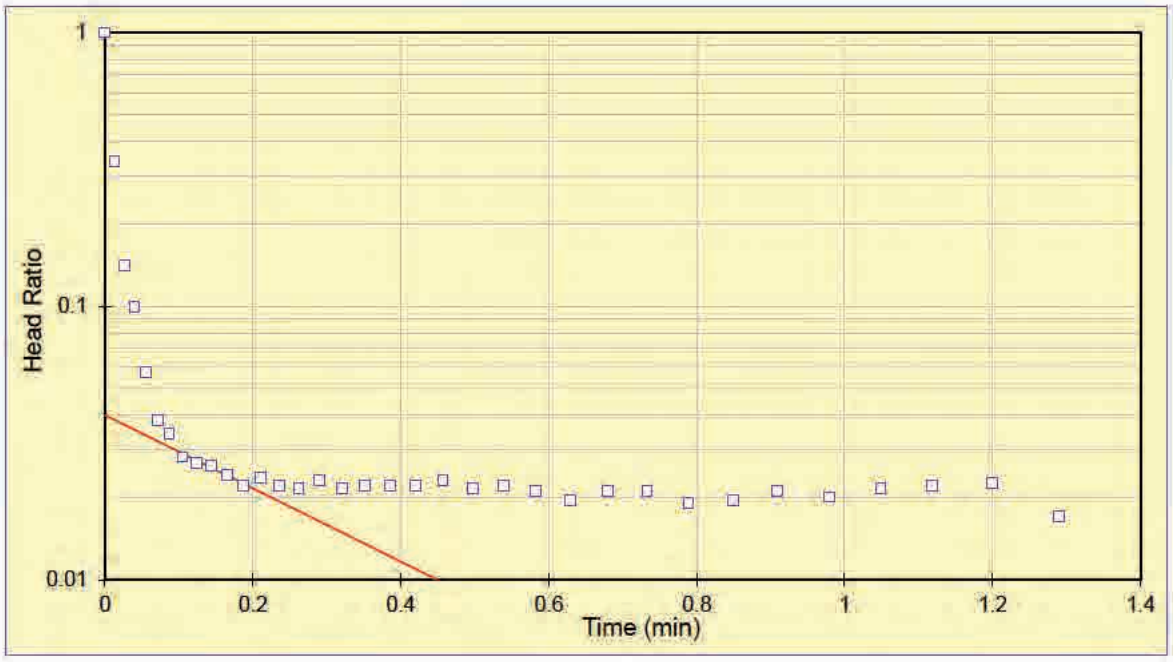
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.348 | K= | 1.11E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.16E+01 | ft/day |
| $t_2$ = | 0.45 | | | |
| $h_1/h_0$ = | 0.04 | | | |
| $h_2/h_0$ = | 0.01 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

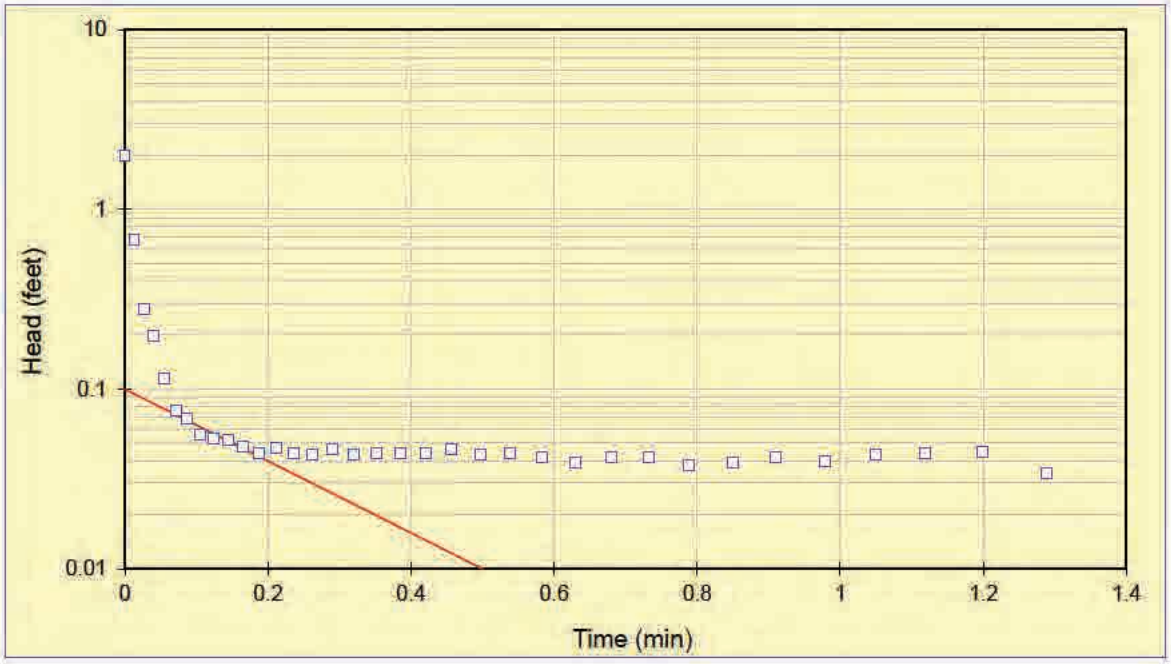
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.348 |
| $\ln(R_e/r_w)$= | 2.13 |
| $y_0$ = | 0.10 |
| $y_t$ = | 0.010 |
| $t$ = | 0.5 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.08E-02 | cm/sec |
| K= | 3.05E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

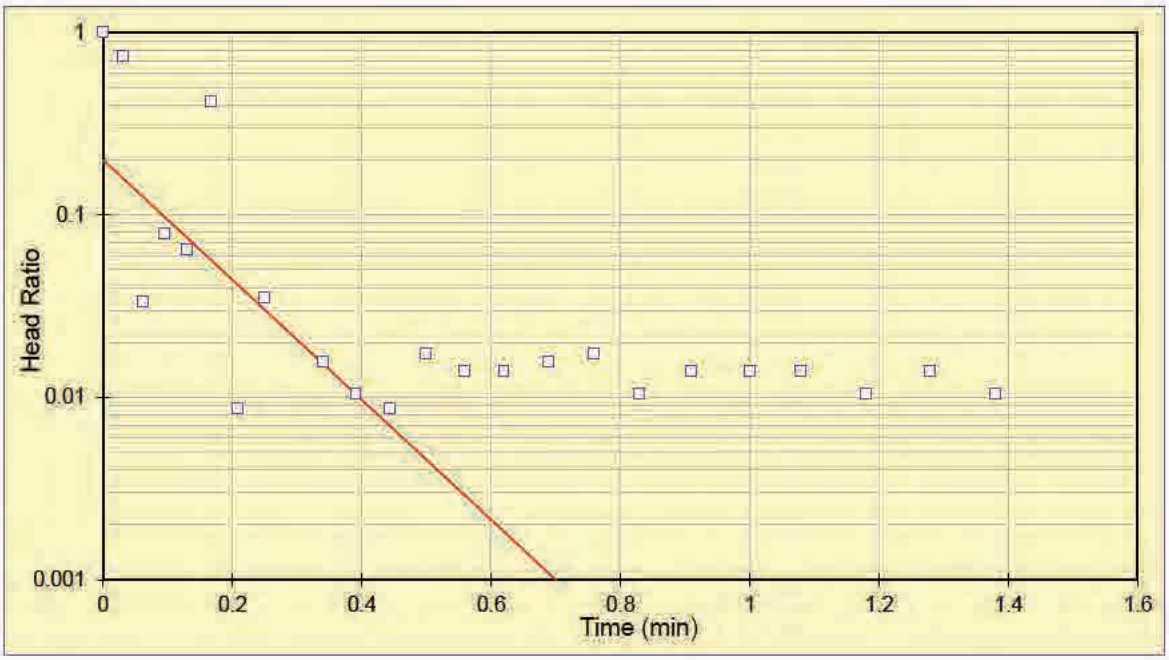
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 4.50E-03 | cm/sec |
| $t_1$ = | 0 | K= | 1.28E+01 | ft/day |
| $t_2$ = | 0.7 | | | |
| $h_1/h_0$ = | 0.20 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

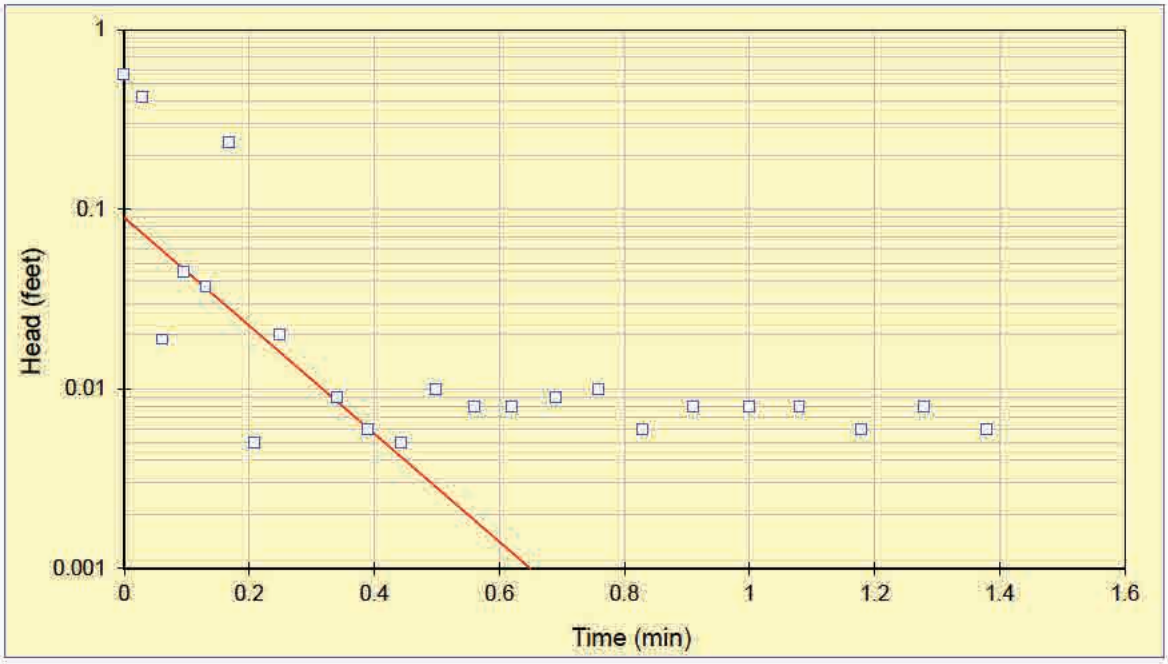
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.83 |
| $y_0$ = | 0.09 |
| $y_t$ = | 0.001 |
| $t$ = | 0.7 |

**RESULTS**

| | | |
|---|---|---|
| K= | 3.45E-03 | cm/sec |
| K= | 9.79E+00 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

# van der KAMP FALLING HEAD SLUG TEST ANALYSIS

## UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

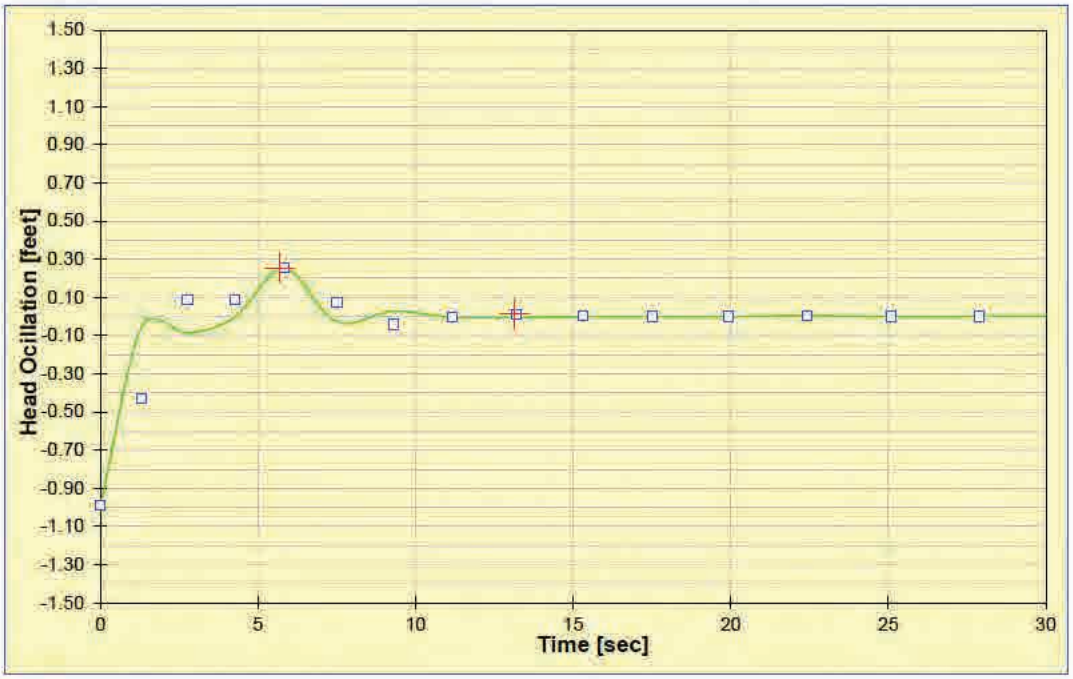
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 0.93787 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.4374 | $ft^{-1}$ |
| $L_c$ = | 19.23 | ft | $a$ = | 0.00186 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 5.70 | sec |
| $w$ = | 0.8434 | $ft^{-1}$ | $t_2$ = | 13.15 | sec |
| $g$ = | 0.4102 | $ft^{-1}$ | $h(t_1)$ = | 0.26 | ft |
| $L$ = | 36.60 | $ft^3/sec^2$ | $h(t_2)$ = | 0.01 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 1.84E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 9.76E-03 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 8.44E+02 $ft^2/day$ | $L_1$ = | 36.60 |
| $K$ = | 2.70E+01 ft/day | $L_2$ = | 24.23 |
| $K$ = | 9.53E-03 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
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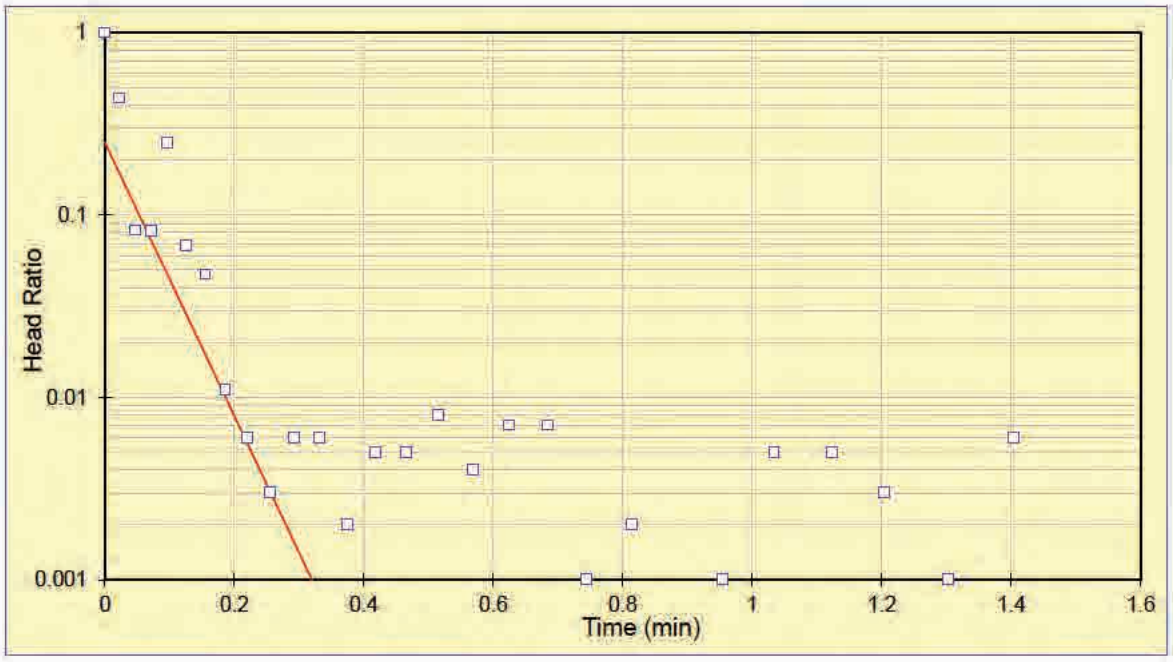
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.03E-02 | cm/sec |
| $t_1$ = | 0 | K= | 2.91E+01 | ft/day |
| $t_2$ = | 0.32 | | | |
| $h_1/h_0$ = | 0.25 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
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Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

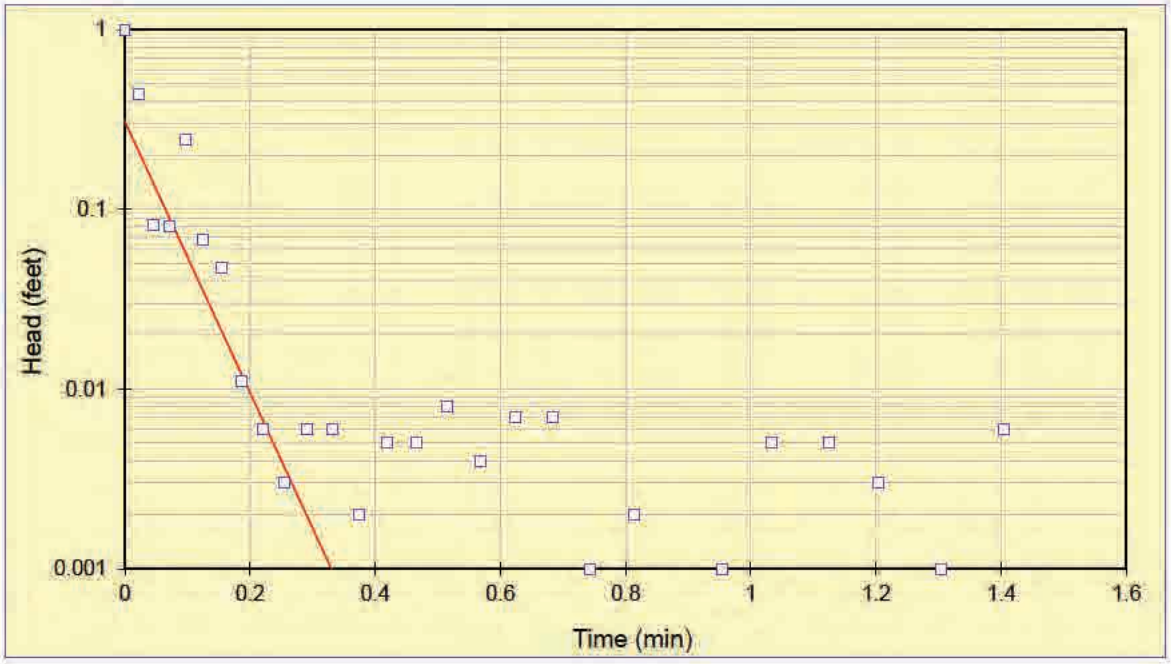
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.85 |
| $y_0$ = | 0.31 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 8.75E-03 | cm/sec |
| K= | 2.48E+01 | ft/day |




Project Name: NIPSCO Schahfer
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Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-15B (TEST 1)

$$T = b + a \ln T$$

where:

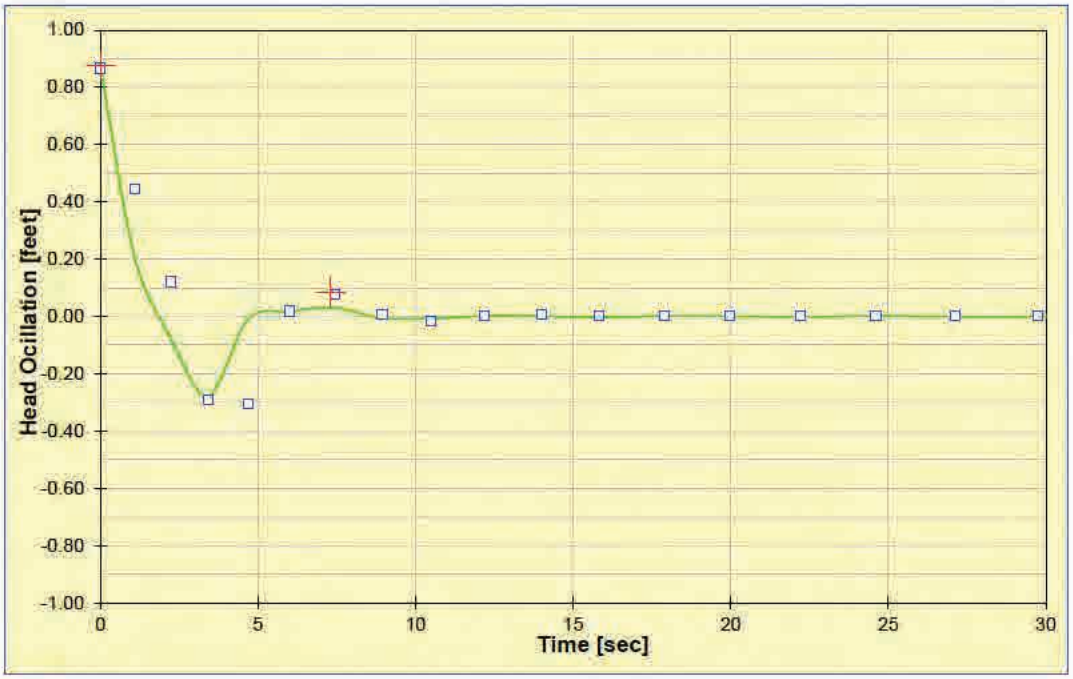
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 0.91806 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.3479 | $ft^{-1}$ |
| $L_c$ = | 19.23 | ft | $a$ = | 0.00229 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 0.8607 | $ft^{-1}$ | $t_2$ = | 7.30 | sec |
| $g$ = | 0.3194 | $ft^{-1}$ | $h(t_1)$ = | 0.88 | ft |
| $L$ = | 38.19 | $ft^3/sec^2$ | $h(t_2)$ = | 0.09 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.27E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.27E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 1.09E+03 $ft^2/day$ | $L_1$ = | 38.19 |
| $K$ = | 3.50E+01 ft/day | $L_2$ = | 24.23 |
| $K$ = | 1.24E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | NO |




Project Name: NIPSCO RMSGS
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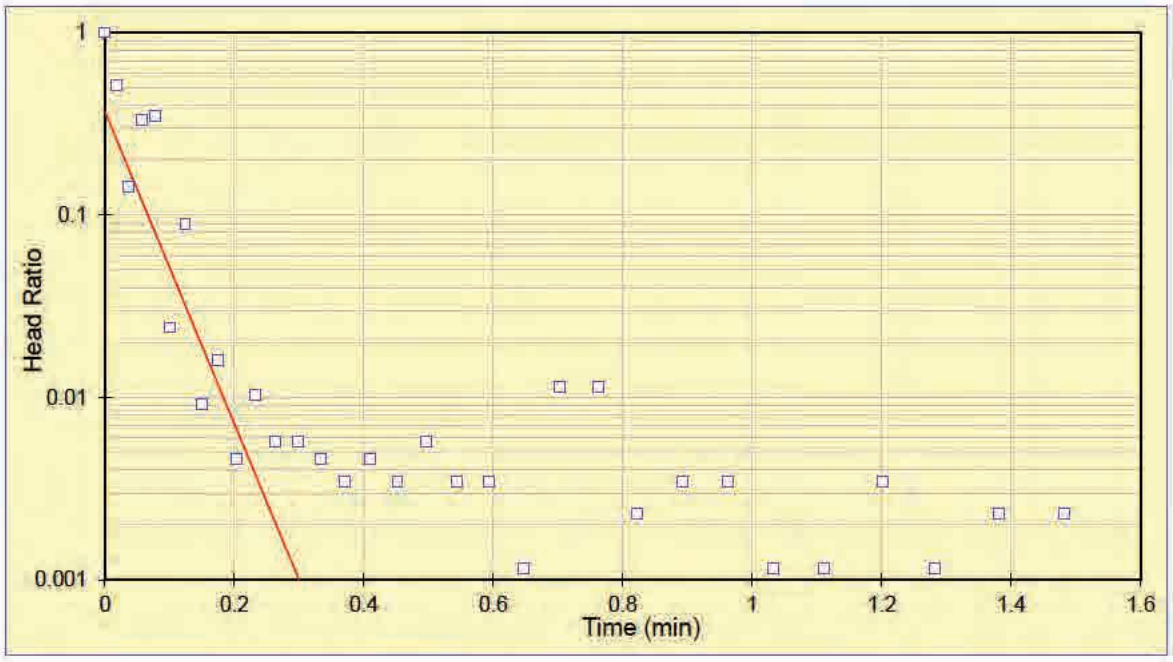
## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:

$r_c$ = casing radius (feet)
$R_e$ = equivalent radius (feet)
$L_e$ = length of screened interval (feet)
$t$ = time (minutes)
$h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.17E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.32E+01 | ft/day |
| $t_2$ = | 0.3 | | | |
| $h_1/h_0$ = | 0.37 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
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Analysis By: DFS
Checked By: JRS
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## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

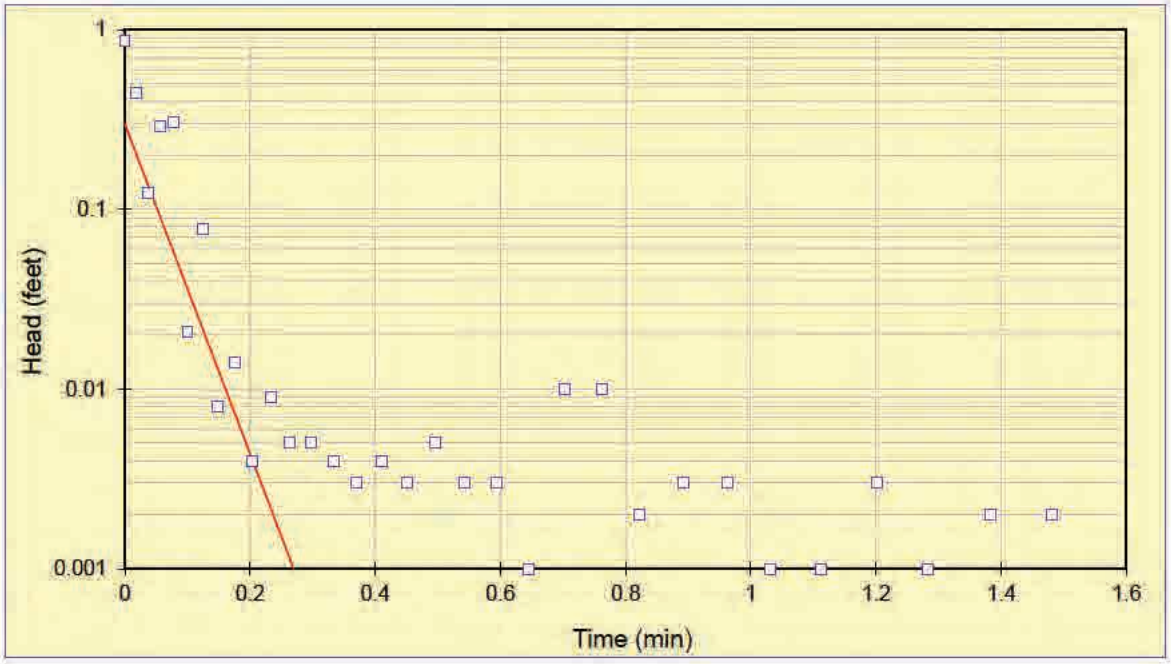
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.85 |
| $y_0$ = | 0.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.06E-02 | cm/sec |
| K= | 3.02E+01 | ft/day |




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Analysis By: DFS
Checked By: JRS
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## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-15B (TEST 2)

$$T = b + a \ln T$$

where:

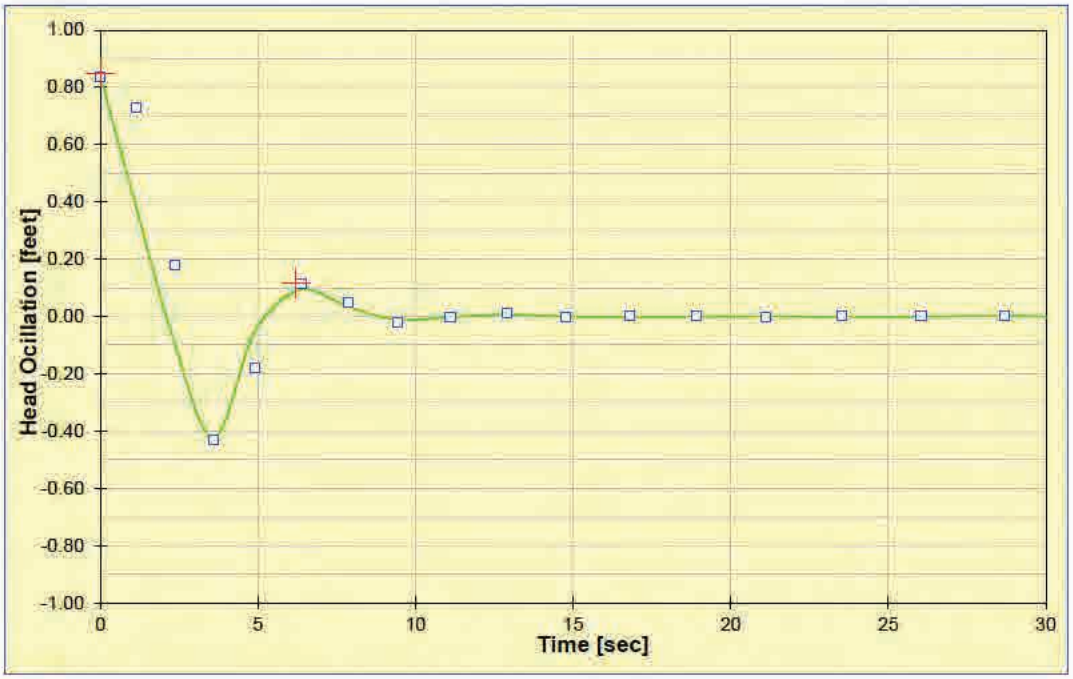
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma/(g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.06353 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.3034 | $ft^{-1}$ |
| $L_c$ = | 19.22 | ft | $a$ = | 0.00304 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 1.0134 | $ft^{-1}$ | $t_2$ = | 6.20 | sec |
| $g$ = | 0.3226 | $ft^{-1}$ | $h(t_1)$ = | 0.85 | ft |
| $L$ = | 28.46 | $ft^3/sec^2$ | $h(t_2)$ = | 0.12 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.97E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.73E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 1.50E+03 $ft^2/day$ | $L_1$ = | 28.46 |
| $K$ = | 4.80E+01 ft/day | $L_2$ = | 24.22 |
| $K$ = | 1.69E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
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Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 2)

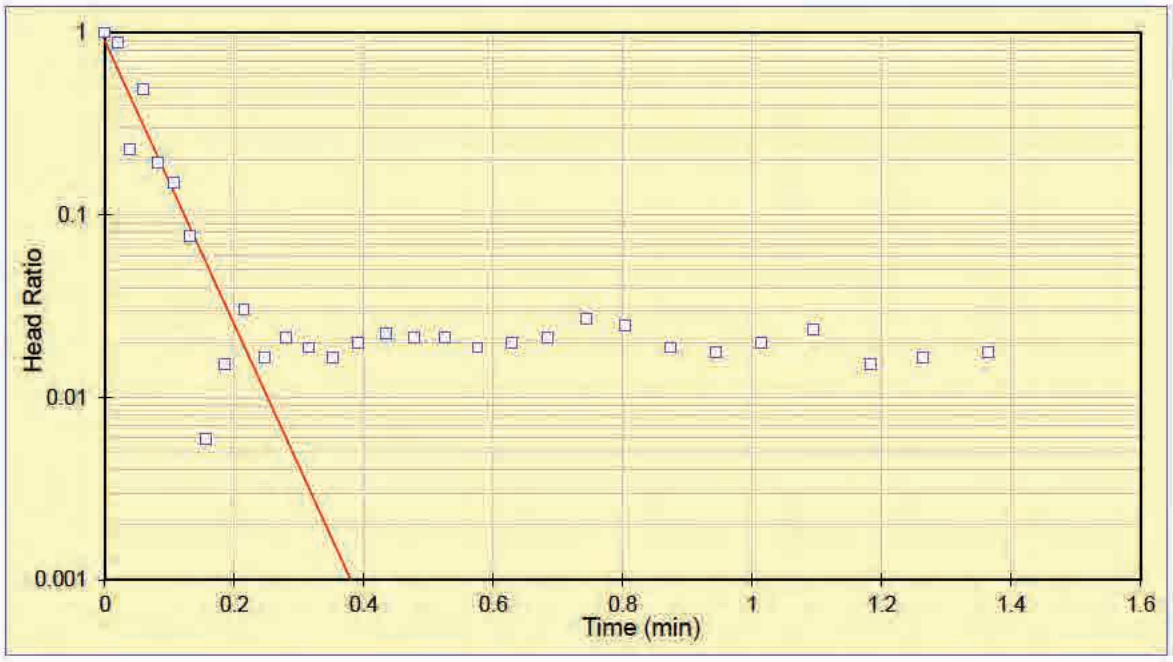
$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $R_e$ = | 0.34 |
| $L_e$ = | 10 |
| $t_1$ = | 0 |
| $t_2$ = | 0.38 |
| $h_1/h_0$ = | 0.90 |
| $h_2/h_0$ = | 0.00 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.06E-02 | cm/sec |
| K= | 3.02E+01 | ft/day |




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Test Date: 07/08/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-15B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

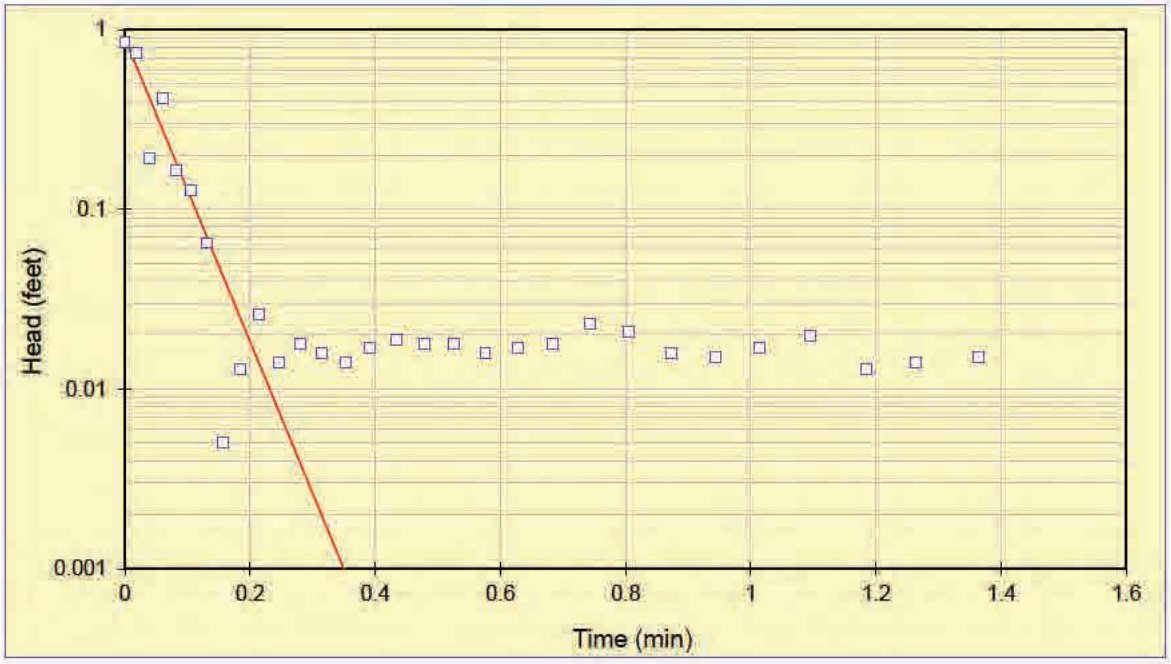
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 2.85 |
| $y_0$ = | 0.90 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 9.79E-03 | cm/sec |
| K= | 2.77E+01 | ft/day |




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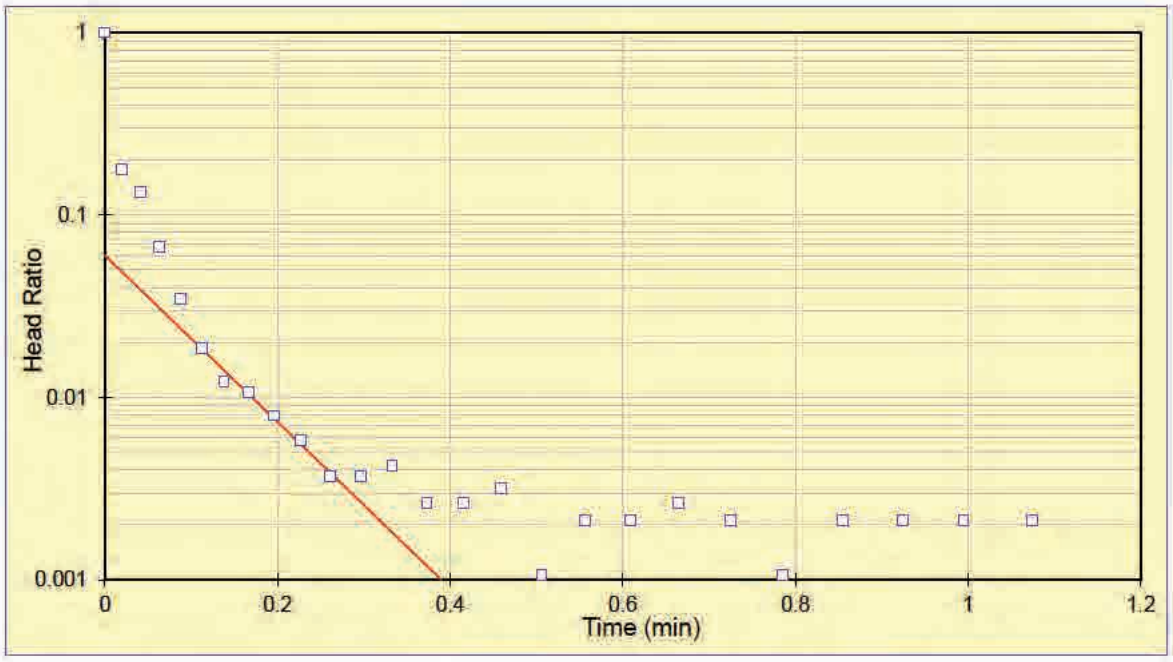
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.705 | K= | 3.70E-02 | cm/sec |
| $t_1$ = | 0 | K= | 1.05E+02 | ft/day |
| $t_2$ = | 0.39 | | | |
| $h_1/h_0$ = | 0.06 | | | |
| $h_2/h_0$ = | 0.00 | | | |




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Analysis By: DFS
Checked By: JRS
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## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 1)

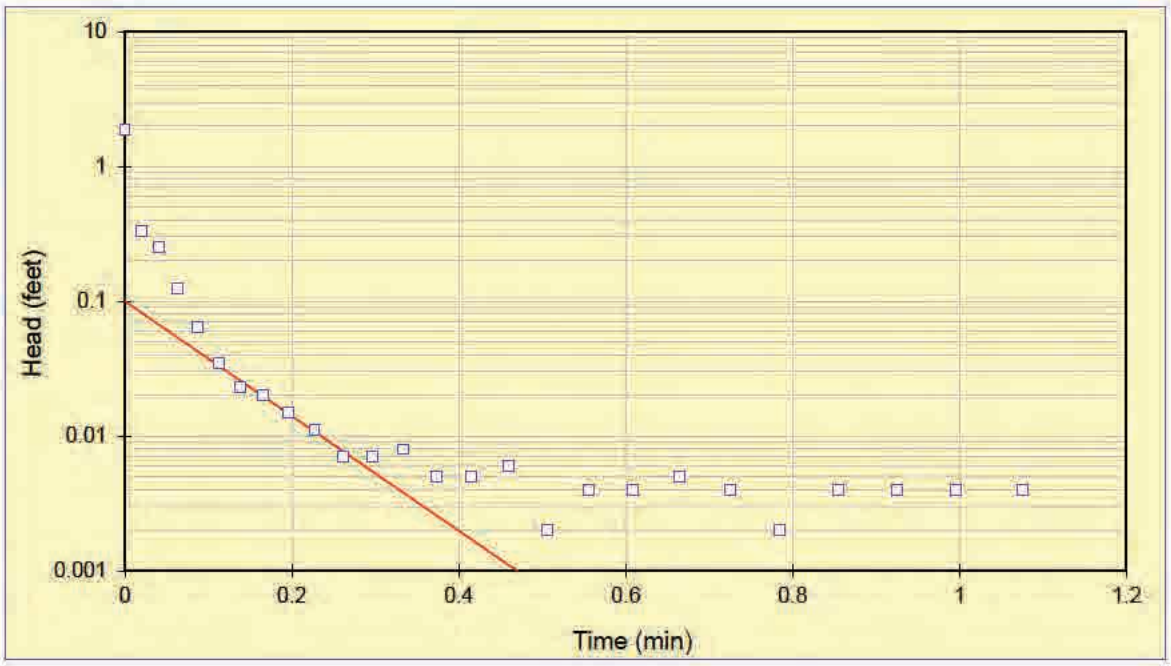
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.705 |
| $\ln(R_e/r_w)$= | 2.18 |
| $y_0$ = | 0.10 |
| $y_t$ = | 0.001 |
| $t$ = | 0.5 |

| RESULTS | | |
|---|---|---|
| K= | 2.25E-02 | cm/sec |
| K= | 6.38E+01 | ft/day |




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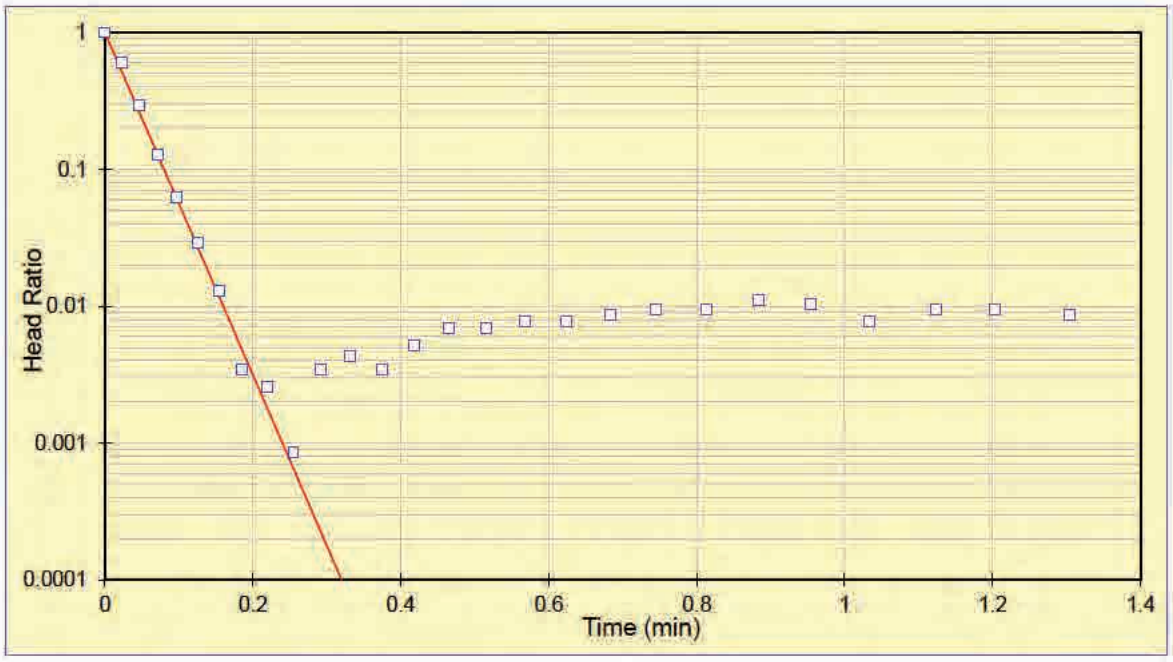
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.20 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 9.735 | K= | 1.01E-01 | cm/sec |
| $t_1$ = | 0 | K= | 2.87E+02 | ft/day |
| $t_2$ = | 0.32 | | | |
| $h_1/h_0$ = | 1.00 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19 (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

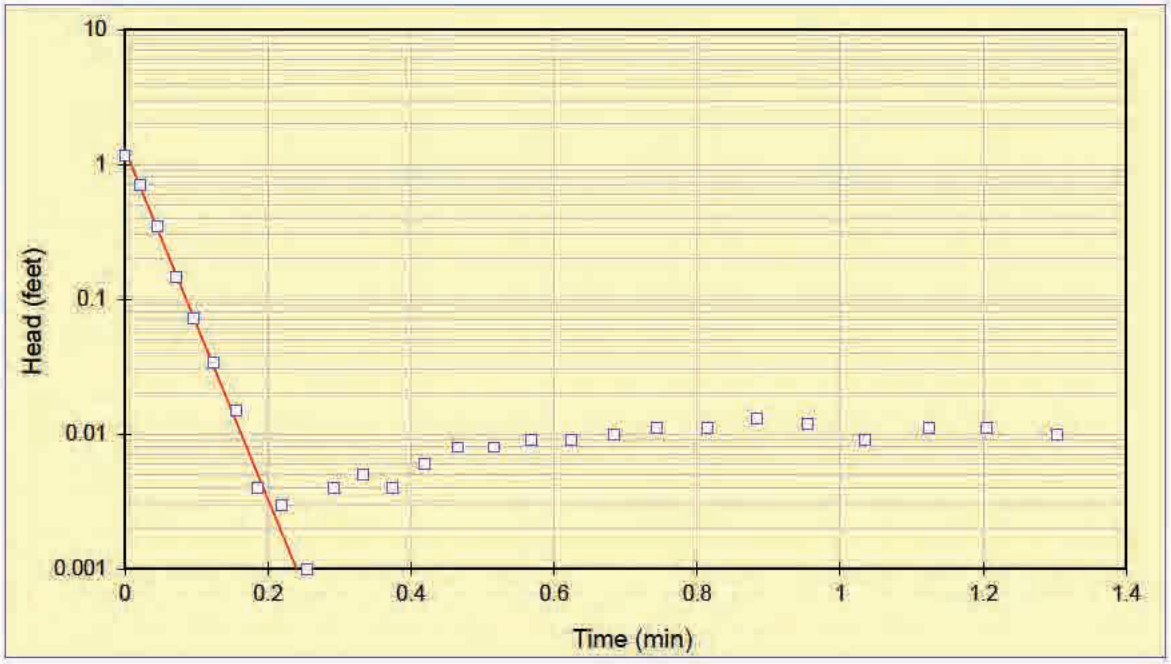
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.20 |
| $r_w$ = | 0.34 |
| $L_e$ = | 9.735 |
| $\ln(R_e/r_w)$= | 2.18 |
| $y_0$ = | 1.30 |
| $y_t$ = | 0.001 |
| $t$ = | 0.2 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.85E-02 | cm/sec |
| K= | 1.94E+02 | ft/day |




Project Name: NIPSCO Schahfer
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Test Date: 07/07/16

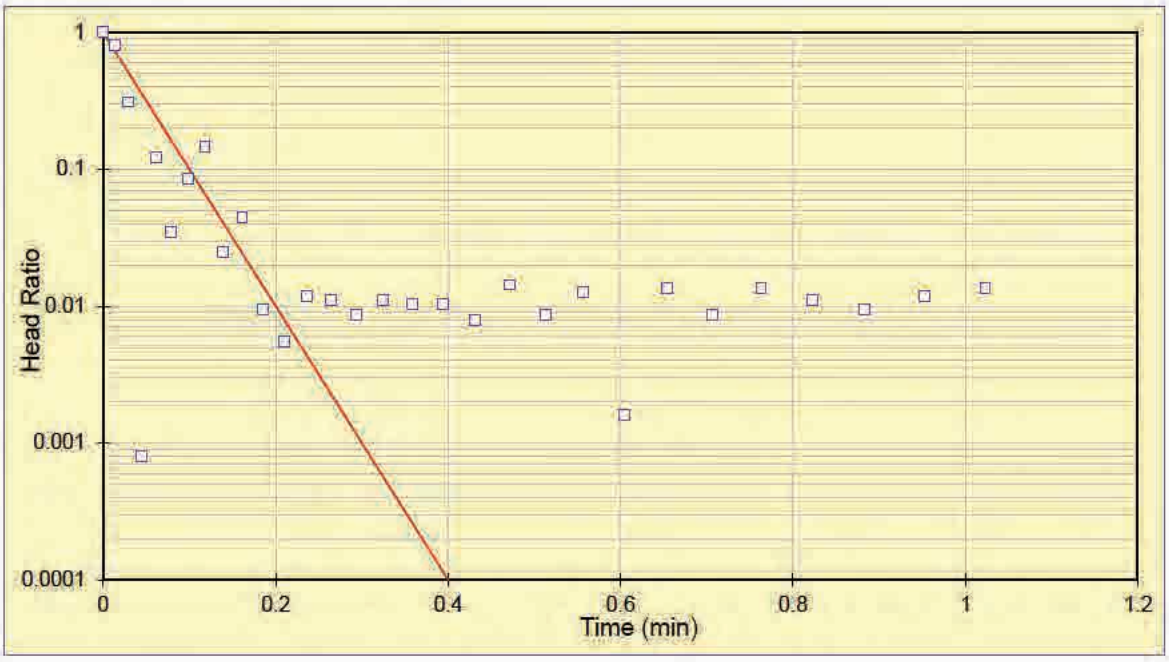
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.37E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.88E+01 | ft/day |
| $t_2$ = | 0.4 | | | |
| $h_1/h_0$ = | 1.00 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

# BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 1)

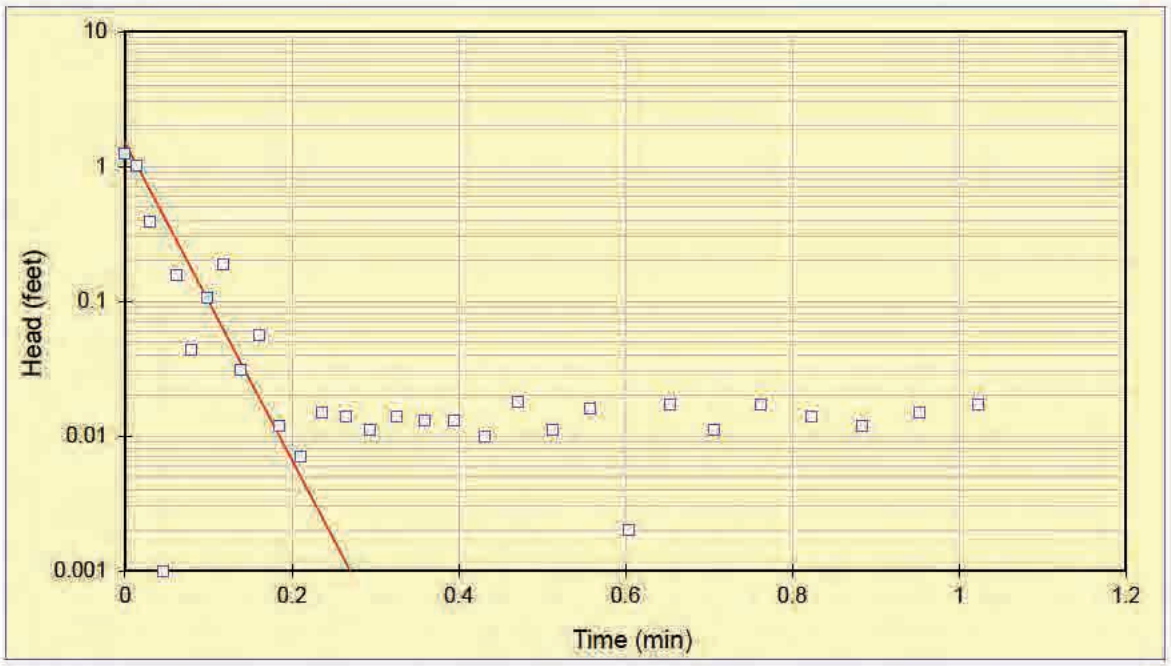
$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 1.50 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

| RESULTS | | |
|---|---|---|
| K= | 1.44E-02 | cm/sec |
| K= | 4.09E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## HVORSLEV SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 2)

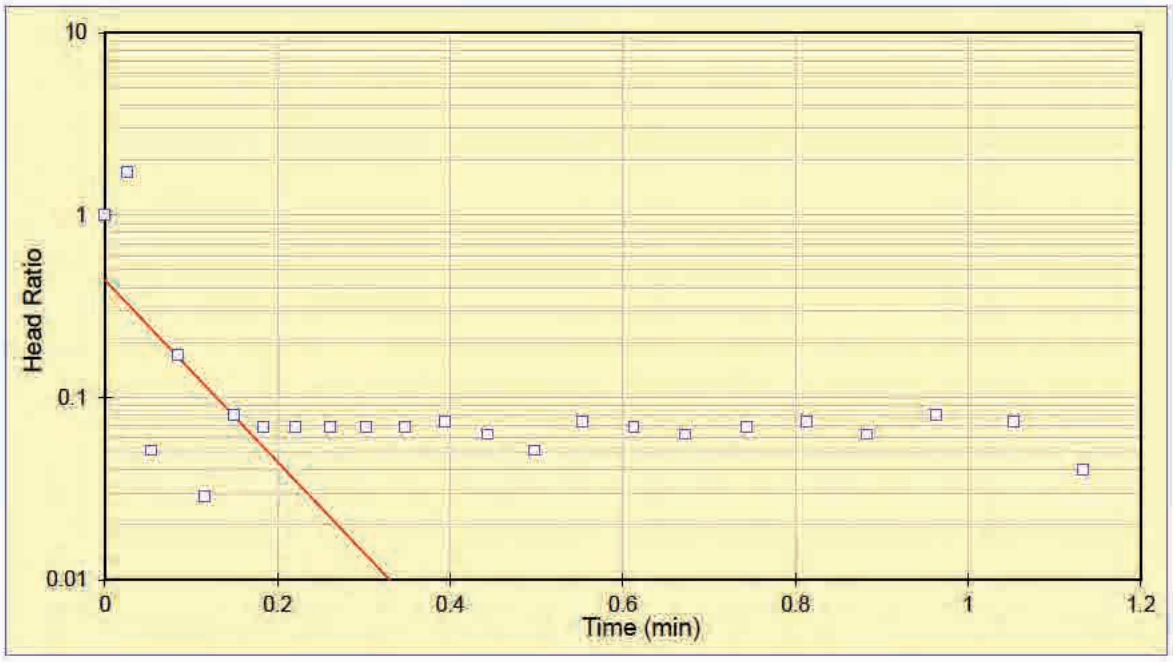
$$K = \frac{r_c^2}{2L_e} \ln\frac{L_e}{R_e}\left[\frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)}\right] 30.48$$

where:
$r_c$ = casing radius (feet)
$R_e$ = equivalent radius (feet)
$L_e$ = length of screened interval (feet)
$t$ = time (minutes)
$h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $R_e$ = | 0.34 |
| $L_e$ = | 10 |
| $t_1$ = | 0 |
| $t_2$ = | 0.33 |
| $h_1/h_0$ = | 0.44 |
| $h_2/h_0$ = | 0.01 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.82E-03 | cm/sec |
| K= | 1.93E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## FALLING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

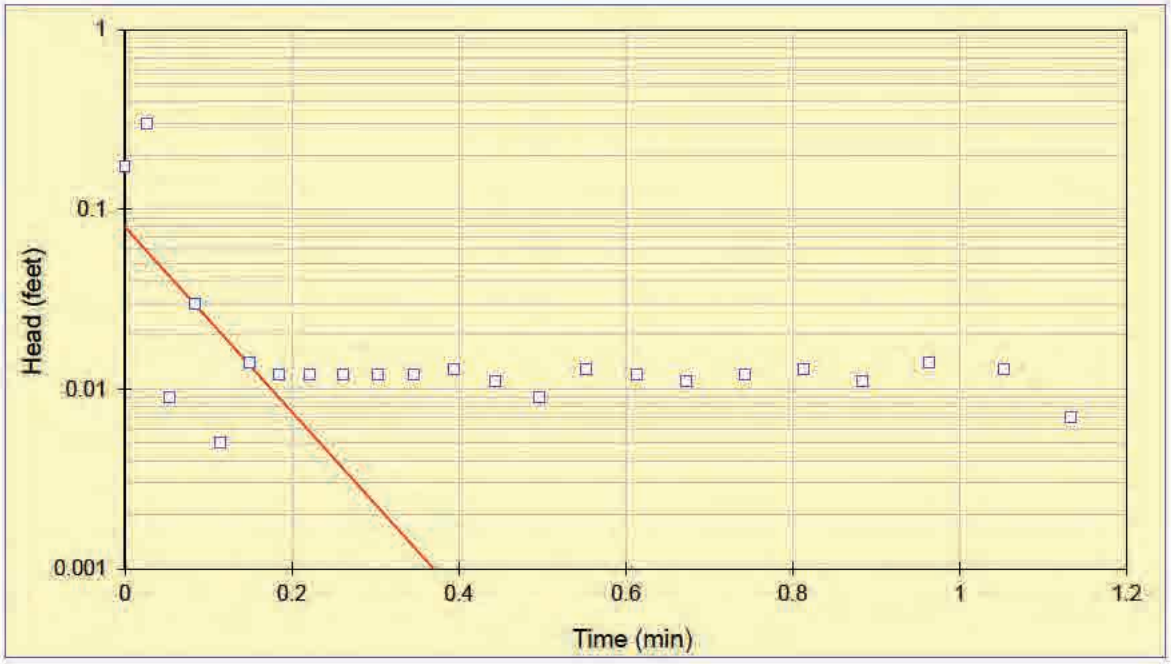
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 0.08 |
| $y_t$ = | 0.001 |
| $t$ = | 0.4 |

**RESULTS**

| | | |
|---|---|---|
| K= | 6.31E-03 | cm/sec |
| K= | 1.79E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-19B (TEST 1)

$$T = b + a \ln T$$

where:

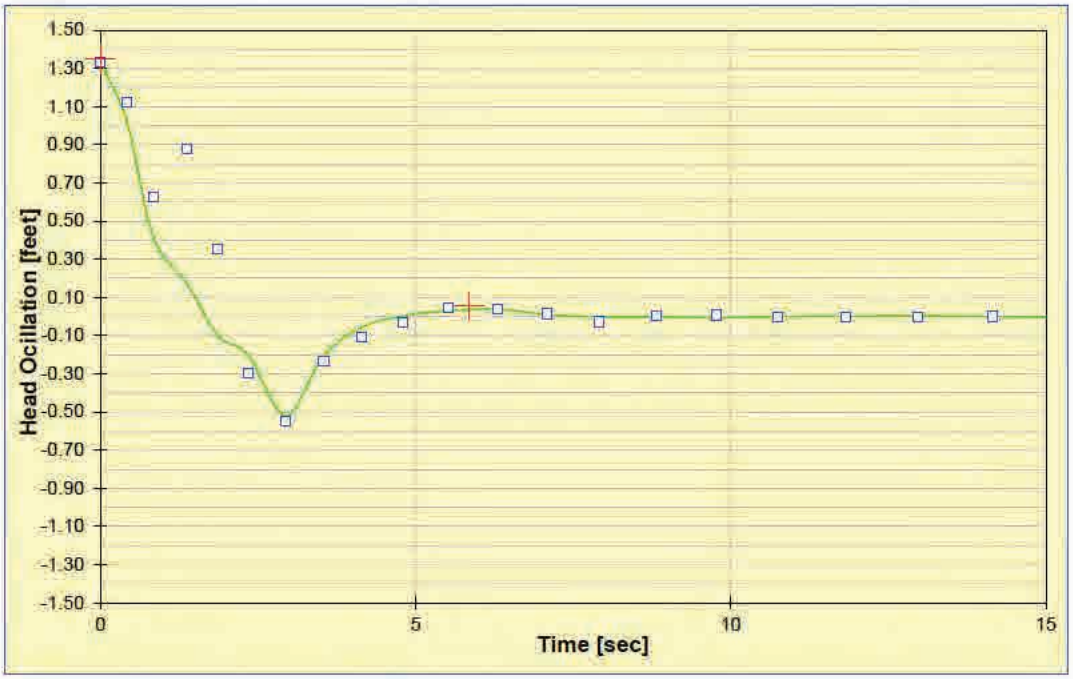
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.20536 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.4539 | $ft^{-1}$ |
| $L_c$ = | 17.92 | ft | $a$ = | 0.00231 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 1.0740 | $ft^{-1}$ | $t_2$ = | 5.85 | sec |
| $g$ = | 0.5471 | $ft^{-1}$ | $h(t_1)$ = | 1.35 | ft |
| $L$ = | 22.16 | $ft^3/sec^2$ | $h(t_2)$ = | 0.06 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.22E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.20E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 1.04E+03 $ft^2/day$ | $L_1$ = | 22.16 |
| $K$ = | 3.67E+01 ft/day | $L_2$ = | 22.92 |
| $K$ = | 1.29E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

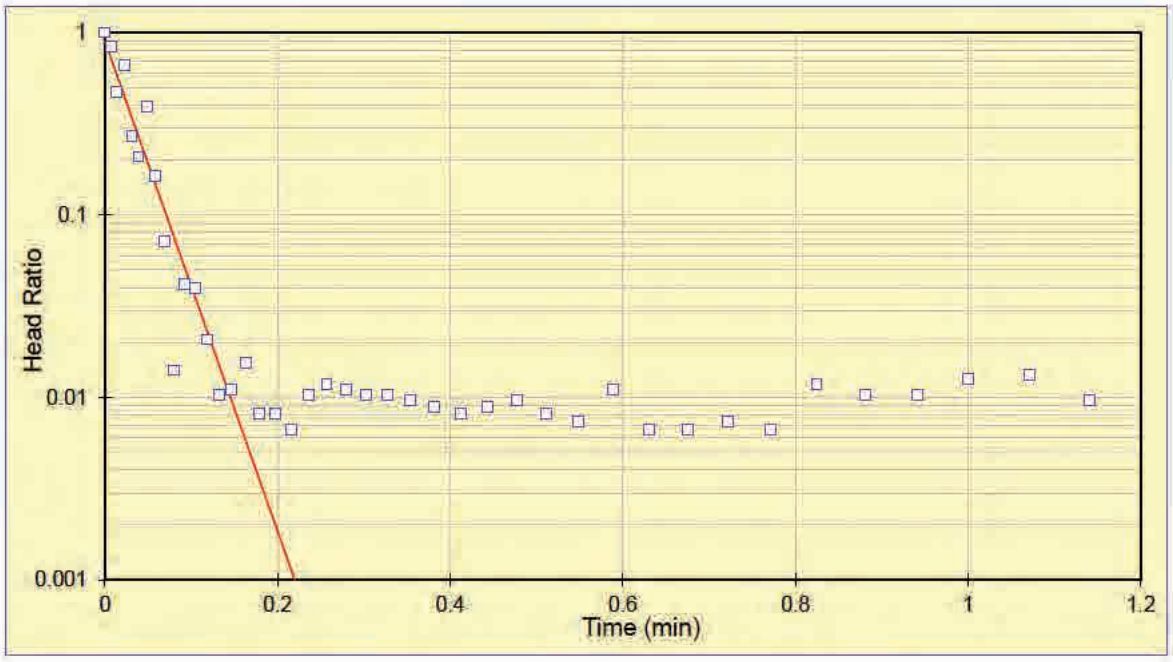
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.84E-02 | cm/sec |
| $t_1$ = | 0 | K= | 5.21E+01 | ft/day |
| $t_2$ = | 0.22 | | | |
| $h_1/h_0$ = | 0.90 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 1)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

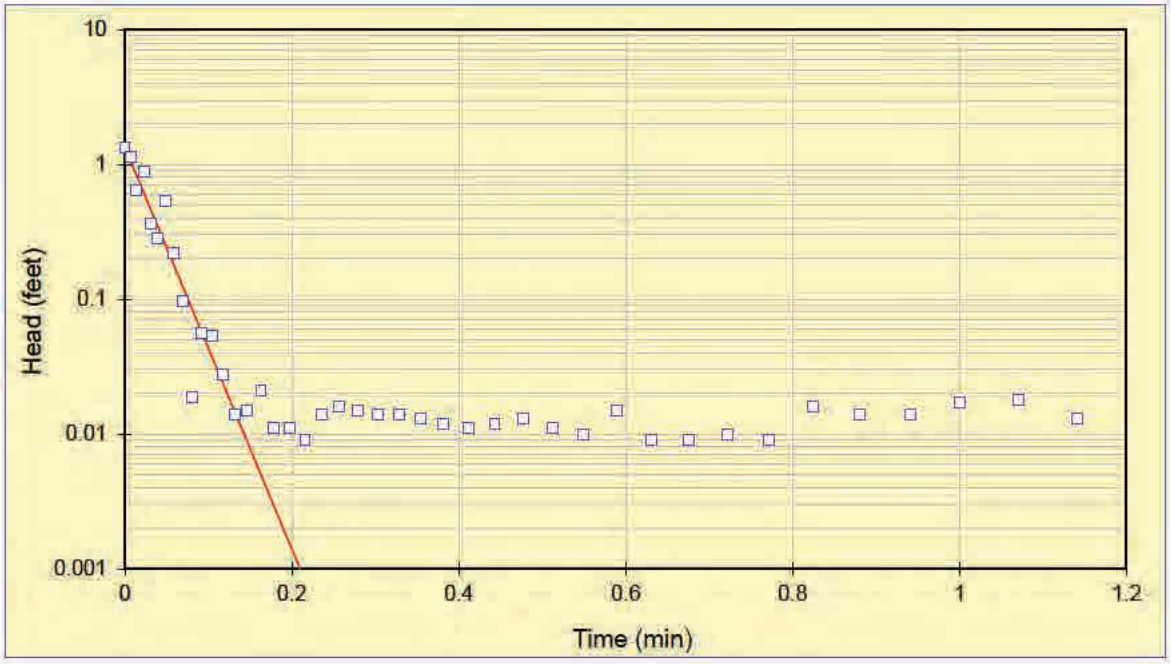
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 1.35 |
| $y_t$ = | 0.001 |
| $t$ = | 0.2 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.83E-02 | cm/sec |
| K= | 5.18E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## van der KAMP RISING HEAD SLUG TEST ANALYSIS
## UNDERDAMPED SLUG TEST GAMW-19B (TEST 2)

$$T = b + a \ln T$$

where:

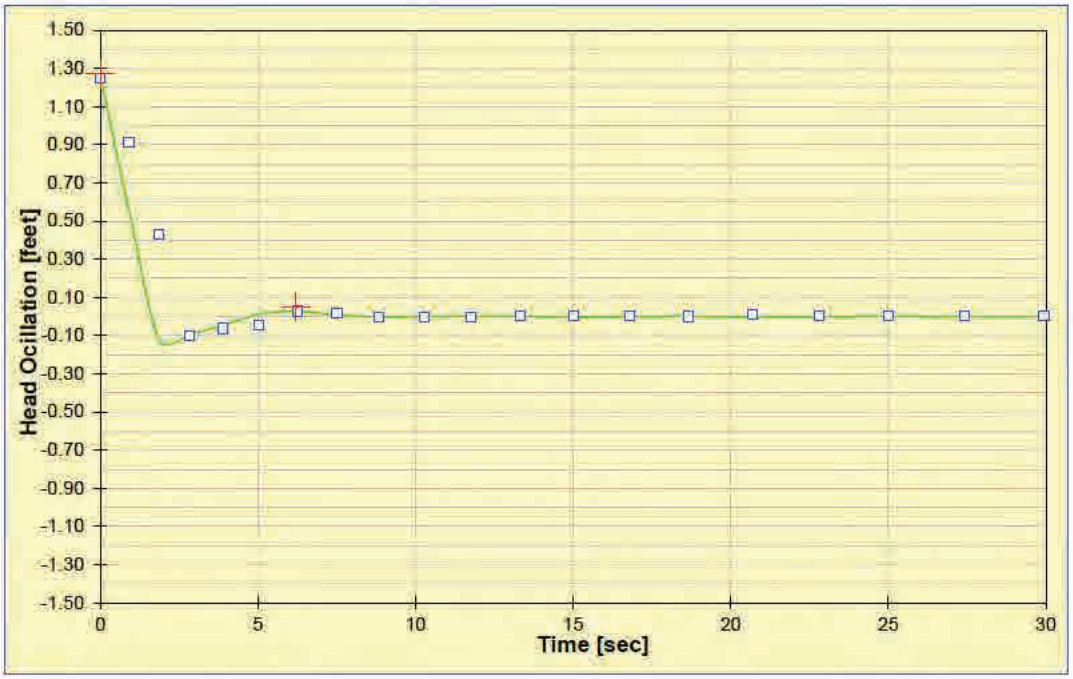
$$b = -a \ln\left[0.79 r_s^2 S (g/L)^{1/2}\right]$$
$$a = r_c^2 \left(g/L^{1/2}\right)/8d$$
$$d = \gamma / (g/L)^{1/2}$$
$$L = g/\left(\omega^2 + \gamma^2\right)$$

### INPUT PARAMETERS

| | | | | | |
|---|---|---|---|---|---|
| $r_c$ = | 0.08 | ft | $(g/L)^{1/2}$ = | 1.13983 | $ft^2$ |
| $r_s$ = | 0.08 | ft | $d$ = | 0.4577 | $ft^{-1}$ |
| $L_c$ = | 17.95 | ft | $a$ = | 0.00216 | $ft^3$ |
| $L_s$ = | 10.00 | ft | $t_1$ = | 0.00 | sec |
| $w$ = | 1.0134 | $ft^{-1}$ | $t_2$ = | 6.20 | sec |
| $g$ = | 0.5217 | $ft^{-1}$ | $h(t_1)$ = | 1.27 | ft |
| $L$ = | 24.78 | $ft^3/sec^2$ | $h(t_2)$ = | 0.05 | ft |
| $g$ = | 32.19 | $ft/sec^2$ | $S$ = | 1.00E-02 | dim |

### RESULTS

| | | | |
|---|---|---|---|
| $b = T_0$ = | 2.09E-02 $ft^2/sec$ | $a < 0.1$? | YES |
| $T$ = | 1.12E-02 $ft^2/sec$ | $d < 0.7$? | YES |
| $T$ = | 9.69E+02 $ft^2/day$ | $L_1$ = | 24.78 |
| $K$ = | 3.43E+01 ft/day | $L_2$ = | 22.95 |
| $K$ = | 1.21E-02 cm/sec | $L_1$:$L_2$ Diff <20% ? | YES |




Project Name: NIPSCO RMSGS
Project No.: 164-8171
Test Date: 07/07/16

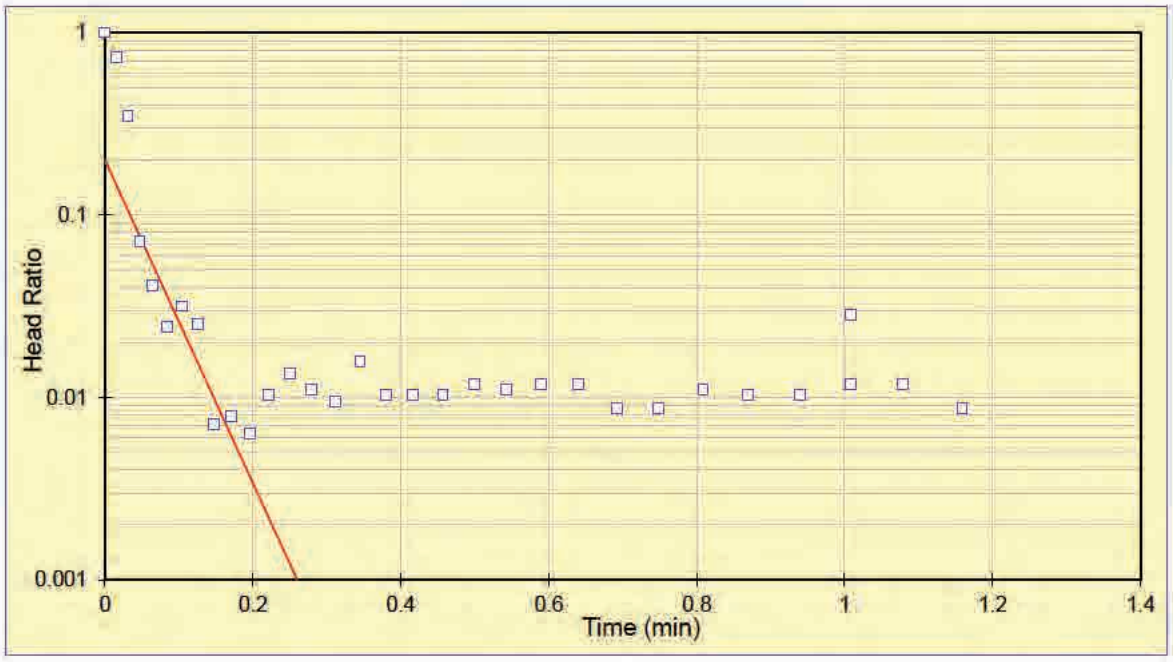
Analysis By: DFS
Checked By: JRS
Analysis Date: 7/31/2017

## HVORSLEV SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2}{2L_e} \ln \frac{L_e}{R_e} \left[ \frac{\ln\left(\frac{h_1}{h_2}\right)}{(t2 - t1)} \right] 30.48$$

where:
- $r_c$ = casing radius (feet)
- $R_e$ = equivalent radius (feet)
- $L_e$ = length of screened interval (feet)
- $t$ = time (minutes)
- $h_t$ = head at time $t$ (feet)

| INPUT PARAMETERS | | RESULTS | | |
|---|---|---|---|---|
| $r_c$ = | 0.08 | | | |
| $R_e$ = | 0.34 | | | |
| $L_e$ = | 10 | K= | 1.21E-02 | cm/sec |
| $t_1$ = | 0 | K= | 3.43E+01 | ft/day |
| $t_2$ = | 0.26 | | | |
| $h_1/h_0$ = | 0.20 | | | |
| $h_2/h_0$ = | 0.00 | | | |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

## BOUWER AND RICE SLUG TEST ANALYSIS
## RISING HEAD TEST GAMW-19B (TEST 2)

$$K = \frac{r_c^2 \ln\left(\frac{R_e}{r_w}\right)}{2L_e} \frac{1}{t} \ln\frac{y_0}{y_t}$$

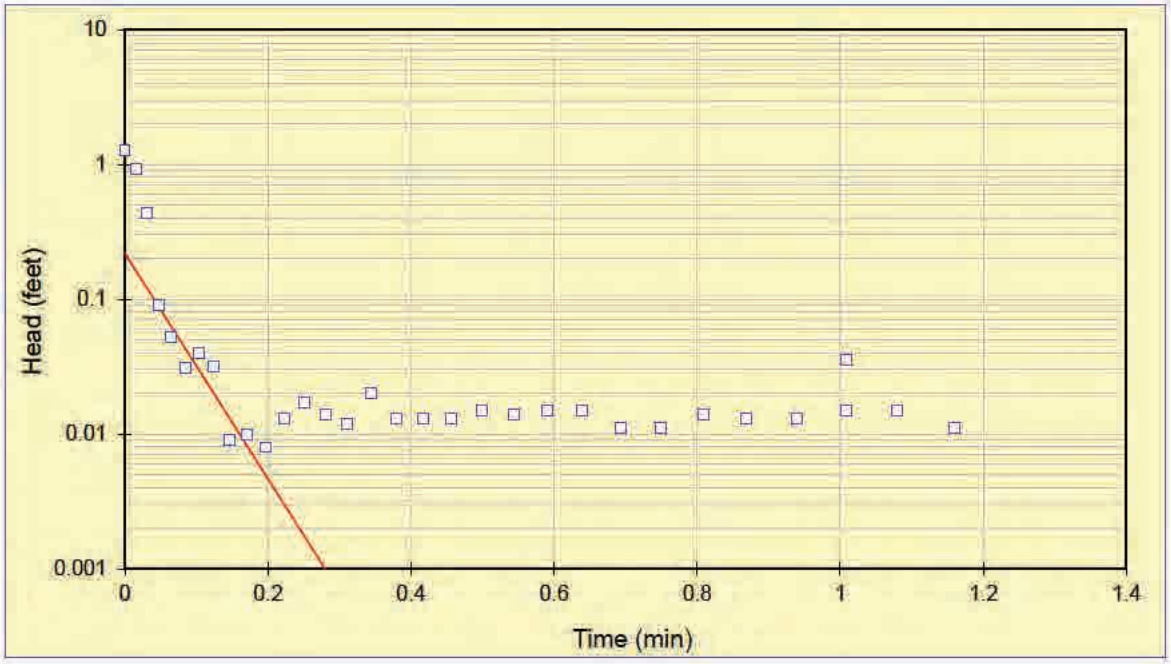
where:

$r_c$ = casing radius (feet);
$R_e$ = effective radius (feet);
$L_e$ = length of screened interval (feet);
$r_w$ = radial distance to undisturbed aquifer (feet)
$y_0$ = initial drawdown (feet)
$y_t$ = drawdown (feet) at time t (minutes)

| INPUT PARAMETERS | |
|---|---|
| $r_c$ = | 0.08 |
| $r_w$ = | 0.34 |
| $L_e$ = | 10 |
| $\ln(R_e/r_w)$= | 3.02 |
| $y_0$ = | 0.22 |
| $y_t$ = | 0.001 |
| $t$ = | 0.3 |

**RESULTS**

| | | |
|---|---|---|
| K= | 1.03E-02 | cm/sec |
| K= | 2.91E+01 | ft/day |




Project Name: NIPSCO Schahfer
Project No.: 164-8171
Test Date: 07/07/16

Analysis By: DFS
Checked By: JRS
Analysis Date: 7/27/2016

**APPENDIX C**

# Vertical Gradient Calculation

**APPENDIX C**

# Vertical Gradient Calculation

Appendix D
VERTICAL GRADIENT FLOW CALCULATIONS

| Monitoring Well Locations | Ground Surface Elevation (ft-masl) | Top of Casing Elevation (ft-masl) | Screen Interval | | | | June 13, 2016 | | | | July 15, 2016 | | | | September 9, 2016 | | | | November 2, 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft bgs) | Center (ft masl) | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction |
| GAMW07 | 993.02 | 993.94 | 5 | 15 | 10 | 983.02 | 10.77 | 983.17 | | | 10.84 | 983.10 | | | 9.55 | 984.39 | | | 9.96 | 983.98 | | |
| GAMW07B | 993.01 | 993.93 | 30 | 40 | 35 | 958.01 | | | | | | | | | | | | | 11.04 | 982.90 | -0.0815 | Down |
| GAMW08 | 992.85 | 993.76 | 5 | 15 | 10 | 982.85 | 9.91 | 983.85 | N/A | N/A | | | NA | NA | 9.61 | 984.15 | N/A | N/A | 10.16 | 983.60 | -0.1568 | Down |
| GAMW08B | 992.92 | 993.81 | 30 | 40 | 35 | 957.92 | | | | | | | | | | | | | 10.14 | 983.68 | | |
| GAMW09 | 992.1 | 992.99 | 5 | 15 | 10 | 982.10 | 9.09 | 983.90 | | | 10.04 | 982.95 | | | 8.11 | 984.88 | | | 8.92 | 984.07 | -0.0459 | Down |
| GAMW09B | 992.16 | 992.98 | 24.5 | 34.5 | 29.5 | 962.66 | 9.15 | 983.83 | -0.180-02 | Down | 9.81 | 983.17 | -0.145-02 | Down | 8.15 | 984.83 | -0.245-02 | Down | 8.98 | 984.00 | | |
| GAMW10 | 993.21 | 993.95 | 5 | 15 | 10 | 983.21 | 9.52 | 984.43 | | | 9.82 | 984.13 | | | 8.29 | 985.66 | | | 8.96 | 984.99 | | |
| GAMW10B | 993.11 | 993.05 | 29.3 | 37.1 | 33.2 | 959.91 | 9.12 | 983.93 | -0.417-03 | Down | 9.42 | 983.63 | 0.00E+00 | Up | 8.18 | 984.87 | 0.417-03 | Up | 8.96 | 984.09 | 0.000000 | Up |
| GAMW11 | 992.57 | 993.37 | 5 | 15 | 10 | 982.57 | 9.21 | 984.16 | 0.00E-00 | Down | 9.61 | 983.76 | 1.46E-01 | Up | 8.18 | 985.19 | 0.417-03 | Up | 8.52 | 984.85 | 0.000000 | Up |
| GAMW11B | 992.16 | 992.76 | 70.16 | 74.71 | 72.44 | 919.72 | 8.91 | 983.85 | | | 9.40 | 983.36 | | | 7.91 | 984.85 | | | 8.64 | 984.12 | | |
| GAMW12 | 993.61 | 994.60 | 5 | 15 | 10 | 983.61 | 10.10 | 984.50 | | | 9.29 | 985.31 | | | 10.05 | 984.55 | | | 9.25 | 985.35 | | |
| GAMW12B | 993.63 | 994.05 | 35 | 45 | 40 | 953.63 | 10.19 | 983.87 | -0.228-03 | Up | 9.77 | 984.29 | 0.417-03 | Down | 10.05 | 983.99 | 4.22E-04 | Down | 9.23 | 984.83 | 0.228-04 | Down |
| GAMW13 | 993.74 | 994.73 | 5 | 15 | 10 | 983.74 | 9.75 | 983.98 | N/A | N/A | 9.96 | 983.77 | N/A | N/A | 8.44 | 985.29 | N/A | N/A | 8.90 | 984.83 | 0.000E+00 | Down |
| GAMW13B | 993.64 | 994.47 | 25 | 35 | 30 | 958.64 | – | – | – | – | – | – | – | – | – | – | – | – | 8.54 | 985.93 | | |
| GAMW14 | 991.90 | 992.83 | 5 | 15 | 10 | 981.90 | – | – | N/A | N/A | – | – | N/A | N/A | – | – | N/A | N/A | 7.06 | 985.84 | 0.000E+00 | Down |
| GAMW14B | 992.80 | 993.79 | 22 | 32 | 27 | 970.80 | – | – | – | – | – | – | – | – | – | – | – | – | 7.05 | 985.84 | 0.000E+00 | Down |
| GAMW15 | 994.27 | 995.12 | 5 | 15 | 10 | 984.27 | – | – | N/A | N/A | – | – | N/A | N/A | – | – | N/A | N/A | 7.06 | 988.06 | 1.00E-01 | Up |
| GAMW15B | 992.20 | 993.10 | 27 | 37 | 32 | 960.20 | – | – | – | – | – | – | – | – | – | – | – | – | 7.05 | 986.05 | 1.00E-01 | Up |
| GAMW15C | 991.89 | 992.84 | 5 | 15 | 10 | 981.89 | – | – | N/A | N/A | – | – | N/A | N/A | – | – | N/A | N/A | 6.85 | 986.04 | 1.42E-01 | Up |
| GAMW15D | 992.07 | 993.02 | 26 | 36 | 31 | 961.07 | – | – | – | – | – | – | – | – | – | – | – | – | 6.97 | 986.05 | | |
| GAMW16 | 992.97 | 993.91 | 5 | 15 | 10 | 982.97 | – | – | N/A | N/A | – | – | NA | NA | – | – | N/A | N/A | 6.85 | 986.06 | 1.41E-01 | Up |
| GAMW16B | 992.99 | 993.87 | 32 | 42 | 37 | 955.99 | – | – | – | – | – | – | – | – | – | – | – | – | 7.07 | 986.80 | | |
| GAMW17 | 992.95 | 993.84 | 5 | 15 | 10 | 982.95 | – | – | N/A | N/A | – | – | NA | NA | – | – | N/A | N/A | 6.54 | 987.30 | 0.00E+00 | Down |
| GAMW20B | 995.16 | 997.03 | 45 | 55 | 50 | 945.16 | – | – | – | – | – | – | – | – | – | – | – | – | 10.41 | 986.62 | | |
| GAMW18 | 990.43 | 991.41 | 5 | 15 | 10 | 980.43 | – | – | N/A | N/A | – | – | NA | NA | – | – | N/A | N/A | 7.96 | 983.45 | -0.0815 | Down |
| GAMW19B | 988.35 | 990.84 | 50 | 60 | 55 | 933.35 | – | – | – | – | – | – | – | – | – | – | – | – | 7.83 | 983.01 | | |

Notes:
bgs = Feet below ground surface
amsl = Feet above mean sea level
Bold = Calculation is missing
ft/ft = Feet/Feet
NA = Not available

| Monitoring Well Location | Ground Surface Elevation (ft-masl) | Top of Casing Elevation (ft-masl) | Screen Interval | | | January 4, 2017 | | | | February 21, 2017 | | | | April 24, 2017 | | | | June 26, 2017 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft-bgs) | Center (ft-masl) | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-btoc) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction |
| GAMW07 | 991.11 | 993.94 | 5 | 15 | 10 | 981.11 | 12.83 | 981.11 | 1.10E-03 | Down | 12.83 | 981.11 | 0.00E+00 | Flat | 12.83 | 981.11 | 0.00E+00 | Flat | 12.83 | 981.11 | 0.00E+00 | Flat |
| GAMW07B | 991.61 | 994.10 | 30 | 40 | 35 | 956.61 | 37.99 | 956.12 | | | 37.99 | 956.12 | | | 37.99 | 956.12 | | | 37.99 | 956.12 | | |
| GAMW08 | 992.45 | 995.15 | 5 | 15 | 10 | 982.45 | 13.60 | 981.55 | 1.54E-03 | Up | 13.73 | 981.42 | 2.61E-04 | Down | 13.71 | 981.44 | 1.42E-04 | Up | 13.75 | 981.40 | 3.42E-04 | Up |
| GAMW08B | 979.15 | 981.97 | 20 | 35 | 27 | 952.15 | 24.51 | 957.46 | | | 24.57 | 957.40 | | | | | | | | | | |
| GAMW09 | 990.1 | 992.86 | 5 | 15 | 10 | 980.10 | 9.49 | 983.37 | | | 9.50 | 983.36 | | | 9.25 | 983.61 | 2.53E-03 | Down | 9.30 | 983.56 | 2.1E-03 | Down |
| GAMW09B | 990.19 | 992.96 | 34.5 | 44.5 | 39.5 | 955.69 | 9.65 | 983.31 | 2.00E-03 | Down | 9.81 | 983.15 | 2.00E-03 | Down | 9.56 | 983.40 | | | 9.60 | 983.36 | | |
| GAMW10 | 993.17 | 995.95 | 5 | 15 | 10 | 983.17 | 9.83 | 986.12 | | | 9.90 | 986.05 | | | 9.60 | 986.35 | | | 9.80 | 986.15 | | |
| GAMW10B | 993.13 | 995.95 | 29.5 | 39.5 | 34.5 | 958.63 | 9.83 | 986.12 | 1.23E-03 | Up | 9.91 | 986.04 | 1.89E-04 | Up | 9.77 | 986.18 | 1.47E-03 | Up | 9.80 | 986.15 | 0.00E+00 | Flat |
| GAMW11B | 992.37 | 994.97 | 5 | 15 | 10 | 982.37 | 8.83 | 986.14 | | | 8.86 | 986.11 | | | 8.77 | 986.20 | | | 8.72 | 986.25 | | |
| GAMW11C | 992.76 | 995.26 | 27.5 | 34.75 | 30.75 | 962.01 | 9.41 | 985.85 | 1.34E-03 | Up | 9.50 | 985.76 | 1.02E-03 | Up | 9.34 | 985.92 | 1.63E-03 | Up | 9.58 | 985.68 | 1.63E-03 | Up |
| GAMW14 | 993.51 | 996.30 | 5 | 15 | 10 | 983.51 | N/A | N/A | | | 12.49 | 984.02 | 1.02E-02 | Up | 11.35 | 985.16 | 9.46E-03 | Up | 11.51 | 984.93 | 1.56E-02 | Up |
| GAMW14B | 993.43 | 996.08 | 35 | 45 | 40 | 958.43 | 11.60 | 984.48 | | | 11.64 | 984.44 | | | 11.60 | 984.48 | | | 11.58 | 984.50 | | |
| GAMW15 | 993.74 | 996.57 | 5 | 15 | 10 | 983.74 | 9.49 | 987.08 | | | 9.56 | 987.01 | | | 9.45 | 987.12 | | | 9.56 | 987.01 | | |
| GAMW15B | 993.64 | 996.47 | 25 | 35 | 30 | 963.64 | 9.62 | 986.84 | 6.23E-03 | Down | 9.91 | 986.55 | 5.03E-03 | Down | | | | | | | | |
| GAMW16 | 991.00 | 993.83 | 5 | 15 | 10 | 981.00 | 9.75 | 984.08 | | | 9.84 | 983.99 | | | | | | | | | | |
| GAMW16B | 990.80 | 993.74 | 22 | 32 | 27 | 963.80 | 9.75 | 984.04 | -3.89E-04 | Down | 9.89 | 983.90 | 1.83E-04 | Up | | | | | | | | |
| GAMW17 | 994.27 | 997.13 | 5 | 15 | 10 | 984.27 | 9.77 | 987.14 | | | 9.84 | 987.07 | | | | | | | | | | |
| GAMW17B | 994.20 | 997.03 | 37 | 47 | 42 | 952.20 | 9.78 | 986.94 | 9.10E-03 | Up | 9.85 | 986.87 | 2.05E-03 | Up | | | | | | | | |
| GAMW18 | 990.89 | 993.84 | 5 | 15 | 10 | 980.89 | 9.55 | 984.08 | | | 9.61 | 984.11 | | | | | | | | | | |
| GAMW18B | 990.91 | 993.84 | 28 | 38 | 33 | 957.84 | 9.55 | 984.08 | 4.81E-03 | Up | 9.61 | 984.11 | 2.37E-03 | Up | | | | | | | | |
| GAMW19 | 992.07 | 994.91 | 5 | 15 | 10 | 982.07 | 9.85 | 985.06 | | | 9.91 | 985.00 | | | | | | | | | | |
| GAMW19B | 992.07 | 994.91 | 30 | 40 | 35 | 957.07 | 9.85 | 985.06 | 0.00E+00 | Flat | 9.91 | 985.00 | 2.80E-03 | Up | | | | | | | | |
| GAMW20B | 990.69 | 993.47 | 32 | 42 | 37 | 953.69 | 8.83 | 984.64 | | | 8.89 | 984.58 | | | | | | | | | | |
| GAMW20C | 990.76 | 993.54 | 5 | 15 | 10 | 980.76 | 9.03 | 984.51 | 1.50E-03 | Down | 9.09 | 984.45 | 1.93E-03 | Down | | | | | | | | |
| GAMW20D | 990.16 | 992.93 | 85 | 95 | 90 | 905.16 | 9.61 | 984.32 | | | 9.70 | 984.23 | | | | | | | | | | |
| GAMW21B | 990.23 | 992.91 | 5 | 15 | 10 | 980.23 | 9.33 | 984.13 | -1.50E-03 | Down | 9.38 | 984.08 | 4.64E-03 | Down | | | | | | | | |
| GAMW21D | 990.33 | 992.91 | 80 | 90 | 85 | 910.33 | 9.79 | 984.12 | | | 9.85 | 984.06 | | | | | | | | | | |

Notes:
ft-bgs = Feet below ground surface
ft-masl = Feet above mean sea level
ft-btoc = Feet below top of casing
m/m = Feet/Feet
N/A = Not available

| Monitoring Well Locations | Ground Surface Elevation (ft-msl) | Top of Casing Elevation (ft-msl) | Screen Interval | | | | August 21, 2017 | | | | October 2, 2017 | | | | February 26, 2018 | | | | March 12, 2018 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft bgs) | Center (ft msl) | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction | Depth To Water (ft-bgs) | Groundwater Elevation (ft-msl) | Vertical Gradient (ft/ft) | Flow Direction |
| GAMW09 | 993.02 | 993.94 | 5 | 15 | 10 | 983.02 | 9.08 | 984.86 | | | 10.15 | 983.79 | | | | | | | 9.8 | 984.06 | | |
| GAMW09A | 994.67 | 995.02 | 30 | 40 | 35 | 959.67 | -- | -- | | | -- | -- | | | | | | | -- | -- | | |
| GAMW09B | 992.45 | 992.76 | 5 | 15 | 10 | 982.45 | 10.10 | 982.53 | NA | NA | 10 | -- | NA | NA | -- | -- | NA | NA | 9.88 | 982.88 | NA | NA |
| GAMW09B | 979.52 | 980.40 | 20 | 30 | 25 | 954.52 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW10A | 1,000.1 | 1,002.96 | 5 | 15 | 10 | 990.01 | 9.11 | 993.85 | | | 10.25 | 992.83 | | | -- | -- | | | 9.29 | 993.75 | | |
| GAMW10B | 993.19 | 995.16 | 24.5 | 34.5 | 29.5 | 963.69 | 1.62 | 993.54 | 0.2245.02 | Down | 9.91 | 985.28 | 0.2225.02 | Down | -- | -- | NW | NA | 9.92 | 985.24 | -0.1(1.02) | Down |
| GAMW10C | 993.01 | 995.05 | 5 | 15 | 10 | 983.01 | 1.68 | 993.37 | | | 9.80 | 985.25 | | | -- | -- | | | 9.96 | 985.09 | | |
| GAMW11A | 993.11 | 995.05 | 27.7 | 37.7 | 33.7 | 959.41 | 1.67 | 993.38 | 1.4(0.02) | Up | 9.80 | 985.25 | 1.4(0.02) | Up | -- | -- | NW | NW | 9.96 | 985.09 | 1.4(0.02) | Up |
| GAMW11B | 992.97 | 994.97 | 5 | 15 | 10 | 982.97 | 3.55 | 991.42 | | | 10.58 | 984.39 | | | -- | -- | | | 9.36 | 985.61 | | |
| GAMW11C | 992.76 | 994.76 | 170.16 | 181.73 | 175.95 | 816.81 | 7.64 | 987.12 | 0.6(0.02) | Up | 9.97 | 984.79 | 0.6(0.02) | Up | -- | -- | NW | NW | 9.81 | 984.95 | 0.6(0.02) | Up |
| GAMW11 | 993.51 | 995.83 | 5 | 15 | 10 | 983.51 | 17.56 | 978.27 | | | NA | | | | -- | -- | | | 10.45 | 985.38 | | |
| GAMW12A | 993.63 | 995.0 | 35 | 45 | 40 | 953.63 | 16.95 | 978.05 | 1.0(0.02) | Down | 2.23 | 992.77 | | | -- | -- | NW | NW | 9.12 | 985.88 | 1.0(0.02) | Up |
| GAMW12 | 993.74 | 995.57 | 5 | 15 | 10 | 983.74 | 9.23 | 986.34 | | | 10.73 | 984.84 | | | -- | -- | NW | NW | 9.7 | 985.71 | | |
| GAMW12B | 993.58 | 995.47 | 25 | 35 | 30 | 963.58 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| TRENCH01 | 991.00 | 992.69 | 5 | 20 | 13 | 987.00 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW08B | 993.90 | 995.74 | 22 | 32 | 27 | 974.08 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW20 | 994.27 | 996.10 | 5 | 15 | 10 | 984.07 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW20B | 994.20 | 995.93 | 37 | 47 | 42 | 952.20 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW53 | 995.80 | 997.64 | 5 | 15 | 10 | 984.80 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW53B | 995.61 | 997.19 | 26 | 36 | 31 | 959.80 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW54 | 995.97 | 998.01 | 5 | 15 | 10 | 985.97 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW54B | 995.99 | 997.47 | 32 | 42 | 37 | 958.99 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW55 | 997.05 | 999.04 | 5 | 15 | 10 | 987.05 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW55B | 996.18 | 997.93 | 35 | 45 | 40 | 951.18 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |
| GAMW56 | 997.03 | 999.01 | 5 | 15 | 10 | 987.03 | -- | -- | NA | NA | -- | -- | NA | NA | -- | -- | NW | NW | -- | -- | NA | NA |
| GAMW56B | 996.33 | 997.84 | 33 | 43 | 38 | 958.33 | -- | -- | | | -- | -- | | | -- | -- | | | -- | -- | | |

Notes:
ft-bgs = Feet below ground surface
ft-msl = Feet above mean sea level
ft-bgs = Top of screen (ft-bgs) minus top of casing (ft-msl)
NA = Not applicable

| Monitoring Well Location | Ground Surface Elevation (ft-masl) | Top of Casing Elevation (ft-masl) | Screen Interval | | | | April 13, 2016 | | | | June 12, 2016 | | | | August 27-30, 2016 | | | | October 22-26, 2016 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (ft-bgs) | Bottom (ft-bgs) | Center (ft-bgs) | Center (ft-masl) | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction | Depth To Water (ft-bTOC) | Groundwater Elevation (ft-masl) | Vertical Gradient (m/m) | Flow Direction |
| GAMW09 | 891.62 | 893.94 | 5 | 15 | 10 | 881.62 | 9.99 | 883.95 | 7.70E-01 | Up | 9.63 | 884.31 | 1.71E-01 | Up | 9.95 | 884.00 | 3.43E-01 | Up | 10.07 | 883.87 | 1.71E-01 | Up |
| GAMW09-R | 891.67 | 894.10 | 290 | 40 | 35 | 856.67 | 4 | 889.93 | | | 4.30 | 889.80 | | | 4.58 | 889.51 | | | 10.1 | 883.99 | | |
| GAMW08 | 892.45 | 895.15 | 5 | 15 | 10 | 882.45 | 9.84 | 885.31 | 0.00E+00 | Up | 9.60 | 885.55 | 1.03E-01 | Up | 12.50 | 882.65 | -1.24E-01 | Up | 11.16 | 883.99 | 2.56E-01 | Up |
| GAMW08B | 892.52 | 895.42 | 20 | 30 | 25 | 867.52 | 4 | 891.42 | | | 5.20 | 890.32 | | | 5.04 | 890.38 | | | 6.35 | 889.17 | | |
| GAMW06 | 890.1 | 892.96 | 5 | 15 | 10 | 880.01 | 7.42 | 885.54 | 0.00E+00 | Down | 7.5 | 885.46 | -2.15E-02 | Down | 8.12 | 884.83 | -2.04E-02 | Down | 8.89 | 884.06 | -2.04E-02 | Down |
| GAMW06B | 890.19 | 893.19 | 28.5 | 38.5 | 33.5 | 856.69 | 7.14 | 886.05 | | | 7.25 | 885.94 | | | 8.15 | 885.03 | | | 8.79 | 884.39 | | |
| GAMW15 | 883.07 | 885.95 | 5 | 15 | 10 | 873.07 | 1.62 | 884.33 | 9.53E-01 | Up | 1.4 | 884.55 | 1.71E-01 | Up | 2.58 | 883.37 | 1.71E-01 | Up | 2.73 | 883.21 | 1.71E-01 | Up |
| GAMW15B | 883.18 | 886.08 | 27.5 | 37.5 | 32.5 | 850.68 | 1.4 | 884.68 | | | 1.65 | 884.43 | | | 2.53 | 883.55 | | | 3.02 | 883.06 | | |
| GAMW16 | 882.0 | 884.97 | 5 | 15 | 10 | 872.0 | 3.15 | 881.82 | 9.53E-01 | Up | 3.36 | 881.61 | 3.41E-01 | Up | 3.95 | 881.02 | 1.71E-01 | Up | 4.2 | 880.77 | 1.71E-01 | Up |
| GAMW16B | 882.13 | 884.76 | 27.16 | 34.71 | 30.76 | 851.84 | 2.45 | 882.31 | | | 2.6 | 882.16 | | | 3.24 | 881.52 | | | 3.65 | 881.11 | | |
| GAMW17 | 884.51 | 887.60 | 5 | 15 | 10 | 874.51 | 11.35 | 876.25 | | | 11.45 | 876.15 | | | 11.86 | 875.74 | | | 12.1 | 875.50 | | |
| GAMW17B | 884.63 | 887.6 | 28 | 38 | 33 | 851.63 | 10.42 | 877.18 | -9.53E-01 | Up | 10.23 | 877.40 | 1.03E-01 | Up | 11 | 876.6 | -2.71E-01 | Down | 11.43 | 876.18 | 2.71E-01 | Down |
| GAMW18 | 884.74 | 888.07 | 5 | 15 | 10 | 874.74 | 3.17 | 884.90 | 1.36E-01 | Up | 3.12 | 884.95 | 1.03E-01 | Up | 3.66 | 884.41 | 1.71E-01 | Up | 3.8 | 884.27 | 2.05E-01 | Up |
| GAMW18B | 883.54 | 886.47 | 28 | 38 | 33 | 850.54 | 9 | 884.47 | | | 9.33 | 884.15 | | | 9.28 | 884.21 | | | 9.32 | 884.17 | | |
| GAMW01 | 891.00 | 893.69 | 5 | 20 | 13 | 878.00 | | | NA | NA | 7.60 | 887.20 | -1.88E-01 | Down | 8.04 | 886.76 | -1.03E-01 | Down | 8.39 | 886.41 | -1.03E-01 | Down |
| GAMW04B | 890.80 | 893.79 | 22 | 32 | 27 | 863.80 | – | – | | | 7.06 | 886.74 | | | 7.54 | 886.26 | | | 7.89 | 885.91 | | |
| GAMW10 | 894.27 | 896.91 | 5 | 15 | 10 | 884.27 | – | – | | | – | – | | | 9.15 | 887.76 | | | 9.49 | 887.42 | | |
| GAMW04B | 890.20 | 893.03 | 27 | 37 | 32 | 863.20 | – | – | NA | NA | – | – | NA | NA | 8.85 | 884.35 | >1.71E-01 | Up | 9.20 | 884.00 | 1.71E-01 | Up |
| GAMW05 | 886.89 | 889.84 | 5 | 15 | 10 | 876.89 | – | – | | | 11.05 | 878.84 | | | 8.85 | 881.04 | -1.37E-01 | Up | 9.10 | 880.79 | 1.71E-01 | Up |
| GAMW05B | 886.91 | 889.91 | 26 | 36 | 31 | 855.91 | – | – | | | 7.05 | 882.86 | | | 7.77 | 882.14 | | | 8.05 | 881.86 | | |
| GAMW04 | 883.97 | 886.97 | 5 | 15 | 10 | 873.97 | 7.23 | – | | | 7.05 | 880.92 | | | 7.58 | 880.39 | | | 7.99 | 879.97 | | |
| GAMW04B | 883.97 | 886.97 | 32 | 42 | 37 | 851.97 | 7.32 | -2.71E-01 | 1.03E-01 | Up | 7.07 | 880.90 | 3.41E-02 | Up | 7.72 | 880.25 | 3.41E-02 | Down | 8.02 | 879.95 | 3.41E-02 | Down |
| GAMW05 | 886.95 | 889.94 | 5 | 15 | 10 | 876.95 | – | – | NA | NA | 6.84 | 883.00 | 3.42E-02 | Up | 9.44 | 880.40 | 2.39E-01 | Down | 6.93 | 883.01 | 3.08E-01 | Down |
| GAMW05B | 886.18 | 889.33 | 26 | 36 | 31 | 855.18 | – | – | | | 6.66 | 882.67 | | | 6.93 | 882.40 | | | 6.95 | 882.38 | | |
| GAMW06 | 886.24 | 889.61 | 5 | 15 | 10 | 876.24 | – | – | NA | NA | 6.56 | 883.05 | -1.03E-01 | Down | 9.56 | 880.05 | -1.03E-01 | Up | 9.93 | 879.68 | 1.71E-01 | Up |
| GAMW06B | 886.35 | 889.31 | 27 | 37 | 32 | 854.35 | – | – | | | 6.64 | 882.67 | | | 6.83 | 882.48 | | | 6.85 | 882.46 | | |

Notes:
Bgs = Feet below ground surface
masl = Feet above mean sea level
Notes = Negative (-) is Upward
NA = Not Available

Appendix C
VERTICAL GRADIENT FLOW CALCULATIONS

| Monitoring Well Locations | Ground Surface Elevation (masl) | Top of Casing Elevation (masl) | Screen Interval | | | | February 23, 2018 | | | | Average Vertical Gradient (m/m) | Flow Direction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Top (m bgs) | Bottom (m bgs) | Center (m bgs) | Center (masl) | Depth To Water (m BTOC) | Groundwater Elevation (masl) | Vertical Gradient (m/m) | Flow Direction | | |
| DAMW27 | 1000.23 | 999.95 | 5 | 10 | 7.5 | 992.45 | 10.55 | 989.40 | | | | |
| DAMW28 | 999.61 | 999.33 | 10 | 15 | 12.5 | 987.11 | 11.23 | 988.10 | 0.05E-02 | Up | 0.0050 | Up |
| DAMW29 | 999.95 | 999.66 | 5 | 10 | 7.5 | 992.16 | 10.89 | 988.77 | | | | |
| DAMW30 | 999.92 | 999.61 | 15 | 20 | 17.5 | 982.11 | 11.13 | 988.48 | 0.00E+00 | Up | 0.0031 | Up |
| DAMW31 | 999.5 | 999.19 | 5 | 10 | 7.5 | 992.19 | 10.68 | 988.51 | | | | |
| DAMW32 | 999.53 | 999.24 | 24.5 | 31.5 | 28.0 | 971.91 | 10.88 | 988.36 | -0.06E-02 | Down | -0.0214 | Down |
| DAMW33 | 999.07 | 998.79 | 5 | 10 | 7.5 | 991.51 | 9.98 | 988.81 | | | | |
| DAMW34 | 998.1 | 998.26 | 37.5 | 47.5 | 42.5 | 955.76 | 9.07 | 989.19 | 0.07E-02 | Up | 0.0051 | Up |
| DAMW35 | 999.2 | 998.92 | 5 | 10 | 7.5 | 991.71 | 10.20 | 988.72 | | | | |
| DAMW36 | 998.76 | 998.39 | 27.75 | 33.75 | 30.75 | 967.64 | 9.82 | 988.57 | 0.03E-02 | Up | 0.0027 | Up |
| DAMW37 | 998.81 | 998.53 | 5 | 10 | 7.5 | 991.03 | 10.04 | 988.49 | | | | |
| DAMW38 | 998.86 | 998.59 | 24 | 34 | 29 | 969.59 | 10.08 | 988.51 | -0.02E-02 | Down | -0.0111 | Down |
| DAMW39 | 999.03 | 998.77 | 5 | 10 | 7.5 | 991.53 | 9.94 | 988.83 | | | | |
| DAMW40 | 999.04 | 998.47 | 25 | 35 | 30 | 969.04 | 9.98 | 988.49 | 0.10E-02 | Up | 0.0055 | Up |
| DAMW41 | 997.90 | 997.63 | 5 | 10 | 7.5 | 990.13 | 9.06 | 988.57 | | | | |
| DAMW42 | 997.96 | 997.79 | 22 | 32 | 27 | 970.79 | 9.06 | 988.73 | -0.08E-02 | Up | -0.0103 | Down |
| DAMW43 | 997.97 | 997.70 | 5 | 10 | 7.5 | 990.20 | 9.09 | 988.61 | | | | |
| DAMW44 | 997.97 | 997.70 | 27 | 37 | 32 | 965.70 | 9.09 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW45 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW46 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW47 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW48 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW49 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW50 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW51 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW52 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW53 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW54 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW55 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW56 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW57 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW58 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |
| DAMW59 | 998.01 | 997.74 | 5 | 10 | 7.5 | 990.24 | 9.13 | 988.61 | | | | |
| DAMW60 | 997.99 | 997.72 | 25 | 35 | 30 | 967.99 | 9.11 | 988.61 | 0.00E+00 | Up | 0.0000 | Up |

Notes:
mbgs = meters below ground surface
masl = meters above mean sea level
mBTOC = meters below top of casing
NM = Flow Dry
NA = not available

Prepared by: EMW
Checked by: TV
Reviewed by: MAH

**APPENDIX D**

# Monitored Natural Attenuation Evaluation

GOLDER

**REPORT**

# MONITORED NATURAL ATTENUATION EVALUATION

*Northern Indiana Public Service Company LLC*
*Rollin M Schahfer Generating Station*
*Wheatfield, IN*

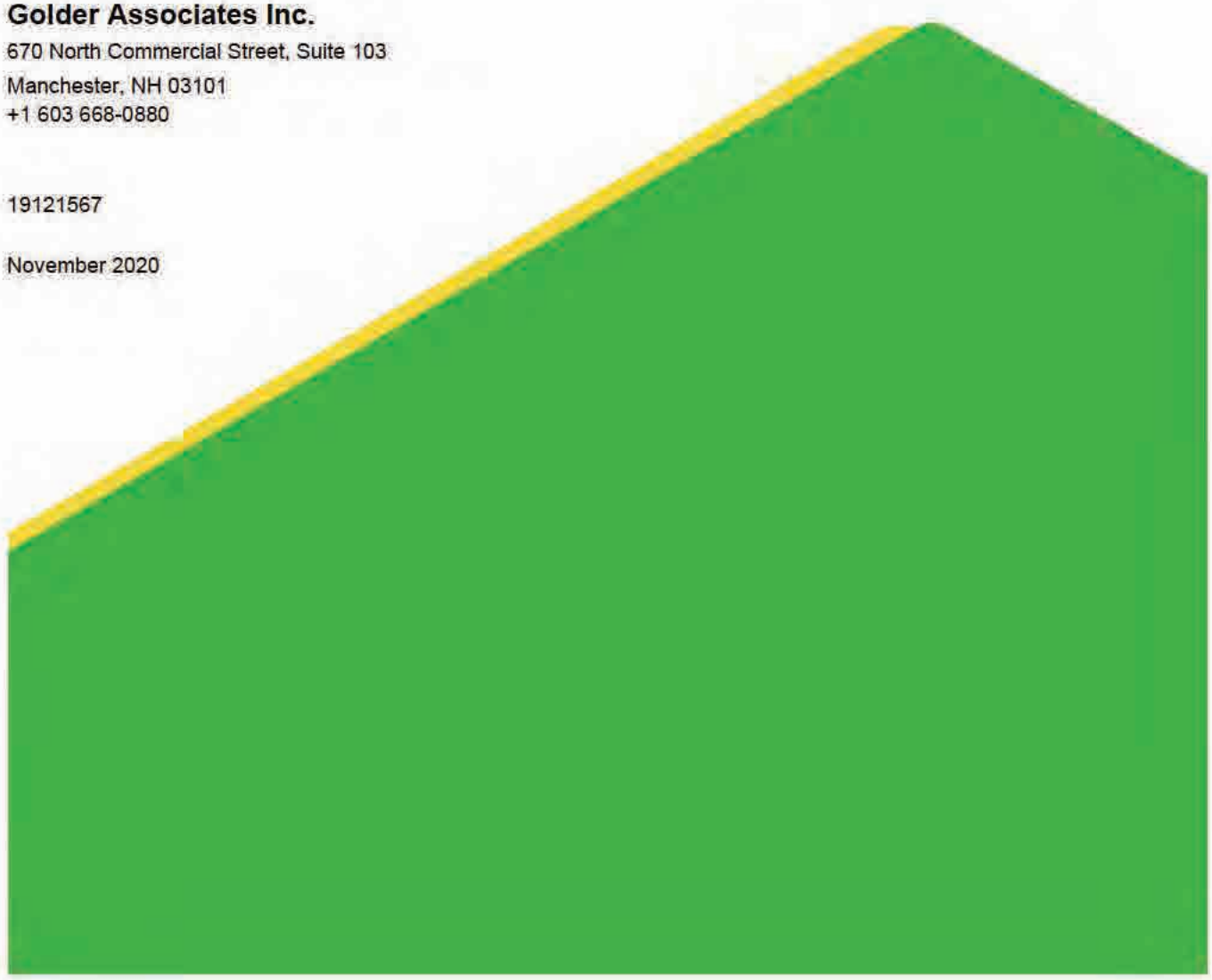
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November 2020



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**APPENDICES**

**APPENDIX A**
Groundwater and Porewater Monitoring Data

**APPENDIX B**
Groundwater Flow Model Technical Memorandum

# Acronyms

| | |
|---|---|
| ACM | Assessment of Corrective Measures |
| CCR | Coal Combustion Residuals |
| CFR | Code of Federal Regulations |
| DO | Dissolved Oxygen |
| Eh | Reduction Potential |
| ft bgs | feet below ground surface |
| g | Gram |
| GMPIM | Groundwater Monitoring Program Implementation Manual |
| GWPS | Groundwater Protection Standards |
| IAP | Ion Activity Product |
| IDEM | Indiana Department of Environmental Management |
| ITRC | Interstate Technology Regulatory Council |
| kg | kilogram |
| Ksp | Solubility Product |
| MCL | Maximum Contaminant Level |
| MCWB | Metal Cleaning Waste Basin |
| mg | milligram |
| mg/L | milligram per liter |
| MNA | Monitored Natural Attenuation |
| mV | millivolt |
| MSRB | Material Storage Runoff Basin |
| NIPSCO LLC | Northern Indiana Public Service Company LLC |
| ORP | Oxidation-Reduction Potential |
| RMSGS | R. M. Schahfer Generating Station |
| SCM | surface complexation model |
| SEP | Sequential Extraction Potential |
| SI | Saturation Index |
| SSL | Statistically Significant Level |
| SU | Standard Unit |
| TAL | Target Analyte List |
| TDS | Total Dissolved Solids |
| USEPA | United States Environmental Protection Agency |
| XRD | X-ray diffraction |

# 1.0 OVERVIEW

Groundwater and solid materials were evaluated to determine the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments (i.e., Material Storage Runoff Basin (MSRB), Metal Cleaning Waste Basin (MCWB), and the Drying Area (together, the CCR Unit) at the Northern Indiana Public Service Company LLC (NIPSCO LLC) Rollin M. Schahfer Generating Station (RMSGS, or Site). The structure of this feasibility evaluation closely follows the United States Environmental Protection Agency (USEPA) guidance on using MNA as a remedial strategy (USEPA 2007a and 2007b) and considers best practices from the Interstate Technology Regulatory Council (ITRC) document: “A Decision Framework for Applying Monitored Natural Attenuation Processes to Metals and Radionuclides in Groundwater” (ITRC 2010).

RMSGS manages CCR in the surface impoundments subject to applicable requirements of 40 Code of Federal Regulations (CFR) Part 257 as amended (CCR Rule). In April 2019, pursuant to 40 CFR §257.96(a), an assessment of corrective measures (ACM) was completed for the CCR Unit. This evaluation identified MNA as a potential remedial alternative for cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. Additionally, arsenic, boron, lithium, and molybdenum were evaluated as part of this assessment due to the potential for future SSLs, should they ever occur. The results of the evaluation will be used to assess the performance and reliability of MNA as a potential remedial alternative as required by 40 CFR §257.97, Golder determined the overall feasibility of MNA for the CCR Unit by evaluating the following tiers (USEPA 2007a,b):

1) Demonstrate active constituent removal from groundwater and dissolved plume stability (Tier I)

2) Determine the mechanisms and rates of the operative attenuation processes (Tier II)

3) Determine the long-term capacity for attenuation and the stability of immobilized constituents (Tier III)

Following completion of this multi-tier evaluation, the fourth and final tier of an MNA program, which involves the design of a performance monitoring program and the development of a contingency plan, will be developed.

# 2.0 APPROACH

Golder evaluated the feasibility, mechanisms, rates, and stability of MNA as a remedy for groundwater impacts from the CCR Unit. In order to perform the evaluation, Golder collected samples of groundwater and overburden soil between July 24, 2018 and March 3, 2020 for geochemical analysis. The supplemental MNA assessment included the following activities:

- Groundwater:
  - Characterization to identify temporal and geographical trends, where present, and to estimate site-wide attenuation rates using temporal and spatial trends in groundwater quality data.
  - Geochemical modeling to identify the major chemical species and evaluate saturation indices of minerals relevant to attenuation of arsenic, boron, cobalt, lithium, and molybdenum.
  - Determination of the capacity of different mechanisms to attenuate arsenic, boron, cobalt, lithium, and molybdenum, including adsorption, precipitation and co-precipitation, and physical attenuation (dilution/dispersion).
  - Geochemical modeling to assess the stability and reversibility of attenuation due to adsorption.

- Overburden soil:
  - Mineralogical analysis of overburden soils to identify and quantify the major mineral components.
  - Chemical analysis of overburden soils to quantify the total metal content and identify the environmentally-available fraction of metals.

The results generated by this supplemental assessment were used by Golder to complete the Tier I, Tier II, and Tier III evaluation (USEPA 2007a,b). In addition, groundwater data collected during previous sampling events were used. The results of the Tier I, Tier II, and Tier III are described in the subsequent sections to establish a basis for the likely success of MNA at the RMSGS site.

## 2.1 Groundwater and Porewater Sampling

### 2.1.1 Sample Collection

Golder personnel collected groundwater and porewater samples in accordance with the Golder RMSGS Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017) from the background, downgradient, Assessment, and property boundary monitoring wells presented in Table 1, and from piezometers located within the CCR Unit. Piezometer GAPIEZ-06 is located interior of the slurry wall on the western edge of the MSRB and is screened within the CCR materials. Piezometers DAPZ-02A and DAPZ-02B (abandoned in April 2020) were installed interior of the slurry wall on the eastern edge of the Drying Area and were screened in native materials (i.e., below the extent of CCR) from approximately five to 20 feet below ground surface (ft bgs) and 33 to 38 ft bgs, respectively. The monitoring well and former piezometer locations are shown in Figure 1.

**Table 1: Overview of the Wells Used in the Monitored Natural Attenuation Assessment**

| Background Wells | Downgradient Wells | Assessment Wells | Property Boundary Wells |
|---|---|---|---|
| GAMW-04, GAMW-07, GAMW-07B, GAMW-15, GAMW-15B | GAMW-08, GAMW-08B, GAMW-09, GAMW-09B, GAMW-16, GAMW-16B, GAMW-17, GAMW-17B, GAMW-18, GAMW-18B | GAMW-52, GAMW-52B, GAMW-53, GAMW-53B, GAMW-54, GAMW-54B, GAMW-55/55R, GAMW-55B, GAMW-56, GAMW-56B | GAMW-46, GAMW-46B |

### 2.1.2 Groundwater and Porewater Analysis

The geochemical characterization of porewater and groundwater samples included the measurement of field parameters and the laboratory analysis of samples for total metals and major cations and anions. The field parameters and laboratory analyses included:

**Field Parameters:** Parameters measured in the field included pH, dissolved oxygen (DO), oxidation reduction potential (ORP), conductivity, and temperature. These measurements were used to determine general geochemical conditions in the groundwater and support geochemical modeling.

**Metals:** Analysis of Appendix III and IV metals concentrations was conducted to understand the geochemical composition of groundwater and porewater. Metals analysis allows for the delineation of a potential plume, evaluation of mineral saturation indices, development of partitioning coefficients (in conjunction with solid material analyses), and evaluation of background contributions from natural sources or anthropogenic sources.

**Major Cations and Anions:** Geochemical modeling of mineral solubility, metals attenuation and background contributions requires analysis of major cations and anions because they affect and participate in sorption and mineral dissolution or precipitation reactions.

The groundwater and porewater samples were analyzed using the following methods:

- pH following SW846 9040C “pH Electrometric Measurement” (USEPA 2004)
- Total dissolved solids standard method (SM) 2540C “Total Dissolved Solids Dried at 180°C” (USEPA 1993a)
- Total hardness following SM 2340B (USEPA 1997)
- Chloride, fluoride, and sulfide following USEPA SW846 9056A “Determination of Inorganic Anions by Ion Chromatography”, Revision 1 (USEPA 2007c)
- Nitrate and nitrite following USEPA 353.2 “Determination of Nitrate-Nitrite Nitrogen by Automated Colorimetry, Revision 2.0” (USEPA 1993b)
- Alkalinity following SM 2320B “Alkalinity by Titration” (USEPA 2005a)
- Phosphorous following SM 4500-P E “Phosphorous by Ascorbic Acid Method” (USEPA 2005b)
- Total Target Analyte List (TAL) metals following USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3, SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2, and SW846 6020A “Inductively Coupled Plasma-Mass Spectrometry”, Revision 1 (USEPA 1998a)

## 2.2 Overburden Soil Sampling and Analysis

### 2.2.1 Sample Collection

Golder subcontracted a licensed well driller to advance borings into the overburden soil and install monitoring wells using roto sonic drilling methods. During boring operations, the driller collected continuous drill cores from all deep wells (i.e.” B” flagged wells). From the drill cores, Golder staff collected overburden samples from the depth of the screened intervals (i.e. 10-foot screened interval) from one background well soil boring (SB-07B), two downgradient well soil borings (SB-08B and SB-18B) and from five Assessment Monitoring well soil borings (SB-52B, SB-53B, SB-54B, SB-55B, and SB-56B). Golder staff also collected an additional sample from SB-53B (25’-27’) at the top of the screened interval due to minor unidentified visual soil staining encountered within the planned interval itself. An additional soil boring was completed just external to the slurry wall on the eastern side of the MCWB (OW-9) and samples were collected on approximately 10-foot intervals.

The driller used a “marsh buggy” with a hollow stem auger drill rig specifically designed to work in the wet, soft soil/ash conditions inside the CCR Unit to advance eight soil borings within the Drying Area. From these eight borings, 23 samples were analyzed for total metals with one of these samples (DA-14_4-6’) also analyzed using the 7-step sequential extraction. The only sample for which data are included in this report is DA-14_4-6’; all other data, which were obtained for other purposes, are provided in the Ash Pond Assessment Report (Golder 2020).

Soil borings were numbered to match the equivalent monitoring wells, where applicable. Golder field staff prepared a composite overburden sample from boreholes by selecting a two-foot interval from each drill core and submitting it to the laboratory for analysis under chain-of-custody procedures. The unique descriptions used to

identify the samples included the boring name and depth of the sample below ground surface (e.g., SB-07B-35'-37'). The sample type and analytical testing conducted on each sample are provided in Table 2.

**Table 2: Summary of Overburden Soil Samples/Analyses**

| Sample Location | Number of Samples | Analyses |
|---|---|---|
| Background boring (SB-07B) 35'-37' | 1 | Total metals, sequential extraction |
| Downgradient boring (SB-08B) 30'-32' | 1 | Total metals, sequential extraction |
| Downgradient boring (SB-18B) 32'-34' | 1 | Total metals, sequential extraction |
| Assessment boring (SB-52B) 35'-37' | 1 | Total metals, sequential extraction, mineralogical composition |
| Assessment boring (SB-53B) 25'-27' & 30'-32' | 2 | Total metals, sequential extraction |
| Assessment boring (SB-54B) 30'-32' | 1 | Total metals, sequential extraction, mineralogical composition |
| Assessment boring (SB-55B) 30'-32' | 1 | Total metals, sequential extraction |
| Assessment boring (SB-56B) 30'-32' | 1 | Total metals, sequential extraction, mineralogical composition |
| Downgradient boring (OW-9) 10'-12' & 18'-20' | 2 | Total metals, sequential extraction, mineralogical composition |
| Drying area boring (DA-14) 4'-6' | 1 | Total metals, sequential extraction |

### 2.2.2 Overburden Soil Analyses

Multiple geochemical methods were used to assess the mineralogical and chemical composition of the overburden soil samples. The selected geochemical test methods included the following:

- **Mineralogical composition:** The mineralogical analysis was used to identify and quantify the crystalline mineral phases in each sample. This information is required for geochemical modeling as the release or attenuation of constituents of interest is influenced by the mineral phase(s) present in the aquifer (Hem 1985). The mineralogical testing laboratory (SGS Minerals Services) performed the mineralogical analysis using quantitative (Rietveld) X-ray diffraction (XRD) and a Bruker AXS D8 Advance Diffractometer.
- **Total metals:** This analysis was used to quantify the chemical composition of overburden soils. The total mass of metals, in combination with the results of sequential extraction testing, can be used to determine the provenance of metals and verify sequential extraction results. The laboratory analyzed a target analyte list of

metals following the methods USEPA SW846 6010C “Inductively Coupled Plasma-Atomic Emission Spectrometry”, Revision 3 (November 2000) and USEPA SW846 7471B “Mercury in Solid or Semisolid Wastes (Manual Cold-Vapor Technique)”, Revision 2.

- **Sequential extraction:** The sequential extraction procedure (SEP) consisted of a seven-step procedure to extract metals from solids, as per Tessier et al. (1979), to identify the provenance of constituents of interest (i.e. the operationally-defined fraction that contains the metal)[1] and determine their potential environmental mobility. For instance, metals bound in the carbonate fraction, or that are exchangeable, are much more likely to become mobile due to changes in groundwater conditions than metals bound within a sulfide or silicate fraction. The summed concentration of a metal measured from all seven steps (SEP SUM) can be compared to the concentration determined from a total metals analysis (SEP Total) for compositional accountability. The laboratory analyzed the metals content of the extracted samples using the method USEPA SW846 6020B “Inductively Coupled Plasma-Mass Spectrometry”, Revision 2 (July 2014).

## 2.3 Groundwater Assessment Monitoring

Following the installation of a groundwater monitoring system in 2016 and throughout calendar year 2017, Golder collected background groundwater samples and performed Detection Monitoring around the CCR Unit pursuant to the requirements of 40 CFR §257.94. In 2018, Golder performed the first and second Assessment Monitoring sampling events pursuant to the requirements of 40 CFR §257.95. Following the first Assessment Monitoring sampling event, including verification sampling, the constituents that were detected above the groundwater protection standards (GWPS) at SSLs included:

- Cobalt and Lithium at GAMW-08
- Molybdenum at GAMW-18

The GWPS is the larger value of the Maximum Contaminant Level (MCL) or the unit-specific background concentration for each analyte based on a tolerance/prediction limit statistical procedure. However, USEPA amended the CCR Rule (i.e., Phase 1 Part 1 amendment) and created health-based standards for cobalt, lead, lithium, and molybdenum, constituents that do not have MCLs, as of August 29, 2018. Pursuant to 40 CFR §257.95(h)(2), the health-based standards can be used in place of background levels to calculate the GWPS. Consequently, after the second Assessment Monitoring event (October 2018), cobalt in monitoring well GAMW-08 remained as the only constituent detected at an SSL. Arsenic has never been detected above the GWPS or at an SSL, however, Golder also assessed arsenic as part of this evaluation due to sporadic detections at or above the MCL.

[1] Sequential extraction of metals from overburden samples consisted of seven discrete steps for this investigation:

Step 1 - Exchangeable Phase: This extraction includes trace elements that are revers bly adsorbed to overburden minerals, amorphous solids, and/or organic material by electrostatic forces.

Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.

Step 3 – Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g., iron).

Step 4 - Metal Hydroxide Phase: Trace elements bound to hydroxides of iron, manganese, and/or aluminum.

Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.

Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.

Step 7 - Residual Fraction: Trace elements remaining in the overburden after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.

Although boron is not currently an Appendix IV constituent, USEPA is reportedly considering adding it to the Appendix IV list. The Indiana Department of Environmental Management (IDEM) has, however, established a health-based standard as part of the state cleanup program. Boron is frequently used as a tracer to indicate the extent of a release from a CCR management unit. Due to these characteristics and as a conservative measure, boron was selected by Golder to assess the nature and extent of groundwater impacts at the Site.

The health-based standards, unit-specific background concentration, and groundwater protection standards used in this evaluation are summarized in Table 3.

**Table 3: Summary of Health-Based Standards, Background Concentrations, and Groundwater Protection Standards for the Constituents of Interest**

| Constituent | Health-Based Standard (mg/L) | Background Concentration (mg/L) | Groundwater Protection Standard (mg/L) |
|---|---|---|---|
| Arsenic | 0.01 | 0.091 | 0.091 |
| Boron | 4(1) | | |
| Cobalt | 0.006 | 0.01 | 0.01 |
| Lithium | 0.04 | 0.01 | 0.04 |
| Molybdenum | 0.1 | 0.05 | 0.1 |

(1) IDEM health-based standard, not currently part of the CCR Rule

## 2.4 Groundwater and Porewater Geochemical Analysis

### 2.4.1 Estimation of Attenuation Rates

To evaluate the attenuation of arsenic, boron, cobalt, lithium, and molybdenum in groundwater at the Site and to assess the rate of attenuation, Golder applied the point decay method (USEPA 2011). The point decay method is used to determine the rate at which a constituent's concentrations are increasing or decreasing in groundwater at a single well between sampling events and this method can thus be used to predict when the constituent's concentrations will fall back below regulatory limits. Equation 1 describes first-order decay for a constituent:

$$Ln(C_t) = kt + Ln(C_0) \qquad \text{(Equation 1)}$$

where $C_0$ is the initial constituent concentration, $C_t$ is the constituent concentration at time t, t is the amount of time in years that has passed since the initial concentration measurement, and k is the first-order decay rate constant (1 per year). Equation 2 shows Equation 1 reorganized to solve for the decay rate constant:

$$k = (Ln(C_t) - Ln(C_0))/t \qquad \text{(Equation 2)}$$

Groundwater water quality data from the background and downgradient wells collected between July 2016 and November 2019 were used to determine the mean first-order decay rate for each constituent of interest. Due to variable detection limits, results that were reported as below detection limits were not used in the point decay analysis. Using Equation 1 and the mean first-order decay rate, Golder calculated the number of years that it would take for constituents of interest concentrations greater than the GWPS to decrease below their respective thresholds.

### 2.4.2 Geochemical Speciation Modeling Methods

Golder conducted geochemical modeling to evaluate general groundwater and porewater composition, determine the potential for precipitation of sorbent media, evaluate the potential for mineral precipitation or adsorption in the aquifer, and determine the speciation of metals of interest. The geochemical computer code developed by the United States Geological Survey (USGS), PHREEQC (Parkhurst and Appelo 2013), was used for these simulations. PHREEQC version 3.4 is a general-purpose geochemical modeling code used to simulate reactions in water and between water and solid mineral phases (e.g., rocks and sediments). Reactions include aqueous equilibria, mineral dissolution and precipitation, ion exchange, surface complexation, solid solutions, gas-water equilibrium, and kinetic biogeochemical reactions. The widely-accepted thermodynamic database, Minteq.v4, 2017 edition, was used as a basis for the thermodynamic constants required for modeling (USEPA 1998b).

The Geochemist's Workbench version 12 (Bethke 2015) was used to generate graphical representations of geochemical modeling outputs in the form of predominance, or Pourbaix diagrams (also known as Eh-pH diagrams) for the species of interest (i.e. arsenic, boron, cobalt, lithium, and molybdenum) and trilinear plots (also known as Piper plots) displaying the relative abundance of major ions. The Minteq.v4 database was used as the basis for the Pourbaix diagrams.

### 2.4.3 Predictive Geochemical Modeling Methods

Golder performed geochemical modeling to assess viable attenuation mechanisms and to predict the quantity and stability of the attenuated constituents of concern.

#### *2.4.3.1 Capacity of Adsorption as an Attenuation Mechanism*

Adsorption is an important mechanism by which constituents in groundwater can be attenuated. The adsorptive partitioning between dissolved and solid phases was simulated using a two-layer surface complexation model (SCM). The SCM approach is described in Davis and Kent (1990), with additional parameterization based on Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) utilizing iron (hydrous ferric oxide [Hfo]) as ferrihydrite [$Fe(OH)_{3(am)}$], and aluminum (hydrous aluminum oxide [Hao]) as gibbsite [$Al(OH)_{3(am)}$], as adsorbing surfaces.

The amount of Hfo and Hao available at the site for attenuation was based on the amorphous and metal hydroxide phase iron and aluminum concentrations measured in the SEP as described in Section 3.2.2. The minimum, mean, and maximum concentrations in soil borings were used in the adsorption models to capture the range of expected site concentrations. The Hfo and Hao surface properties (i.e., surface area, site density, and types of sites) from Dzombak and Morel (1990) and Karamalidis and Dzombak (2011) were used to quantify the iron and aluminum adsorption sites per mole of mineral.

The calculation methodology of Appelo and Postma (2010) was used to determine the specific quantity of sites on each mineral surface type as a function of the amount of mineral available to participate in these reactions. The methodology assumes the number of surface sites (sites) equals the product of the moles of iron ([Fe]) and the moles of surface sites per mole of iron ([sites]/[Fe]= 0.2 moles of sites per mole of iron). For the amount of ferrihydrite available for sorption, the Appelo and Postma methodology further assumes the mass of ferrihydrite ($M_{HFO}$) in grams (g) available equals the product of the [Fe] and the molecular weight of ferrihydrite ($MW_{HFO}$ = 88.85 g/mole). The same approach was used to calculate the number of sites from gibbsite, assuming the [sites]/[Al] is 0.41 moles of sites per mole of aluminum and the molecular weight of gibbsite is 78.003 g/mole.

The geochemical thermodynamic database Minteq V.4 was used to conduct adsorption modeling. However, new and updated thermodynamic data have been released in scientific literature. These new data are important to include in the geochemical modeling exercises for certain elements or minerals as they allow further refinement of potential reactions, or for correction of previous data that may have been less accurate or more broadly defined. For groundwater modeling at the Site, Golder made numerous updates to the Minteq V.4 database, including the addition of data relating to partitioning coefficients for metals on gibbsite, developed by Karamalidis and Dzombak (2011). Of the five constituents of interest, the database did not contain partitioning coefficients for ferrihydrite or gibbsite for lithium, so its potential for adsorption could not be assessed.

To quantify current levels of adsorption, the concentration of constituents that adsorb in soils (as milligram (mg) of constituent/kilogram (kg) of soil) was modeled for the minimum, maximum, and mean Hfo and Hao contents when equilibrated with the range of groundwater qualities observed at the Site. To quantify the capacity of soil to adsorb additional amounts of each constituent, Golder simulated a step-wise increase in arsenic, boron, cobalt, and molybdenum concentrations (similar in concept to a titration, using the mean proportions observed in porewater) into the range of observed groundwater qualities while allowing equilibration with the sorption surfaces in soils (minimum, maximum and mean Hfo and Hao). The model was then used to predict the quantity of each constituent that would adsorb with this titration of additional arsenic, boron, cobalt, and molybdenum.

#### 2.4.3.2 Mineral Precipitation and Co-precipitation

The potential for mineral precipitation was assessed in PHREEQC using a saturation index (SI) calculated according to Equation 3.

$$SI = \log (IAP/Ksp) \quad \text{(Equation 3)}$$

The saturation index is the ratio of the ion activity product (IAP) of a mineral to the solubility product (Ksp). An SI value greater than zero indicates that the solution is supersaturated with respect to a particular mineral phase and, therefore, precipitation of this mineral may occur. An evaluation of precipitation kinetics is then required to determine whether the supersaturated mineral will indeed form. An SI value less than zero indicates the solution is undersaturated with respect to a particular mineral phase. An SI value close to zero indicates equilibrium conditions exist between the mineral and the solution. SI values between -0.5 and 0.5 are considered to represent ‘equilibrium’ in this report to account for the uncertainties inherent in the analytical methods and geochemical modeling.

Co-precipitation was evaluated based on published literature and known association between minerals and constituents of concern. For example, cobalt is known to coprecipitate with iron oxyhydroxides as well as adsorb to Hfo (Norstrom and Alpers 1999). Therefore, to evaluate co-precipitation, minerals identified by PHREEQC to be at equilibrium (SI > -0.5) were evaluated for their potential to host arsenic, boron, cobalt, lithium, and molybdenum.

#### 2.4.3.3 Capacity of Dilution and Dispersion as Attenuation Mechanisms

Dilution and dispersion are physical mechanisms of attenuation by which concentrations of constituents in groundwater decrease with migration along groundwater flowpaths.

To assess the potential for dilution and dispersion downgradient of the CCR Unit, Golder used MODPATH (Pollack 1989) and the calibrated Site Groundwater Flow model (discussed in Section 4.0 and Appendix B) to simulate travel times for particles released from the MCWB. The length of the particle traces produced by

MODPATH along with travel time estimates were used to calculate average groundwater velocities for the following flow paths: (see Figure 1):

- GAMW-16 to GAMW-53
- GAMW-18 to GAMW-55
- GAMW-17 to GAMW-54
- GAMW-09 to GAMW-54

The results of these flow path travel time simulations are presented in Table 4.

Golder estimated the capacity of dilution and dispersion to attenuate constituent concentrations from the CCR Unit using ratios of concentrations measured in monitoring wells along these flow paths, as presented in Table 8. For example, along the flow path from GAMW-16 to GAMW-53, concentrations of boron decreased from 9.7 milligram per liter (mg/L) to 3.1 mg/L, representing an estimated 68% decrease in concentration along the flow path due to dilution and attenuation.

#### *2.4.3.4 Long Term Stability of Attenuated Constituents*

Three sensitivity analyses were performed to assess the stability of adsorbed constituents under variable pH, redox, and ionic strength conditions. Variations in pH, redox, and ionic strength are the most likely types of changes that will occur in an aquifer over time affecting the stability of the constituents of interest (ITRC 2010). The sensitivity analyses were conducted applying the minimum, mean, and maximum Hfo and Hao contents determined for the Site soils, equilibrated with the groundwater qualities observed at the Site at the measured pH and redox conditions. For each sensitivity analysis, a single parameter was varied:

- **pH -** Hydrochloric acid or sodium hydroxide addition was modeled to vary the pH between 4 and 12 standard units (SU). A pH range of 4 to 10 is the typical range considered for evaluating metal speciation.
- **Redox -** DO addition was simulated to adjust reduction potential (Eh) values between -200 and +700 millivolts (mV) based on the historical and anticipated range of Eh in the region.
- **Ionic Strength -** Total dissolved solids (TDS) concentrations were increased by titrating in calcium, magnesium, sodium, potassium, chloride, and sulfate in the proportions observed in porewater. TDS concentrations were evaluated up to 10,000 mg/L, which is approximately four times higher than the highest TDS concentration observed in groundwater at the CCR Unit.

### 2.4.4 Geochemical Modeling Assumptions and Data Handling

Geochemical modeling assumptions and data handling included the following:

- **Groundwater continuity:** Three or four groundwater quality samples were collected from each well during sampling events conducted between September 2018 and November 2019. Samples from this period were selected for the geochemical modeling because all wells related to the CCR Unit were sampled and analyzed for the full suite of parameters described in Section 2.1.2 and the resulting data are assumed to provide a comprehensive overview of groundwater conditions. Temporal trend analysis for arsenic, boron, cobalt, lithium, and molybdenum made use of all available sampling events between July 2016 and November 2019.

- **Porewater chemistry:** Porewater samples collected from GAPIEZ-06 (three samples total in August, September, and October 2018), DAPZ-02A (one sample collected in March 2020), and DAPZ-02B (one sample collected in March 2020) were assumed to be representative of porewater found in the CCR Unit. Data from three sampling events from GAPIEZ-06 were used to evaluate porewater trends.
- **Redox values:** ORP values measured in the field were converted to Eh by adding 200 mV to the field-measured values as per YSI Tech Note (YSI 2015).
- **Non-detect values:** Constituents with concentrations less than their respective method reporting limits were assumed to have a concentration equal to half the reporting limit in model simulations.
- **Total recoverable concentrations:** Total recoverable fraction results were used for geochemical modeling.
- **Charge balance:** Groundwater and porewater compositions with charge balance errors less than 10% were considered valid. Compositions with charge balance errors greater than 10% were flagged as potentially less reliable, but still included in the geochemical modeling effort.

# 3.0 SUPPLEMENTAL ASSESSMENT RESULTS

## 3.1 Groundwater and Porewater

### 3.1.1 Groundwater Characterization

Groundwater quality data for background, downgradient, and Assessment Monitoring wells used for this evaluation were collected from September 2016 to November 2019. Non-regulated (per the CCR Rule) groundwater parameters (e.g., alkalinity, potassium, sodium) are only available from September 2018 to November 2019. The assessment of trends in arsenic, boron, cobalt, lithium, and molybdenum concentrations in groundwater included observations of all validated data collected during that time frame. Groundwater quality monitoring data are presented in Appendix A and can be summarized as follows:

- **Charge balance error:** Charge balance errors could only be assessed for samples for which the full suite of cations and anions was reported. Eleven groundwater samples had charge balance errors greater than 10%. Eight out of the eleven samples (GAMW-07 in November 2019, GAMW-07B in November 2019, GAMW-08B October 2018, GAMW-08B in November 2019, GAMW-18 in October 2018, GAMW-18B in October 2018, GAMW-18B in November 2019 and GAMW-56B in April 2019) reported charge balance errors between 10% and 15%. Only samples from GAMW-07B in September 2018, GAMW-18B in April 2019, and GAMW-56 in April 2019 had a charge balance error greater than 40%. All eleven results were flagged (Table 5) and retained, with the understanding that they may be somewhat less reliable. Upon subsequent sampling, charges balance errors decreased to <10 % in these wells.
- **pH:** Groundwater pH across background, downgradient, and Assessment Monitoring wells ranged from 5.2 to 8.7. The geometric mean pH across all wells was 7.2. GAMW-07B, GAMW-52B, GAMW-54B were the only wells that produced samples with a pH exceeding 8.0.
- **ORP (Redox):** Field-measured redox, corrected to Eh (+200 millivolts [mV]) values, ranged from -115 to +335 mV in the background monitoring well, downgradient monitoring well, Assessment Monitoring well, and porewater samples collected between September 2018 to November 2019. There was no apparent trend in redox conditions based on sample location or depth.

- **Total Dissolved Solids:** Groundwater TDS concentrations were variable. Generally, the lowest TDS concentrations (less than 400 mg/L) were measured in groundwater at Assessment Monitoring wells (GAMW-46, GAMW-46B, GAMW-52, GAMW-53) while TDS concentrations up to an order of magnitude higher were determined in groundwater at wells located immediately downgradient of the CCR Unit (e.g., GAMW-08B). In general, deep wells demonstrated higher TDS concentrations than shallower companion wells at the same locations.

- **Major ion chemistry:** A Piper plot was generated for all porewater samples and groundwater samples from background, downgradient, and Assessment Monitoring wells to facilitate the identification of water types and changes in major ion chemistry over time (Figure 2a-c). The majority of background, downgradient, and porewater samples are calcium-sulfate dominated. In general, deep wells have a higher proportion of sodium and sulfate than the shallower companion wells. The differences between shallow and deep companion wells are more pronounced in the Assessment Monitoring wells. Except for GAMW-54 and GAMW-55, the shallow samples from the assessment wells are calcium-(bi)carbonate dominated and plot in a different location on the Piper plot than background, downgradient, and porewater samples. Shallow wells GAMW-54 and GAMW-55, along with all the deep Assessment Monitoring wells, are calcium-sulfate dominated and plot with background, downgradient, and porewater samples. The water types have remained generally unchanged between September 2018 and November 2019. Generally, this indicates that groundwater types are consistent. However, based on major ion chemistry, there are different water types on the site that are likely influenced by variable site geology.

- **Arsenic:** Arsenic concentrations in groundwater samples collected from downgradient monitoring and Assessment Monitoring wells between September 2016 to November 2019 ranged from non-detect (<0.005 mg/L) to 0.022 mg/L (Figure 4a-c). The highest measured arsenic concentration in groundwater at the CCR Unit (0.091 mg/L) was reported in a sample collected from background well GAMW-15 in September 2018 (Figure 4a). No downgradient monitoring well has ever exceeded the GWPS of 0.091 mg/L designated for the CCR Unit. Arsenic concentrations in groundwater appear to be stable or decreasing in all downgradient monitoring wells (Figure 4b). Arsenic concentrations in the CCR Unit porewater (GAPIEZ-06) ranged from 0.011 to 0.012 mg/L in August and October 2018 (Appendix A-2). Arsenic concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were an order of magnitude lower (<0.0010 and 0.0018 mg/L, respectively). Based on the observed pH and Eh conditions, arsenic predominately occurs as an oxidized arsenate ($As^{+5}$) species, with arsenic in only a small number of samples present as a reduced arsenite ($As^{+3}$) species (Figure 3a). Arsenite is less readily adsorbed than arsenate and is thus generally regarded to be more mobile in natural environments (Nordstrom 2014).

- **Boron:** Boron concentrations in downgradient groundwater samples collected between September 2016 to November 2019 ranged from 0.056 mg/L to 25 mg/L (Figure 5a-c). The highest boron concentration (25 mg/L) was measured in monitoring well GAMW-09B in September 2017. Two background wells (GAMW-07B and GAMW-15B), seven downgradient wells (GAMW-08B, GAMW-09, GAMW-09B, GAMW-16B, GAMW-17, GAMW-17B, and GAMW-18B) and two Assessment Monitoring wells (GAMW-54B and GAMW-55B) reported boron concentrations greater than the health-based standards (4 mg/L). Boron concentrations in porewater were between 7.4 mg/L and 13.8 mg/L. Based on pH conditions on the Site, boron in all wells occurs predominately in the form of protonated boric acid ($H_3BO_3$) (Figure 3b). Generally, boron concentrations in the background and downgradient wells have remained stable or has decreased. This is also the case for all assessment and boundary well except for GAMW-55B, where boron has increased slightly. GAMW-55B is a deep well and heavily influenced by bedrock.

- **Cobalt:** Cobalt concentrations ranged from non-detect (<0.001 mg/L) to 0.059 mg/L in groundwater samples collected between September 2016 to November 2019 at the CCR Unit (Figure 6a-c). GAMW-08 had the highest cobalt concentration of all monitoring wells (0.059 mg/L in November 2016) and generally reported a decreasing trend thereafter (Figure 6b). The second highest concentration (0.010 mg/L in June 2017 and October 2018) occurred in GAMW-07, a background well (Figure 6a). GAMW-08 is the only well on Site to have reported a historic cobalt level greater than the GWPS (0.010 mg/L). Cobalt in porewater ranged from below the laboratory reporting limit (<0.0010 mg/L) to 0.0022 mg/L. Cobalt in all wells occurs predominately as the divalent cation $Co^{+2}$, based on pH and Eh conditions (Figure 3c). Cobalt concentrations appear to be stable or decreasing in groundwater samples collected from the upgradient, downgradient, and Assessment Monitoring wells.
- **Lithium:** Lithium concentrations in groundwater ranged from non-detect (<0.008 mg/L) to 0.025 mg/L between September 2016 to November 2019 (Figure 7a-c). Two downgradient wells, GAMW-18B and GAMW-08, located directly downgradient of the MCWB, have historically had the highest lithium concentrations (Figure 7b). Lithium concentrations historically have not exceeded 0.040 mg/L, the health-based standard. Lithium levels in GAMW-08 appear generally consistent over time, and a trend cannot be determined for GAMW-18B, as the well was recently installed and fewer than four sampling events have been conducted. Lithium concentrations in groundwater at all other wells downgradient of the CCR Unit appear to be stable. Lithium was not detected above the laboratory reporting limit (0.008 mg/L) in the CCR Unit porewater (GAPIEZ-06). Lithium concentrations collected from the Drying Area in March 2020 (DAPZ-02A and DAPZ-02B) were <0.008 mg/L and 0.016 mg/L, respectively. Lithium predominately occurs as the monovalent cationic species $Li^{+}$ based on field pH and Eh conditions (Figure 3d).
- **Molybdenum:** Molybdenum concentrations in groundwater ranged from non-detect (<0.010 mg/L) to 0.18 mg/L (Figure 8a-c). Although GAMW-18 has reported historical levels of up to 0.18 mg/L, concentrations have been below 0.1 mg/L (the health-based standard) since August 2017. No other CCR Unit monitoring wells have reported concentrations exceeding 0.1 mg/L. The molybdenum concentration in porewater has ranged from 0.063 mg/L to 0.81 mg/L. Molybdenum is predominately present in the form of the divalent anionic molybdate ($MoO_4^{-2}$) species based on field-measured pH and Eh conditions (Figure 3e).
- **Iron:** Total (un-filtered) iron concentrations were variable, ranging from non-detect (<0.1 mg/L) to 13 mg/L between September 2018 and November 2019 (Appendix A-1). The highest concentration of 13 mg/L was observed in the groundwater sample collected from Assessment Monitoring well GAMW-56. No geographical trend is apparent; however, deeper “B wells” generally tended to have higher total iron contents. Ferric iron ($Fe^{+3}$) concentrations were higher than ferrous iron ($Fe^{+2}$) concentrations in all samples, except for those collected from wells GAMW-15, GAMW-55B, and GAMW-56.
- **Nutrients:** Total nitrogen (nitrate + nitrite) was measured in groundwater samples collected in October 2018 and was present at low levels (i.e. less than 2.8 mg/L). Nitrate concentrations were measured in samples collected in 2019 and concentrations ranged from below the detection limit (<0.05 mg/L) to 7.7 mg/L. The highest reported nitrate concentration was found in GAMW-08 in May 2019 (7.7 mg/L-N). The presence of low-level nitrate confirms oxidized conditions surround the CCR Unit. Phosphate concentrations exceeding 1 mg/L were detected in groundwater samples from GAMW-15 and GAMW-16. Phosphate concentrations were below detection in groundwater samples collected from 18 of the 25 wells between September 2018 and November 2019. No geographical or temporal trend is apparent in the phosphate concentrations related to the CCR Unit (Appendix A).

The monitoring data also indicate that sulfate generally occurs at the highest concentrations immediately downgradient of the CCR Unit and in background monitoring wells (Figure 9a-c). As identified in Figure 2a-c, considering major groundwater chemistry and sulfate, the CCR Unit is likely influencing groundwater quality in Assessment Monitoring wells GAMW-54/54B and GAMW-55/55B. However, while affected by the CCR Unit, these wells report low concentrations of arsenic, cobalt, lithium, and molybdenum below health-based standards or below detection limits. Boron concentrations were elevated above its GWPS in both upgradient and downgradient wells, suggesting elevated concentrations are naturally occurring or due to an alternate source at the Site.

### 3.1.2 Evaluation of Attenuation Rates

The results of the point decay analysis for groundwater at background and downgradient wells (including Assessment Monitoring wells) between September 2016 and November 2019 are provided in Table 6, as mean site attenuation rates. This evaluation reveals that, despite concentrations generally increasing in background wells over time (as indicated by positive point decay constants), boron, cobalt, lithium, and molybdenum concentrations in downgradient wells have decreased (negative point decay constants) over that same monitoring period. The mean downgradient decay rates can be used to estimate the number of years it would take for elevated groundwater concentrations to decrease to the GWPS. Maximum concentrations of boron, cobalt and molybdenum observed in downgradient monitoring wells over the period of monitoring would take approximately 41 years, 39 years, and 20 years, respectively, to attenuate to concentrations below GWPS (or health-based standard for boron) based on these decay rates. The durations required to achieve regulatory standards for arsenic and lithium were not calculated because there are no exceedances of the GWPS for these constituents.

The positive mean point decay rate for arsenic in downgradient monitoring wells indicates that, on average, concentrations are increasing. Given the low concentrations in the porewater samples (≤ 0.012 mg/L), this trend is unlikely to be caused by the CCR Unit. Low-level increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are driving the positive point decay rate, but the arsenic concentrations in these wells remain sufficiently low (≤ 0.005 mg/L) and are likely caused by natural variability. Although an increasing trend of arsenic at these wells currently may exist, it is unlikely this trend will continue given the potential for attenuation (e.g., through sorption and dilution) to maintain arsenic concentrations below the GWPS.

### 3.1.3 Mineralogical Controls in Groundwater and Porewater

The results of speciation modeling of groundwater data from background, downgradient, and Assessment Monitoring wells between September 2018 and November 2019 are provided in Table 5, including saturation indices for relevant minerals. Mineral saturation can play an important role in attenuation of metals, either directly by their removal through mineral precipitation, or indirectly by providing sorptive surfaces or opportunities for co-precipitation.

- **Iron-bearing minerals:** Ferrihydrite was indicated to be at equilibrium with groundwater or oversaturated in nearly all samples, indicating a strong potential for ongoing precipitation of solid-phase iron oxides. Only two samples from Assessment Monitoring well GAMW-53 (April 2019 and November 2019) were modeled to be undersaturated with respect to ferrihydrite. Thus, it is assumed that iron (hydr)oxides are prevalent in the Site aquifers.
- **Other minerals:** Nearly all groundwater samples, with the exception of samples from GAMW-07 and GAMW-52, were simulated to be in equilibrium or oversaturated with respect to barite ($BaSO_4$). Fluorite

($CaF_2$) equilibrium was indicated in wells GAMW-07B, GAMW-08/08B, GAMW-17, and GAMW-52B. Gypsum ($CaSO_4.2H_2O$) was modeled to be in equilibrium in seven wells (GAMW-07B, GAMW-08B, GAMW-15B, GAMW-16B, GAMW-18, GAMW-18B, and GAMW-55B), most of which were deeper "B-wells" nearer to bedrock. Calcite ($CaCO_3$) equilibrium was indicated in all wells except GAMW-53.

In summary, several mineral phases likely control groundwater composition at some or all wells: barite, calcite, fluorite, ferrihydrite, and gypsum. In the case of ferrihydrite, the dissolved concentrations of constituents of interest can be reduced through its ability to act as a substrate for adsorption.

## 3.2 Overburden Soil

### 3.2.1 Mineralogical Composition

Quantitative XRD with Rietveld refinement was used to identify and quantify minerals in five overburden soil samples collected during the drilling activities (Table 7). Three of the samples were collected from the Assessment Monitoring well's soil borings and two samples were collected from the downgradient soil boring (OW-9). These samples were obtained to better understand the mineralogical composition of the aquifer system and identify any minerals that would potentially influence attenuation of constituents of interest. In addition, and in contrast, the presence of certain minerals could also indicate a potential for naturally occurring release of metals into groundwater, for instance due to oxidation of sulfide minerals.

The mineralogical analysis identified the iron sulfide minerals pyrite and marcasite at low levels in three of the five overburden soil samples, at concentrations up to 0.6 wt.%. These minerals can oxidize in the presence of even trace amounts of dissolved oxygen, which would lead to the liberation of trace metals or metalloids known to associate with sulfide minerals (e.g., arsenic, cobalt, and molybdenum) into groundwater (Smith and Huyck 1997). In addition, the associated release of iron creates the potential for formation of minerals with the ability to sorb trace elements.

The presence of the oxidized iron mineral hematite ($Fe_2O_3$) at 0.3 to 0.6 wt.% in three of the five overburden soil samples in the presence of reduced iron sulfide minerals indicates a spectrum of oxidation occurring in overburden soil samples. As pyrite or marcasite is oxidized, intermediate amorphous iron phases, such as ferrihydrite, would likely occur first. Over time, crystallization would progress, forming iron oxide-oxyhydroxides such as hematite or goethite (FeOOH). Therefore, it is likely a range of iron solid phases is present in the overburden soil, and the potential exists over time for an increased presence of amorphous and crystallized iron oxides-oxyhydroxides with a strong affinity to attenuate certain metals and metalloids (Dzombak and Morel 1990).

The mineralogical analysis also identified the carbonate minerals calcite ($CaCO_3$) and dolomite ($CaMg(CO_3)_2$) in all overburden soil samples, with combined concentrations between 9 and 16 wt.%. Carbonate minerals are known to adsorb cobalt (Brady et al. 2003) while sorption and uptake of arsenic are possible as well (e.g., Romero et al. 2004). Carbonate minerals can dissolve when exposed to sulfuric acid formed by oxidation of sulfide minerals and release associated trace metals and metalloids (Section 3.2.2) into groundwater. Iron can also be released as carbonate minerals dissolve and potentially form metal hydroxide minerals.

### 3.2.2 Chemical Composition and Sequential Extraction

Chemical analysis and sequential extraction were conducted to determine the chemical composition and the distribution of constituents of interest over various operationally defined fractions of the overburden soil. This testing was completed per Table 2 on nine overburden soil samples from eight monitoring well locations, two samples from the OW-9 borehole, and one sample from within the Drying Area (reported in Table 8). Soil samples

from soil borings that correspond to well locations were collected from within the screened depth (except SB-53B 25'-27' which was collected above the screened depth).

A description of the individual fractions determined by sequential extraction is presented in Section 2.2.2, footnote 1. Metals extracted in steps 1 through 5 are considered environmentally available, whereas metals extracted in steps 6 and 7 are present in refractory fractions and are not expected to be released under conditions typically encountered in aquifers (Tessier et al. 1979). The sum of metal concentrations from the sequential extraction steps is expressed as "SEP SUM" in Table 8 and does not represent an analytically determined value. The concentration measured by total metals analysis is referred to as "SEP Total" in Table 8. Boron was not included in the SEP analysis due to method limitations.

The results from the chemical analysis and sequential extraction can be summarized as follows:

- **Iron:** Iron was present in all twelve samples analyzed, varying from 3,400 milligram per kilogram (mg/kg) (DA-14) to 9,900 mg/kg (SB-54B). In all samples, the refractory sulfide and residual fractions accounted for the largest proportion of total iron and, as such, most of the iron is not environmentally available (Figure 10). The labile fraction in steps 1 through 5 can generally be considered representative of the amount of iron in the overburden that may be available as a sorbing medium. While not a constituent of interest, iron and its minerals commonly represent the most important reservoir for metal/metalloid attenuation in soils or overburden. The labile fraction calculated from sequential extraction, therefore, can be used as a proxy for determining the total number of adsorption sites available for attenuation of arsenic, boron, cobalt, and molybdenum in the environment.
- **Arsenic:** Total arsenic in the soil overburden samples ranged from 1.9 to 6.2 mg/kg while the environmentally-available fraction ranged from 0.44 mg/kg in SB-55B to 3.0 mg/kg in SB-53B, representing from 31% to 59% of total arsenic (Figure 11). The majority of arsenic was present in the refractory fraction, predominantly associated with sulfide minerals. The amorphous metal and metal hydroxide fractions hosted all arsenic that was environmentally available except in SB-52B, where the carbonate fraction represented 8.5% of total arsenic. The highest concentrations of environmentally-available arsenic occurred in sample SB-56B, and the lowest concentrations were encountered in samples DA-14, SB-53B and SB-55B. The Drying Area sample (DA-14) had the second lowest environmentally-available arsenic concentrations (0.45 mg/kg) of all samples analyzed. Arsenic in DA-14 predominantly occurred in the sulfide and insoluble fractions.
- **Cobalt:** Total cobalt in soil borings ranged from 2.5 mg/kg to 6.1 mg/kg while the environmentally-available fraction ranged from 1.1 mg/kg in OW-9 to 2.9 mg/kg in SB-53B, representing from 27% to 60% of total cobalt (Figure 12). Those samples downgradient of the CCR Unit had similar total cobalt in the environmentally-available fraction as the background samples. In all boring samples, cobalt was most abundant in the metal hydroxide, sulfide, and residual fractions. Cobalt was also present in the carbonate phase in the nine soil bore samples (5% to 14% of total). Cobalt in the carbonate phase is most likely sorbed onto or coprecipitated with the calcite that was indicated to be in equilibrium with groundwater in geochemical modeling. Cobalt was not detected in the exchangeable phase. DA-14 reported the lowest total and environmentally-available cobalt concentrations (0.87 mg/L and 0.39 mg/L, respectively) of all samples analyzed, predominantly in the metal hydroxide and sulfide fractions.
- **Lithium:** Total lithium ranged from 4.2 to 11 mg/kg while the environmentally-available fraction ranged from 0.5 mg/kg in DA-14 to 11.4 mg/kg in SB-18B, representing from 12% to 74% of total lithium (Figure 13). The

majority of lithium was present in either the organic or the refractory fraction. The organic, carbonate, and metal hydroxide fractions hosted all lithium that was environmentally available. The highest concentrations of environmentally-available lithium occurred in samples SB-18B, SB-54B, SB-55B and SB-56B, and the lowest amount was encountered in SB-53B. Lithium concentrations in DA-14 were generally lower than in background and downgradient monitoring wells, with the majority of the lithium present in the sulfide and residual fractions.

- **Molybdenum:** Total molybdenum in overburden ranged from 0.15 to 3.8 mg/kg while the environmentally-available fraction ranged from non-detect to 2.83 mg/kg, in SB-53B (25'-27'), and accounted for 100% of all molybdenum in SB-18B and SB-53B (30'-32') (Figure 14). Molybdenum was most commonly present in the amorphous and metal hydroxide fractions. Notably, in background boring SB-07B and in SB-08B, a downgradient boring in close proximity of the CCR Unit, molybdenum was non-detect in overburden soil samples. The soil boring with the highest total molybdenum content, SB-53B, is located further downgradient from the CCR Unit. The Drying Area sample (DA-14) had the highest concentrations (15 mg/kg) of all samples analyzed. Molybdenum in DA-14 was present predominantly in the exchangeable fraction.

In summary, no definitive trends were present for arsenic, cobalt, lithium or molybdenum that indicated a higher concentration immediately downgradient of the CCR Unit relative to background locations or locations further downgradient. Based on the above results, attenuation by adsorption of all four constituents of interest is likely occurring, with the carbonates, amorphous metal oxides, and metal hydroxide fractions accounting for the majority of the attenuation.

# 4.0 GROUNDWATER MODELING RESULTS

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. Details of the flow model development are presented in Appendix B. This model was utilized to inform the natural attenuation study by simulating travel times for particles released from the MCWB, as presented in Table 4.

# 5.0 GEOCHEMICAL MODELING RESULTS

## 5.1 Identification and Capacity of Attenuation Mechanisms

### 5.1.1 Adsorption to Iron and Aluminum Oxyhydroxides

The Hfo and Hao surface area and sorption site calculations for the minimum, mean, and maximum soil boring iron and aluminum concentrations are presented in Table 10. Adsorption modeling in PHREEQC revealed a large range of adsorption capacities expected for the different constituents at the site. Figure 15 displays the predicted trajectories of aqueous concentrations before and after adsorption onto Hfo and Hao in soils (minimum, mean and maximum Hfo and Hao), as additional arsenic, boron, cobalt, and molybdenum are titrated into solution. The bold lines display the geometric means for all groundwater scenarios within each soil scenario and the grey area represents the range for the 5$^{th}$ to 95$^{th}$ percentile of all soil scenarios. As mentioned in Section 2.4.3.1.2, lithium adsorption to iron and aluminum oxyhydroxides was not modeled due to a lack of available thermodynamic data.

The predicted trajectories are compared against the GWPS and porewater concentrations. On the plots, the further the predicted trajectories are to the right of the 1:1 line, the larger the amount of the constituent that has sorbed to Hfo and Hao surface sites in soils and is no longer predicted to reside in the aqueous phase. For boron, little to no adsorption is predicted by the model, so aqueous concentration before adsorption are almost identical to concentrations after adsorption. For arsenic, a large proportion is expected to adsorb, with a capacity to bring

average arsenic concentrations to below 0.01 mg/L when concentrations are at approximately 10 mg/L or lower prior to adsorption. At higher arsenic concentrations (> 10 mg/L), the relative sorption capacity is diminished as sorption sites are filled and aqueous concentrations after adsorption are predicted to increase above its GWPS. For cobalt and molybdenum, the trajectories run parallel to the 1:1 line, indicating that sorption capacity is directly proportional to the concentration before adsorption. The modeling results suggest that adsorption has the capacity to reduce cobalt concentrations below approximately 0.1 mg/L down to the GWPS of 0.01 mg/L and molybdenum concentrations below approximately 0.2 mg/L down to the GWPS of 0.1 mg/L. The 95$^{th}$ percentile of modeled trajectories show that a minority of pH and redox conditions at site were less favorable for attenuating cobalt or molybdenum, as seen by the proximity to the 1:1 line.

### 5.1.2 Co-precipitation

In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely due to co-precipitation with the dolomite or calcite identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also considered possible. However, per the SEP results, no arsenic was found to be associated with carbonate minerals. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

### 5.1.3 Physical Attenuation

Table 9 presents the predicted concentrations at Assessment Monitoring wells, assuming the minimum and maximum amount of dilution and dispersion downgradient of the CCR Unit (Section 4.0). The highest concentrations of arsenic, boron, cobalt, lithium, and molybdenum measured in porewater were “diluted” in the geochemical simulations with the maximum concentrations observed in side-gradient wells GAMW-52, GAMW-52B, GAMW-56, and GAMW-56B to provide a conservative estimate of dilution and dispersion.

For arsenic, cobalt, and lithium, the maximum concentrations in porewater were below the GWPS. Dilution and dispersion with groundwater from side-gradient wells generally resulted in a further decrease below the GWPS. At GAMW-56, arsenic and cobalt concentrations were elevated over those in porewater. Consequently, dilution/dispersion of porewater with water from GAMW-56 resulted in higher concentrations relative to porewater, though still below GWPS.

For boron the maximum porewater concentrations were elevated above the health-based standard (345%) and for molybdenum, the maximum porewater concentrations were elevated above the GWPS (810%). The 32 to 63 percent reduction in concentrations by dilution and dispersion alone was not sufficient to bring the maximum porewater concentrations below the relevant standards. For boron, concentrations in background monitoring well GAMW-15 were twice as high as those in porewater. Due to this background source, boron concentrations in side-gradient wells are also relatively high and limit the effectiveness of dilution to reduce boron concentrations downgradient of the CCR Unit. For molybdenum, concentrations in monitoring wells have been below GWPS since March 2018, indicating additional dilution/dispersion or other attenuating processes have reduced porewater concentrations between the CCR Unit and the monitoring wells. As a consequence, molybdenum concentrations will likely remain below the GWPS.

## 5.2 Long-Term Stability of Attenuated Constituents

The expected variations in dissolved concentration as a function of pH, Eh, and TDS are presented in Figures 16, 17, and 18, respectively. Results are presented along with GWPS values and the range of pH, Eh, or TDS values (5th percentile to 95th percentile) observed at the Site. Responses to changes in pH, Eh, and TDS vary widely by constituent. The results of the adsorption stability modeling for arsenic, boron, cobalt, and molybdenum can be summarized as follows:

- **Arsenic:** For the range of pH values observed at the site, greater than 95% of the arsenic is expected to sorb to Hfo and Hao (Figure 16a). At pH values below 6.0, a conversion of arsenate to arsenite is modeled to release the adsorbed arsenic into groundwater. For alkaline pH values between 8.0 and 10.0, there is a small amount of additional capacity for arsenic to adsorb. At extremely alkaline conditions (pH greater than 10.0), higher proportions of negatively-charged sorption sites on Hfo and Hao limit the effectiveness of sorption of anionic species, resulting in higher amounts of desorbed arsenic. Under reducing conditions (Eh less than -100 mV), arsenic is largely present as arsenite and sorption is limited (Figure 17a). Over intermediate redox conditions (Eh between 0 and 500 mV), adsorbed arsenic is relatively stable. Above 500 mV, arsenic is expected to desorb again. Under increasing TDS concentrations (Figure 18a), arsenic sorption declines as other anions compete with and replace arsenic from sorption surfaces. For arsenic, TDS concentrations at the Site could quadruple relative to observed values before aqueous concentrations increase above the GWPS.
- **Boron:** Based on the relatively small proportion of boron that can be adsorbed to Hfo and Hao surface sites, changes in pH, Eh, and TDS concentrations are modeled to have only a minor impact on aqueous concentrations, as evidenced by the horizontal trends in Figures 16b, 17b, and 18b.
- **Cobalt:** The pH response of cobalt (Figure 16c) is broadly similar to that of arsenic, with cobalt being nearly completely in dissolved form under acidic conditions but generally sorbed under alkaline conditions. Cobalt was generally modeled to be unresponsive to changes in redox conditions (Figure 17c), with little additional cobalt sorbing or desorbing over the range of tested Eh conditions. Cobalt was also not responsive to increases in TDS concentrations (Figure 18c), with sorption remaining relatively unchanged as TDS concentrations increased 4- to 40-fold above the commonly-observed range at the Site.
- **Molybdenum:** For molybdenum, lower pH values (more acidic conditions) were generally more favorable for adsorption (Figure 16d). At alkaline pH values (pH greater than 10), nearly all molybdenum is desorbed and present in the dissolved phase. Over the range of common Eh values at site (Figure 17d), molybdenum sorption is relatively stable. Highly reducing conditions are predicted to increase molybdenum adsorption and highly oxidizing conditions are predicted to reduce adsorption. Molybdenum adsorption is generally insensitive to increases in TDS concentrations (Figure 18d), with TDS concentrations up to 10,000 mg/L less than doubling the aqueous concentrations due to desorption.

# 6.0 TIER I EVALUATION

The potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum was evaluated in accordance with recommended practices and guidance promulgated by the USEPA and the ITRC (USEPA 2007a; USEPA 2007b; ITRC 2010). According to USEPA (USEPA 2007a), the purpose of the Tier 1 evaluation is to “Demonstrate that the groundwater plume is not expanding and that sorption of the contaminant onto aquifer solids is occurring where immobilization is the predominant attenuation process.” Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Plume Stability:** Based on the water quality monitoring data presented in this Assessment Monitoring, groundwater concentrations of arsenic, boron, cobalt, lithium, and molybdenum outside of the CCR Unit appear to be stable or decreasing. Evaluation of trend charts generally did not reveal increasing trends in wells downgradient of the CCR Unit (Figures 4 to 8), including for parameters such as boron and sulfate, which are considered common indicators of CCR leaching (Figures 5 and 10). These observations indicate that the distribution of arsenic, boron, cobalt, lithium, and molybdenum in the aquifer is stable.
- **Magnitude of Exceedances:** Arsenic has remained below the CCR Unit GWPS (0.091 mg/L) in all downgradient monitoring wells. Boron concentrations exceed the health-based standard (4 mg/L) in nine of the downgradient (Downgradient Monitoring and Assessment Monitoring) wells, but concentrations are generally within the range of background monitoring well concentrations, suggesting naturally-elevated levels or an alternative source of boron causing the concentrations in groundwater at the Site. The cobalt concentration in groundwater at GAMW-08, the only downgradient monitoring well exceeding the GWPS, has shown a decreasing trend since 2016. The most recent concentration of cobalt (0.011 mg/L in November 2019) was just 0.001 mg/L above the GWPS of 0.010 mg/L. No wells exceed the health-based lithium standard (0.04 mg/L). Molybdenum concentrations in all wells have been consistently below the health-based standard of 0.1 mg/L since August 2017, indicating a low likelihood of a future exceedances based on historical trends.
- **CCR Unit Porewater:** The CCR Unit at RMSGS was placed into service in 1976 and historical records are not available for ash additions or porewater concentrations over the CCR Unit's lifespan. However, based on recent porewater data, the arsenic concentration in the CCR Unit (0.011 mg/L to 0.018 mg/L) is well below the GWPS of 0.091 mg/L. Cobalt and lithium concentrations in porewater in the CCR Unit were low and only detected above their laboratory reporting limit in a single sample (0.0022 mg/L and 0.016 mg/L, respectively). This indicates that the CCR Unit is not a potential source for these metals. Boron concentrations in the porewater (8.3 mg/L to 13.8 mg/L) are elevated above the health-based standard of 4 mg/L but are below levels observed in the two deep background monitoring wells GAMW-07B (15-23 mg/L) and GAMW-15B (13-18 mg/L). Molybdenum in the CCR Unit was measured at concentrations up to 0.81 mg/L, above its GWPS. Even so, molybdenum concentrations in groundwater downgradient of the CCR Unit are currently below the GWPS.
- **Groundwater Chemistry:** The groundwater monitoring results and the findings of the geochemical modeling support the potential for natural attenuation of arsenic, boron, cobalt, lithium, and molybdenum. Equilibrium of groundwater with the mineral phase ferrihydrite was modeled to occur in all groundwater samples and calcite equilibrium was indicated in all downgradient monitoring wells except GAMW-53. This is consistent with the results from the sequential extraction analysis that indicate carbonate, amorphous, and metal hydroxide fractions sequester arsenic, boron, cobalt, lithium, and molybdenum.
- **Confirmation of Attenuation/Immobilization:** Based on both mineralogical and chemical analysis, it is evident that attenuation of arsenic, cobalt, lithium, and molybdenum by aquifer materials is occurring. Iron, capable of forming (hydr)oxide phases that facilitate metals attenuation (Dzombak and Morel 1990), was identified in all overburden samples. Mineralogical analysis confirmed iron was present as an oxide phase in the form of hematite in all overburden samples. Arsenic, cobalt, lithium, and molybdenum demonstrated a high degree of immobilization due to attenuation on carbonate, amorphous, and metal hydroxide fractions. This indicates that these phases have been and are scavenging or attenuating constituents that were once present in solution. Groundwater samples from Assessment Monitoring wells GAMW-53/53B, GAMW-

54/54B, GAMW-55/55B, and GAMW-56/56B report a similar major ion signature as groundwater in monitoring wells proximal to the CCR Unit. However, no arsenic, cobalt, lithium, or molybdenum has been detected in these wells above background levels. In addition, soil borings from these wells contained significant proportions of constituents attenuated in various phases, especially in the case of lithium. As a result, the groundwater concentrations of these constituents are maintained at low levels, demonstrating attenuation.

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered candidates for an MNA remedy application and were deemed to meet the criteria for Tier I MNA in accordance with USEPA guidance (USEPA 2007a,b).

# 7.0 TIER II EVALUATION

The purpose of the Tier II evaluation is to "Identify mechanisms and rates of the operative attenuation process." Based on this definition, the following modeling results and observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** PHREEQC modeling results show that adsorption is likely attenuating arsenic, cobalt and, to a lesser degree, molybdenum downgradient of the CCR Unit. This is concluded based on equilibration of site-specific groundwater compositions with the range of Hfo and Hao concentrations observed in SEP results of Site overburden soils. Minor amounts of boron are also expected to attenuate. The sorbing capacity of Hfo and Hao surface sites is partially dependent on the concentrations of the constituents of interest in groundwater. The titration modeling (Figure 15) shows how the soil's capacity to adsorb constituents increases if groundwater concentrations of arsenic, boron, cobalt, and molybdenum were to increase above current levels. In addition to metal oxyhydroxides, clay minerals and/or particular organics can also act as a substrate for attenuation (Goldberg et al. 1993; Goldberg and Forster 1996), but this mechanism was not included in the current evaluation.

  The findings from the modeling are supported by the results of the sequential extraction testing. The presence of arsenic, cobalt, lithium, and molybdenum in the amorphous and metal oxyhydroxide fractions of soils indicates that adsorption is occurring spatially across the monitored area downgradient of the CCR Unit.

- **Co-precipitation:** In addition to adsorption, co-precipitation or the direct incorporation of trace metals such as cobalt into precipitated iron oxide-oxyhydroxides has been well studied in literature (Butt et al. 2000; Dzombak and Morel 1990; Smith 1999). For the soils analyzed by sequential extraction (Section 3.2.2), all samples had higher concentrations of cobalt in the amorphous and metal hydroxide phases than indicated by adsorption modeling. This suggests that cobalt concentrations also may be attenuated during the formation of ferrihydrite (Butt et al. 2000; Tebo et al. 2004). Cobalt was also identified by SEP to be associated with carbonate minerals, likely the result of co-precipitation with dolomite or calcite, which were identified by mineralogical analysis. Arsenic co-precipitation with amorphous phases of iron and other metal oxyhydroxides is also possible. However, there was no arsenic associated with carbonate minerals as identified by SEP. Co-precipitation is either not likely or relevant for boron, lithium, and molybdenum.

- **Estimated Site Attenuation Rates:** Concentrations of boron, cobalt, lithium, and molybdenum are decreasing in downgradient monitoring wells, resulting in negative calculated point decay rates. A positive point decay rate for arsenic suggests that its concentrations are increasing, but low concentrations in porewater indicate that the trend does not imply an impact from the CCR Unit. Increasing arsenic concentrations in Assessment Monitoring wells GAMW-52B, GAMW-53B, GAMW-54, and GAMW-54B are

driving the positive point decay rate, but the arsenic concentrations in these wells are low (less than 0.005 mg/L) and are likely driven by natural variability. Using the mean decay rate, maximum concentrations of boron, cobalt and molybdenum observed in downgradient and Assessment monitoring wells would take approximate 41 years, 39 years, and 20 years, respectively, to attenuate to below GWPS. Arsenic and lithium concentrations in downgradient and Assessment Monitoring wells are already below the GWPS.

- **Advanced Groundwater Modeling:** Groundwater flow results indicate between 32% and 63% dilution and dispersion of groundwater at monitoring wells with upgradient and side-gradient water as it flows towards the Assessment Monitoring wells. This dilution and dispersion attenuate concentrations along the flow paths. Arsenic, cobalt, and lithium concentrations in porewater are already below GWPS in the available monitoring data (August 2018 to March 2020). Dilution and dispersion with groundwater from side-gradient Assessment Monitoring wells (GAMW-52/52B and GAMW-56/56B) would further reduce these concentrations relative to the GWPS. Boron and molybdenum concentrations are elevated above the health-based standards in porewater (and in background wells for boron). As such, while dilution and dispersion reduce concentrations by about 30% to 60%, this is insufficient to dilute porewater to such a degree that the resulting boron and molybdenum concentration decline to below the health-based standards. The concentrations of molybdenum measured in downgradient groundwater at Assessment Monitoring wells have remained below the GWPS, so additional physical and/or chemical attenuation is likely occurring between the CCR Unit and the Assessment Monitoring wells. Modeled groundwater velocities indicate that travel times between downgradient and Assessment Monitoring wells are between 4.5 and 31 years. The modeling results also indicate that groundwater would take between 27 and 130 years to travel from the downgradient monitoring wells to the property boundary (GAMW-46/46B).

Based on these findings, arsenic, boron, cobalt, lithium, and molybdenum were considered to be candidates for an MNA remedy application and deemed to meet the criteria for Tier II MNA in accordance with USEPA guidance (USEPA 2007a and 2007b).

## 8.0 TIER III EVALUATION

According to USEPA (USEPA 2007a), the purpose of the Tier III evaluation is to eliminate sites for an MNA remedy where (1) “Capacity of the aquifer is insufficient to attenuate the COC mass to regulatory standards” and/or (2) “Stability of the immobilized COC is insufficient to prevent remobilization due to future changes in groundwater chemistry”. Based on this definition, the following observations support MNA as a viable corrective measure for the CCR Unit:

- **Adsorption Capacity Modeling:** For arsenic, titration modeling shows that groundwater concentrations could increase up to approximately 2.5 mg/L before exceeding the capacity of soils (95$^{th}$ percentile of scenarios) to attenuate arsenic below the GWPS (0.091 mg/L). Groundwater arsenic concentrations up to 10 mg/L are predicted to attenuate below the GWPS for the average soil capacity scenario. Similarly, cobalt concentrations in groundwater could increase up to approximately 0.02 mg/L before exceeding the capacity of soils (95$^{th}$ percentile of scenarios) to attenuate cobalt below the GWPS (0.01 mg/L). Under the average soil capacity scenario, the aquifer has the capacity to reduce cobalt concentrations as high as 0.1 mg/L to below the GWPS.

  For boron and molybdenum, modeling suggests that adsorption can reduce a portion of the dissolved load, but that there is not sufficient adsorption capacity alone to reduce the concentrations observed in porewater below the health-based standard. However, current molybdenum concentrations observed in downgradient

and Assessment Monitoring wells indicate that the combined long-term attenuation from sorption, dilution, and dispersion is sufficient to reduce concentrations below health-based standards. In addition to iron oxyhydroxides, molybdenum and boron (as well as arsenic and cobalt) are known to adsorb to other metal (hydr)oxides (e.g., manganese, aluminum), clay minerals and particulate organic matter, providing additional sorption capacity in the soils.

- **Stability Modeling for Adsorbed Constituents:** Stability modeling indicates that for the conditions (i.e. pH, Eh, and TDS ranges) determined in groundwater at the Site, adsorbed species of arsenic, boron, cobalt, and molybdenum are relatively stable and remain attenuated. The modeling results further suggest that the adsorption of arsenic, cobalt, and molybdenum could be reversed with sufficiently large fluctuations in pH and Eh conditions at the Site, but there is no historical basis to expect such occurrences. Based on the mineralogical test results for Site soils, carbonate minerals are widely distributed downgradient of the CCR Unit. Groundwater that is in contact with carbonate minerals is typically buffered against large fluctuations in pH. Total alkalinity concentrations in groundwater at the Site (generally between 50 and 410 mg $CaCO_3$/L) support the notion that the groundwater has significant buffering capacity.

  Modeling results also indicate that increasing TDS concentrations could result in an increase in aqueous concentrations of arsenic, cobalt, and molybdenum due to competition for sorption sites. However, the impact is predicted to be relatively minor over the range of TDS concentrations observed at the site. The maximum TDS concentration measured in porewater was 3,830 mg/L and even at those levels, there is sufficient attenuation capacity from the soils to maintain arsenic, boron, cobalt, and molybdenum concentrations below GWPS

# 9.0 CONCLUSIONS

Golder performed a supplemental Assessment Monitoring followed by an attenuation evaluation, which serve as the Tier I, II, and III evaluation of MNA feasibility at RMSGS for arsenic, boron, cobalt, lithium, and molybdenum with respect to the CCR Unit. This evaluation has been completed in accordance with guidance and best practices promulgated by the USEPA (USEPA 2007a and 2007b) and the ITRC (ITRC 2010). Based on the results of this evaluation, Golder makes the following assessment for the individual parameters:

- Arsenic: Physical and chemical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Arsenic is a candidate for MNA at the RMSGS Site.
- Boron: Physical attenuation of boron is occurring at the RMSGS based on substantial decreases of boron in assessment wells. However, the high levels of boron upgradient of the CCR impoundments make it difficult to determine if the evaluation of if MNA will be successful. An alternative or natural source of boron should be further investigated prior to making a MNA determination for boron based on current findings.
- Cobalt: Chemical and physical attenuation is occurring and co-precipitation is possible, levels are stable, and the aquifer has the capacity to attenuate arsenic. Cobalt is a candidate for MNA at the RMSGS Site.
- Lithium: Physical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Lithium is a candidate for MNA at the RMSGS Site.
- Molybdenum: Physical and some chemical attenuation is occurring, levels are stable, and the aquifer has the capacity to attenuate arsenic. Molybdenum is a candidate for MNA at the RMSGS Site.

Therefore, it is recommended that a Tier IV evaluation be completed to design a long-term monitoring plan and contingent remedy for arsenic, boron, cobalt, lithium, and molybdenum.

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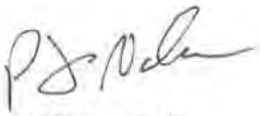
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# Signature Page

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# Tables

**Table 4: Summary of Travel Time Simulations and Attenuation Estimates**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Shallow Flow Paths | | | | Deep Flow Paths | | | |
|---|---|---|---|---|---|---|---|---|
| **Starting Well** | **GAMW-16** | **GAMW-18** | **GAMW-17B** | **GAMW-09B** | **GAMW-16B** | **GAMW-18B** | **GAMW-17B** | **GAMW-09B** |
| **Ending Well** | **GAMW-53** | **GAMW-55** | **GAMW-54B** | **GAMW-54B** | **GAMW-53B** | **GAMW-55B** | **GAMW-54B** | **GAMW-54B** |
| **Distance (ft)** | **1521** | **1964** | **1200** | **1714** | **1521** | **1964** | **1200** | **1714** |
| **Effective Porosity = 16%** | | | | | | | | |
| Travel Time (years) | 4.8 | 11.0 | 4.5 | 8.9 | 5.0 | 11.0 | 5.5 | 9.0 |
| Velocity (ft/year) | 317 | 179 | 267 | 193 | 304 | 179 | 218 | 190 |
| Time to Davis Ditch (years) | 5.5 | - | - | - | 6 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 27 | 49 | 41 | - | 28.5 | 45 | 41 |
| **Effective Porosity = 30%** | | | | | | | | |
| Travel Time (years) | 8.5 | 19.8 | 8.0 | 16.0 | 8.9 | 20.0 | 10.0 | 16.5 |
| Velocity (ft/year) | 179 | 99 | 150 | 107 | 171 | 98 | 120 | 104 |
| Time to Davis Ditch (years) | 10 | - | - | - | 9.9 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 49.8 | 79 | 75 | - | 51.5 | 80 | 76 |
| **Effective Porosity = 46%** | | | | | | | | |
| Travel Time (years) | 13.0 | 31.0 | 12.0 | 25.0 | 13.5 | 29.0 | 15.0 | 25.0 |
| Velocity (ft/year) | 117 | 63 | 100 | 69 | 113 | 68 | 80 | 69 |
| Time to Davis Ditch (years) | 15 | - | - | - | 15 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 76.8 | 122 | 117 | - | 77 | 130 | 120 |
| **Estimate of Dilution/Attenuation Along Flow Path** | | | | | | | | |
| Starting concentration (mg/L) | 9.7 | 13 | 12 | 12 | 9.7 | 13 | 12 | 12 |
| End concentration (mg/L) | 3.1 | 8.2 | 6.4 | 6.4 | 3.1 | 8.2 | 6.4 | 6.4 |
| End Concentration as % of starting concentration | 32% | 63% | 53% | 53% | 32% | 63% | 53% | 53% |
| Dilution/Attenuation along flow path | 68% | 37% | 47% | 47% | 68% | 37% | 47% | 47% |

**Notes:**
ft = feet
mg/L = milligrams per liter

Prepared by: GOL
Checked by: PJN
Reviewed by: RWB

**Table 5: Groundwater Geochemical Modeling Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAPIEZ06 08-2018 | GAPIEZ06 09-2018 | GAPIEZ06 10-2018 | DAPZ-02A 03-2020 | DAPZ-02B 03-2020 | GAMW04 10-2018 | GAMW04 04-2019 | GAMW04 11-2019 | GAMW07 10-2018 | GAMW07 05-2019 | GAMW07 11-2019 | GAMW07B 09-2018 | GAMW07B 10-2018 | GAMW07B 05-2019 | GAMW07B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -3.9 | -1.3 | -5.5 | -7.8 | -4.3 | 5.1 | -1.3 | -9.0 | -3.7 | -3.7 | **-10.8** | **82.8** | -6.8 | -7.0 | **-10.1** |
| **MINERAL PHASES - Saturation Indices** [a] | | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.3 | -2.3 | -1.1 | -3.2 | -2.6 | -2.9 | -3.1 | -2.4 | -3.8 | -2.3 | -2.1 | -1.5 | -3.2 | -2.4 | -2.8 |
| Ferrihydrite | $Fe(OH)_3$ | **2.1** | **2.1** | **3.1** | **0.5** | **2.2** | **2.9** | **1.4** | **0.5** | -6.6 | **1.9** | **0.4** | **3.6** | -1.6 | **4.2** | **-0.2** |
| Siderite | $FeCO_3$ | **-0.1** | **-0.1** | -0.8 | **-0.4** | -0.7 | -2.1 | **0.5** | -1.7 | -3.3 | -3.6 | -1.4 | **1.1** | -0.5 | -0.7 | **-0.3** |
| Melanterite | $FeSO_4 7H_2O$ | -4.9 | -5.0 | -7.2 | -4.5 | -5.1 | -6.1 | -4.0 | -6.5 | -6.7 | -8.3 | -6.5 | -6.8 | -4.4 | -5.3 | -4.5 |
| Anglesite | PbSO | -4.5 | -4.5 | -6.1 | -4.2 | -4.4 | -4.0 | -4.2 | -4.5 | -4.2 | -4.5 | -4.7 | -7.4 | -4.0 | -4.3 | -4.1 |
| Gypsum | $CaSO_4:2H_2O$ | -0.6 | -0.6 | -0.6 | -0.7 | -1.0 | **0.0** | **-0.4** | -0.7 | -0.6 | -0.7 | -0.7 | -2.5 | **-0.2** | **-0.2** | **-0.2** |
| Jarosite-H | $(H_3O)Fe_3(SO_4)_2(OH)_6$ | -7.1 | -6.9 | -11.4 | -7.6 | -5.6 | -3.6 | -8.9 | -10.7 | -26.4 | -6.7 | -12.2 | -10.2 | -15.0 | -0.7 | -12.1 |
| Jarosite-K | $KFe_3(SO_4)_2(OH)_6$ | **-0.4** | **-0.3** | -3.0 | -2.1 | **1.3** | **4.5** | -1.3 | -4.3 | -21.4 | **0.2** | -5.3 | -2.2 | -8.4 | **6.8** | -5.1 |
| Jarosite-Na | $NaFe_3(SO_4)_2(OH)_6$ | -2.5 | -2.4 | -4.9 | -5.0 | -1.8 | **1.6** | -3.0 | -6.7 | -24.5 | -3.0 | -8.6 | -4.3 | -10.6 | **4.5** | -7.6 |
| Calcite | $CaCO_3$ | **0.3** | **0.2** | **1.8** | -0.6 | **-0.4** | **0.0** | **0.1** | **0.1** | -1.2 | **0.2** | **0.4** | **1.3** | **-0.3** | **0.4** | **0.0** |
| Magnesite | $MgCO_3$ | -0.9 | -1.0 | **0.5** | -2.1 | -1.7 | -1.5 | -1.4 | -1.3 | -2.6 | -1.1 | -0.9 | **0.0** | -1.5 | -0.8 | -1.3 |
| Barite | BaSO | **0.7** | **0.6** | **0.7** | **1.0** | **0.9** | **0.9** | **1.1** | **0.9** | **0.9** | **0.9** | **0.7** | -1.2 | **1.2** | **1.1** | **1.0** |
| Witherite | $BaCO_3$ | -3.8 | -3.9 | -2.3 | -4.4 | -3.9 | -4.4 | -3.7 | -3.6 | -5.1 | -3.7 | -3.5 | -2.7 | -4.3 | -3.6 | -4.1 |
| Fluorite | $CaF_2$ | -1.0 | -0.8 | -1.0 | -2.0 | -2.4 | -2.3 | -1.5 | -2.1 | -1.1 | -0.8 | -1.0 | **0.8** | **-0.4** | -0.6 | -0.6 |
| CoCO3 | $CoCO_3$ | -4.2 | -4.4 | -2.9 | -4.3 | -4.2 | -4.1 | -4.2 | -4.3 | -4.3 | -3.1 | -3.0 | -3.2 | -5.0 | -4.2 | -4.6 |
| Cerrusite | $PbCO_3$ | -2.0 | -2.1 | -2.1 | -2.6 | -2.0 | -2.2 | -2.0 | -2.1 | -3.2 | -2.0 | -2.0 | -1.9 | -2.5 | -2.0 | -2.2 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.3 | -2.2 | -4.5 | -1.0 | -1.8 | -2.4 | -2.4 | -1.7 | **-0.3** | -1.8 | -2.1 | -3.2 | -1.6 | -2.4 | -2.0 |

**Notes:**
Charge balances errrors highlighted in **red** are greater than +/-10%
Non-detect values assumed equal to 1/2 analytical detection limit
Redox converted from field ORP to Eh by +200 mV
[a] Saturation indices greater than -0.5 are identified by bold type and grey shading
[b] pCO2(g) values presented at $10^{\wedge value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW08 10-2018 | GAMW08 05-2019 | GAMW08 11-2019 | GAMW08B 09-2018 | GAMW08B 10-2018 | GAMW08B 05-2019 | GAMW08B 11-2019 | GAMW09 10-2018 | GAMW09 05-2019 | GAMW09 11-2019 | GAMW09B 09-2018 | GAMW09B 10-2018 | GAMW09B 05-2019 | GAMW09B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -2.9 | -3.7 | -6.6 | -9.7 | **-12.2** | -8.3 | **-11.7** | -5.0 | -5.0 | -6.0 | -5.7 | -6.7 | -3.0 | -6.5 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.5 | -2.1 | -2.0 | -2.3 | -2.5 | -2.5 | -2.2 | -3.0 | -2.8 | -2.8 | -2.4 | -2.3 | -2.2 | -2.2 |
| Ferrihydrite | $Fe(OH)_3$ | **1.7** | **2.3** | **2.4** | **1.8** | **3.1** | **4.1** | **3.6** | **0.2** | **1.3** | **0.7** | **2.0** | **2.5** | **3.7** | **2.2** |
| Siderite | $FeCO_3$ | -1.8 | -2.2 | -2.1 | **0.2** | **0.1** | **-0.4** | **0.1** | -2.3 | -3.1 | -2.5 | **-0.2** | **-0.1** | **-0.2** | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -6.7 | -7.3 | -7.2 | -4.5 | -4.4 | -4.9 | -4.6 | -6.7 | -7.3 | -7.0 | -5.1 | -5.1 | -5.2 | -5.0 |
| Anglesite | PbSO | -4.6 | -4.8 | -4.8 | -4.4 | -4.2 | -4.2 | -4.4 | -4.3 | -4.2 | -4.3 | -4.5 | -4.6 | -4.7 | -4.7 |
| Gypsum | $CaSO :2H_2O$ | -0.7 | -0.6 | -0.5 | **-0.2** | **-0.2** | **-0.2** | **-0.2** | -0.7 | -0.6 | -0.8 | -0.8 | -0.7 | -0.8 | -0.9 |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -6.6 | -6.5 | -6.5 | -8.4 | -3.5 | -0.9 | -3.6 | -10.6 | -8.2 | -10.1 | -6.8 | -6.1 | -2.6 | -7.3 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | **0.0** | **0.9** | **1.0** | -1.3 | **3.4** | **6.2** | **4.0** | -4.3 | -1.3 | -3.7 | **-0.3** | **0.5** | **4.2** | -0.7 |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -2.9 | -2.1 | -1.9 | -3.1 | **1.4** | **4.3** | **2.0** | -7.1 | -4.2 | -6.5 | -2.2 | -1.5 | **2.1** | -2.9 |
| Calcite | $CaCO_3$ | **0.2** | **0.5** | **0.7** | **0.6** | **0.3** | **0.3** | **0.6** | **-0.3** | **-0.3** | **-0.4** | **0.0** | **0.3** | **0.2** | **0.2** |
| Magnesite | $MgCO_3$ | -1.2 | -0.7 | -0.6 | -0.9 | -1.1 | -1.2 | -0.8 | -2.0 | -1.8 | -2.0 | -1.0 | -0.8 | -0.8 | -0.8 |
| Barite | BaSO | **0.7** | **0.9** | **1.0** | **1.0** | **0.9** | **0.8** | **0.8** | **0.6** | **0.8** | **0.6** | **0.8** | **0.8** | **0.7** | **0.5** |
| Witherite | $BaCO_3$ | -3.7 | -3.3 | -3.2 | -3.6 | -4.0 | -4.0 | -3.7 | -4.3 | -4.2 | -4.3 | -3.7 | -3.6 | -3.6 | -3.7 |
| Fluorite | $CaF_2$ | **-0.4** | **-0.1** | **-0.2** | **-0.4** | **-0.5** | **-0.2** | **-0.3** | -1.9 | -1.9 | -1.9 | -0.5 | -0.6 | -0.6 | -0.6 |
| CoCO3 | $CoCO_3$ | -2.9 | -2.8 | -2.5 | -4.0 | -4.4 | -4.3 | -4.0 | -4.8 | -4.7 | -4.8 | -4.1 | -4.3 | -4.4 | -4.0 |
| Cerrusite | $PbCO_3$ | -2.2 | -1.9 | -1.9 | -2.0 | -2.1 | -2.1 | -1.9 | -2.4 | -2.2 | -2.3 | -2.1 | -2.0 | -2.0 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -1.5 | -1.8 | -2.0 | -2.6 | -2.3 | -2.5 | -2.7 | -1.7 | -2.1 | -2.0 | -2.1 | -2.2 | -2.2 | -2.4 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW15 10-2018 | GAMW15 05-2019 | GAMW15 11-2019 | GAMW15B 09-2018 | GAMW15B 10-2018 | GAMW15B 05-2019 | GAMW15B 11-2019 | GAMW16 10-2018 | GAMW16 05-2019 | GAMW16 11-2019 | GAMW16B 09-2018 | GAMW16B 10-2018 | GAMW16B 05-2019 | GAMW16B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | 0.4 | -4.5 | -7.1 | -5.7 | -3.8 | -5.0 | -5.3 | -0.7 | -7.5 | 8.2 | -3.0 | -2.7 | -4.4 | -8.7 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -4.3 | -2.6 | -2.3 | -2.0 | -3.0 | -2.5 | -2.3 | -2.3 | -2.2 | -4.1 | -1.8 | -2.7 | -2.4 | -2.1 |
| Ferrihydrite | $Fe(OH)_3$ | -6.2 | **2.7** | **2.5** | **3.3** | -2.6 | **3.8** | **1.1** | **0.0** | **3.3** | **4.1** | **4.1** | **0.5** | **4.2** | **3.8** |
| Siderite | $FeCO_3$ | -1.6 | **0.1** | **0.2** | **0.0** | -0.9 | -0.8 | **0.0** | **-0.3** | -0.7 | -3.0 | **0.6** | **-0.1** | **-0.1** | **0.5** |
| Melanterite | $FeSO\ 7H_2O$ | -4.7 | -4.4 | -4.9 | -5.1 | -5.0 | -5.2 | -4.8 | -5.3 | -5.6 | -6.2 | -4.8 | -4.6 | -4.8 | -4.5 |
| Anglesite | PbSO | -4.3 | -4.4 | -4.7 | -4.7 | -4.1 | -4.2 | -4.5 | -4.6 | -4.5 | -4.1 | -4.9 | -4.3 | -4.4 | -4.6 |
| Gypsum | $CaSO :2H_2O$ | -1.1 | -0.9 | -1.1 | -0.6 | -0.6 | **-0.3** | **-0.4** | -0.9 | -0.6 | -0.6 | **-0.4** | **-0.4** | **-0.3** | **-0.3** |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -23.5 | -4.2 | -5.9 | -4.8 | -18.1 | -1.4 | -10.2 | -13.0 | -3.6 | -2.5 | -2.9 | -9.9 | -0.7 | -3.0 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | -19.4 | **2.5** | **0.5** | **2.3** | -12.0 | **5.9** | -3.2 | -6.6 | **3.4** | **4.5** | **4.3** | -3.7 | **6.4** | **4.3** |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -21.9 | **-0.1** | -2.0 | **0.3** | -13.9 | **3.9** | -5.3 | -9.1 | **0.8** | **1.9** | **2.1** | -5.9 | **4.1** | **2.6** |
| Calcite | $CaCO_3$ | -2.1 | **-0.3** | **-0.1** | **0.6** | **-0.4** | **0.2** | **0.4** | **0.1** | **0.3** | -1.5 | **0.9** | **0.1** | **0.4** | **0.7** |
| Magnesite | $MgCO_3$ | -3.4 | -1.4 | -1.3 | -0.8 | -1.8 | -0.9 | -1.0 | -1.4 | -1.1 | -3.0 | **-0.5** | -1.4 | -0.9 | -0.7 |
| Barite | BaSO | **0.5** | **0.8** | **0.5** | **1.1** | **1.0** | **1.4** | **1.0** | **0.5** | **0.7** | **0.6** | **1.0** | **1.0** | **1.2** | **1.1** |
| Witherite | $BaCO_3$ | -5.8 | -4.0 | -3.8 | -3.1 | -4.2 | -3.5 | -3.5 | -3.9 | -3.7 | -5.6 | -3.0 | -3.9 | -3.4 | -3.2 |
| Fluorite | $CaF_2$ | -1.3 | -1.5 | -1.3 | -1.4 | -1.3 | -1.0 | -0.9 | -0.8 | -0.8 | -0.8 | -1.0 | -1.1 | -1.0 | -0.9 |
| CoCO3 | $CoCO_3$ | -5.5 | -3.6 | -3.6 | -4.0 | -4.8 | -4.3 | -4.1 | -4.1 | -4.0 | -5.8 | -3.6 | -4.5 | -4.2 | -3.9 |
| Cerrusite | $PbCO_3$ | -3.7 | -2.1 | -2.1 | -1.9 | -2.4 | -2.0 | -2.0 | -2.1 | -2.0 | -3.4 | -1.9 | -2.3 | -2.0 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | **0.1** | -1.9 | -2.1 | -2.6 | -1.5 | -2.2 | -2.4 | -2.0 | -2.2 | -4.8 | -2.7 | -1.7 | -2.3 | -2.6 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{\wedge value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW17 10-2018 | GAMW17 05-2019 | GAMW17 11-2019 | GAMW17B 09-2018 | GAMW17B 10-2018 | GAMW17B 05-2019 | GAMW17B 11-2019 | GAMW18 10-2018 | GAMW18 04-2019 | GAMW18 11-2019 | GAMW18B 09-2018 | GAMW18B 10-2018 | GAMW18B 04-2019 | GAMW18B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | 0.8 | -0.5 | -6.6 | -3.6 | 1.1 | 0.6 | -4.3 | **-10.9** | -6.4 | -9.2 | -3.2 | **-10.4** | **-48.7** | **-10.9** |
| **MINERAL PHASES - Saturation Indices** [a] | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.8 | -2.2 | -1.9 | -2.0 | -2.2 | -2.3 | -2.0 | -3.0 | -3.0 | -2.5 | -2.0 | -2.9 | -4.7 | -2.1 |
| Ferrihydrite | $Fe(OH)_3$ | -2.9 | **2.5** | **2.9** | **3.3** | **0.1** | **3.6** | **4.3** | -0.7 | **1.7** | **0.9** | **2.8** | **0.6** | **2.1** | **2.2** |
| Siderite | $FeCO_3$ | -2.1 | -2.6 | -2.6 | **0.4** | **0.3** | **0.1** | **-0.1** | -2.5 | -2.9 | -1.8 | **0.6** | -0.5 | -5.1 | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -6.8 | -7.7 | -8.1 | -5.0 | -4.9 | -5.0 | -5.5 | -6.7 | -6.8 | -6.4 | -4.5 | -4.7 | -7.3 | -4.9 |
| Anglesite | PbSO | -4.5 | -4.8 | -5.0 | -4.9 | -4.8 | -4.8 | -4.9 | -4.3 | -4.1 | -4.3 | -4.6 | -4.1 | -3.7 | -4.6 |
| Gypsum | $CaSO :2H_2O$ | -0.8 | -1.0 | -1.1 | -0.9 | -0.9 | -1.0 | -0.9 | -0.6 | **-0.4** | **-0.3** | **-0.4** | **-0.5** | **-0.4** | -0.6 |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -19.9 | -6.7 | -6.3 | -4.5 | -13.3 | -2.1 | -1.6 | -12.0 | -5.3 | -9.3 | -5.6 | -8.8 | -5.3 | -7.6 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | -14.0 | **0.2** | **0.6** | **2.5** | -6.5 | **4.7** | **5.5** | -6.4 | **0.8** | -2.8 | **1.6** | -2.6 | **1.1** | -0.5 |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -16.7 | -2.4 | -2.1 | **0.2** | -8.8 | **1.8** | **2.9** | -9.0 | -1.7 | -5.3 | **-0.3** | -4.4 | -2.5 | -2.4 |
| Calcite | $CaCO_3$ | **-0.2** | **0.1** | **0.4** | **0.5** | **0.3** | **0.2** | **0.4** | **-0.4** | **-0.4** | **0.3** | **0.6** | **-0.3** | -2.1 | **0.4** |
| Magnesite | $MgCO_3$ | -1.4 | -0.8 | -0.7 | -0.9 | -1.0 | -0.9 | -0.7 | -2.2 | -2.1 | -1.5 | -0.6 | -1.5 | -4.6 | -0.7 |
| Barite | BaSO | **0.8** | **0.6** | **0.6** | **0.7** | **0.8** | **0.9** | **0.8** | **0.7** | **0.9** | **1.0** | **1.0** | **0.9** | **1.0** | **0.6** |
| Witherite | $BaCO_3$ | -4.0 | -3.6 | -3.3 | -3.2 | -3.4 | -3.3 | -3.2 | -4.5 | -4.5 | -3.8 | -3.3 | -4.3 | -6.0 | -3.7 |
| Fluorite | $CaF_2$ | **-0.5** | -0.6 | -0.6 | -1.1 | -1.3 | -1.3 | -1.3 | -3.3 | -2.9 | -2.3 | -1.2 | -1.3 | -0.9 | -1.0 |
| CoCO3 | $CoCO_3$ | -4.6 | -4.0 | -3.8 | -4.0 | -4.0 | -4.2 | -3.8 | -4.8 | -5.2 | -4.3 | -4.1 | -5.0 | -6.8 | -4.3 |
| Cerrusite | $PbCO_3$ | -2.4 | -2.0 | -2.0 | -2.0 | -2.0 | -2.1 | -2.0 | -2.5 | -2.4 | -2.1 | -2.0 | -2.3 | -3.8 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -1.6 | -2.4 | -2.6 | -2.3 | -2.1 | -1.7 | -2.4 | -1.2 | -1.5 | -1.8 | -2.4 | -1.5 | -3.9 | -2.4 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW52 09-2018 | GAMW52 10-2018 | GAMW52 05-2019 | GAMW52 11-2019 | GAMW52B 09-2018 | GAMW52B 10-2018 | GAMW52B 05-2019 | GAMW52B 11-2019 | GAMW53 09-2018 | GAMW53 10-2018 | GAMW53 04-2019 | GAMW53 11-2019 | GAMW53B 09-2018 | GAMW53B 10-2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -2.9 | 3.4 | 4.0 | -1.3 | -7.2 | 1.1 | -1.7 | -6.4 | 3.9 | 2.9 | -1.5 | 1.3 | -0.7 | -1.6 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -1.9 | -2.7 | -2.3 | -1.9 | -1.6 | -2.9 | -2.3 | -2.4 | -3.5 | -3.0 | -4.0 | -3.5 | -2.2 | -2.2 |
| Ferrihydrite | $Fe(OH)_3$ | **2.9** | **2.2** | **2.3** | **2.3** | **3.4** | **1.5** | **3.8** | **2.0** | **-0.1** | -1.9 | -0.8 | -1.1 | **1.1** | **1.3** |
| Siderite | $FeCO_3$ | -1.0 | -2.7 | -3.1 | -1.3 | **1.2** | **-0.1** | **-0.4** | **-0.1** | -1.4 | -1.1 | -2.9 | -2.3 | **0.1** | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -6.9 | -8.4 | -8.9 | -7.3 | -5.2 | -5.3 | -5.7 | -5.3 | -5.9 | -6.0 | -6.7 | -6.7 | -5.1 | -5.1 |
| Anglesite | PbSO | -5.4 | -5.3 | -5.5 | -5.5 | -5.9 | -4.9 | -5.0 | -4.8 | -4.4 | -4.6 | -4.5 | -4.7 | -4.8 | -4.7 |
| Gypsum | $CaSO :2H_2O$ | -1.6 | -2.0 | -2.3 | -1.7 | -1.2 | -1.2 | -1.3 | -1.1 | -2.0 | -1.9 | -2.4 | -2.3 | -0.8 | -0.7 |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -6.2 | -7.4 | -7.9 | -8.7 | -7.5 | -8.4 | -2.7 | -7.4 | -9.6 | -16.9 | -11.6 | -13.6 | -9.8 | -9.2 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | **0.3** | -1.3 | -1.7 | -2.0 | **0.1** | -1.9 | **4.2** | -0.7 | -5.0 | -11.7 | -6.6 | -8.6 | -3.6 | -2.8 |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | -2.4 | -4.1 | -4.5 | -4.7 | -1.8 | -3.8 | **2.2** | -2.6 | -7.9 | -14.6 | -9.6 | -11.7 | -5.6 | -4.8 |
| Calcite | $CaCO_3$ | **0.2** | **-0.4** | **-0.4** | **0.2** | **1.1** | **0.0** | **0.1** | **0.1** | -1.7 | -1.1 | -2.6 | -2.0 | **0.3** | **0.3** |
| Magnesite | $MgCO_3$ | -1.1 | -1.6 | -1.5 | -1.0 | **-0.2** | -1.3 | -1.1 | -1.2 | -2.9 | -2.4 | -3.5 | -3.0 | -1.3 | -1.3 |
| Barite | BaSO | **0.0** | -0.6 | -0.8 | **-0.3** | **1.1** | **1.1** | **1.1** | **1.3** | **-0.3** | **-0.3** | **-0.3** | **-0.3** | **0.6** | **0.7** |
| Witherite | $BaCO_3$ | -3.5 | -4.3 | -4.3 | -3.7 | -1.9 | -3.1 | -2.8 | -2.9 | -5.3 | -4.8 | -5.9 | -5.3 | -3.5 | -3.5 |
| Fluorite | $CaF_2$ | -2.0 | -2.2 | -2.4 | -2.1 | **0.4** | -2.4 | -2.4 | -2.3 | -2.8 | -2.7 | -4.8 | -4.7 | -1.5 | -1.6 |
| CoCO3 | $CoCO_3$ | -3.7 | -4.4 | -4.2 | -3.8 | -3.2 | -4.5 | -4.0 | -4.1 | -5.1 | -4.6 | -5.9 | -5.4 | -4.0 | -4.0 |
| Cerrusite | $PbCO_3$ | -2.0 | -2.1 | -2.0 | -2.0 | -2.0 | -2.2 | -2.0 | -2.1 | -2.6 | -2.3 | -3.1 | -2.8 | -2.1 | -2.1 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.1 | -1.8 | -1.9 | -2.3 | -3.0 | -1.8 | -2.1 | -2.1 | -0.9 | -1.3 | -1.2 | -1.3 | -1.9 | -2.0 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW53B 04-2019 | GAMW53B 11-2019 | GAMW54 09-2018 | GAMW54 10-2018 | GAMW54 04-2019 | GAMW54 11-2019 | GAMW54B 09-2018 | GAMW54B 10-2018 | GAMW54B 05-2019 | GAMW54B 11-2019 | GAMW55 09-2018 | GAMW55 10-2018 | GAMW55B 09-2018 | GAMW55B 10-2018 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -2.8 | -2.7 | -1.7 | 2.0 | -3.0 | -3.0 | -1.5 | 1.8 | -6.0 | -3.8 | -1.3 | 0.7 | -6.0 | -2.6 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.1 | -2.1 | -3.3 | -1.7 | -2.8 | -2.3 | -2.7 | -1.2 | -2.4 | -2.4 | -2.8 | -2.5 | -2.6 | -2.5 |
| Ferrihydrite | $Fe(OH)_3$ | **4.1** | **3.3** | **1.5** | **-0.3** | **1.4** | **1.0** | **1.0** | **2.9** | **3.4** | **2.8** | **2.1** | **0.9** | **1.2** | **1.7** |
| Siderite | $FeCO_3$ | **-0.4** | **0.1** | -2.5 | -0.6 | -2.1 | -1.1 | **-0.1** | **1.5** | **0.1** | **0.1** | -1.2 | -1.4 | **-0.1** | **0.0** |
| Melanterite | $FeSO\ 7H_2O$ | -5.8 | -5.3 | -6.7 | -6.6 | -6.6 | -6.5 | -4.7 | -4.7 | -4.8 | -4.7 | -5.8 | -6.1 | -4.7 | -4.7 |
| Anglesite | PbSO | -4.9 | -4.9 | -4.5 | -5.4 | -4.5 | -5.1 | -4.3 | -5.8 | -4.5 | -4.5 | -4.4 | -4.5 | -4.4 | -4.4 |
| Gypsum | $CaSO :2H_2O$ | -0.9 | -1.0 | -1.3 | -1.4 | -1.2 | -1.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.6 | -0.5 | -0.5 | **-0.5** |
| Jarosite-H | $(H_3O)Fe_3(SO\ )_2(OH)_6$ | -1.4 | -4.2 | -4.8 | -17.1 | -7.5 | -10.3 | -8.3 | -9.7 | -2.4 | -3.8 | -4.3 | -9.0 | -7.9 | -6.8 |
| Jarosite-K | $KFe_3(SO\ )_2(OH)_6$ | **5.2** | **2.4** | **0.0** | -10.5 | -1.7 | -4.4 | -2.1 | -1.6 | **4.2** | **2.7** | **1.7** | -2.6 | -1.7 | **-0.4** |
| Jarosite-Na | $NaFe_3(SO\ )_2(OH)_6$ | **3.0** | **0.2** | -2.4 | -12.9 | -4.1 | -7.0 | -4.0 | -3.6 | **2.2** | **0.7** | -0.9 | -5.2 | -3.6 | -2.3 |
| Calcite | $CaCO_3$ | **0.4** | **0.3** | -1.1 | **0.5** | -0.7 | **-0.2** | **-0.1** | **1.6** | **0.2** | **0.2** | **-0.1** | **0.1** | **0.1** | **0.2** |
| Magnesite | $MgCO_3$ | -1.1 | -1.2 | -2.5 | -0.8 | -1.8 | -1.5 | -1.5 | **0.2** | -1.1 | -1.1 | -1.7 | -1.4 | -1.4 | -1.2 |
| Barite | BaSO | **0.5** | **0.7** | **0.4** | **0.3** | **0.4** | **-0.1** | **1.1** | **1.1** | **1.1** | **1.1** | **1.0** | **0.9** | **1.3** | **1.2** |
| Witherite | $BaCO_3$ | -3.5 | -3.3 | -4.8 | -3.2 | -4.4 | -4.0 | -3.7 | -2.1 | -3.5 | -3.5 | -3.8 | -3.7 | -3.5 | -3.4 |
| Fluorite | $CaF_2$ | -1.5 | -1.3 | -2.6 | -2.6 | -2.7 | -2.2 | -1.7 | -1.5 | -1.4 | -1.3 | -1.4 | -1.5 | -2.0 | -2.1 |
| CoCO3 | $CoCO_3$ | -3.9 | -3.9 | -5.1 | -3.5 | -4.6 | -4.2 | -4.5 | -3.0 | -4.2 | -4.2 | -3.5 | -3.4 | -4.6 | -4.3 |
| Cerrusite | $PbCO_3$ | -2.0 | -2.1 | -2.8 | -2.0 | -2.2 | -2.1 | -2.3 | -2.0 | -2.1 | -2.1 | -2.4 | -2.2 | -2.3 | -2.2 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.0 | -2.2 | -1.0 | -2.7 | -1.6 | -1.7 | -1.6 | -3.5 | -1.9 | -1.8 | -1.4 | -1.7 | -1.7 | -1.9 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

**Table 5: Groundwater Geochemical Modeling Re**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Parameter | Units | GAMW55B 05-2019 | GAMW55B 11-2019 | GAMW55R 11-2019 | GAMW56 09-2018 | GAMW56 10-2018 | GAMW56 04-2019 | GAMW56 11-2019 | GAMW56B 09-2018 | GAMW56B 10-2018 | GAMW56B 04-2019 | GAMW56B 11-2019 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Charge Balance | % error | -5.4 | -6.2 | -5.5 | 4.4 | -1.6 | 61.8 | 3.5 | 0.7 | 2.6 | -13.1 | -4.8 |
| **MINERAL PHASES - Saturation Indices [a]** | | | | | | | | | | | | |
| Otavite | $CdCO_3$ | -2.4 | -2.2 | -2.3 | -2.4 | -2.0 | -2.7 | -2.2 | -2.3 | -2.3 | -2.3 | -2.3 |
| Ferrihydrite | $Fe(OH)_3$ | **3.0** | **2.0** | **1.4** | **1.5** | **2.5** | **2.9** | **1.7** | **1.2** | **2.0** | **3.7** | **1.7** |
| Siderite | $FeCO_3$ | **0.0** | **0.2** | -1.9 | **0.5** | **0.8** | -0.7 | **0.1** | **0.2** | **0.1** | **0.2** | **0.1** |
| Melanterite | $FeSO\ 7H_2O$ | -4.8 | -4.8 | -6.9 | -5.1 | -5.1 | -5.9 | -5.6 | -5.0 | -5.2 | -4.8 | -4.9 |
| Anglesite | PbSO | -4.5 | -4.6 | -4.6 | -5.4 | -5.5 | -5.1 | -5.4 | -5.0 | -5.1 | -4.7 | -4.7 |
| Gypsum | $CaSO :2H_2O$ | -0.6 | -0.6 | -0.8 | -1.7 | -1.7 | -1.9 | -1.7 | -1.2 | -1.3 | -1.0 | -0.9 |
| Jarosite-H | $(H_3O)Fe_3(SO )_2(OH)_6$ | -3.6 | -7.1 | -8.6 | -8.3 | -6.6 | -4.3 | -8.7 | -8.8 | -6.6 | -1.5 | -7.8 |
| Jarosite-K | $KFe_3(SO )_2(OH)_6$ | **2.9** | **-0.5** | -1.9 | -2.5 | **-0.4** | **2.4** | -2.6 | -2.6 | **-0.4** | **4.6** | -1.2 |
| Jarosite-Na | $NaFe_3(SO )_2(OH)_6$ | **1.0** | -2.4 | -4.4 | -5.4 | -3.2 | **0.4** | -5.7 | -5.0 | -2.7 | **1.7** | -3.5 |
| Calcite | $CaCO_3$ | **0.2** | **0.4** | **0.2** | **-0.1** | **0.2** | -0.6 | **0.1** | **0.0** | **0.0** | **0.0** | **0.1** |
| Magnesite | $MgCO_3$ | -1.1 | -1.0 | -1.2 | -1.5 | -1.1 | -1.2 | -1.2 | -1.2 | -1.1 | -1.3 | -1.1 |
| Barite | BaSO | **1.0** | **1.0** | **0.6** | **0.0** | **0.0** | **-0.1** | **-0.1** | **0.6** | **0.4** | **0.8** | **0.9** |
| Witherite | $BaCO_3$ | -3.5 | -3.4 | -3.8 | -3.7 | -3.5 | -4.2 | -3.7 | -3.6 | -3.6 | -3.5 | -3.5 |
| Fluorite | $CaF_2$ | -2.0 | -2.0 | -1.3 | -0.8 | -1.0 | -1.7 | -1.2 | -1.7 | -1.9 | -1.7 | -1.7 |
| CoCO3 | $CoCO_3$ | -4.2 | -4.0 | -4.1 | -3.8 | -2.9 | -3.4 | -2.9 | -4.2 | -4.2 | -4.2 | -4.2 |
| Cerrusite | $PbCO_3$ | -2.1 | -2.1 | -2.1 | -2.2 | -2.0 | -2.2 | -2.1 | -2.1 | -2.1 | -2.0 | -2.0 |
| Carbon Dioxide | $pCO_2(g)$ [b] | -2.0 | -2.1 | -2.0 | -1.2 | -1.6 | -1.6 | -1.6 | -1.4 | -1.3 | -1.6 | -1.8 |

**Notes:**

Charge balances errrors highlighted in **red** are greater than +/-10%

Non-detect values assumed equal to 1/2 analytical detection limit

Redox converted from field ORP to Eh by +200 mV

[a] Saturation indices greater than -0.5 are identified by bold type and grey shading

[b] pCO2(g) values presented at $10^{value}$ atm

Prepared by GOL
Checked by PJN
Reviewed by RV

**Table 6: Average Point Decay Rates in Background and Downgradient Wells**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Constituent | Units | Point Decay Constants (first-order decay) | |
|---|---|---|---|
| | | Background Wells | All Downgradient Wells (including Assessment Wells) |
| Arsenic | $yr^{-1}$ | -0.33 | **0.11** |
| Boron | $yr^{-1}$ | 0.04 | **-0.04** |
| Cobalt | $yr^{-1}$ | 0.36 | **-0.05** |
| Lithium | $yr^{-1}$ | 0.20 | **-0.06** |
| Molybdenum | $yr^{-1}$ | 0.28 | **-0.03** |

**Notes:**
$yr^{-1}$ = rate per year

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

**Table 7: Summary of Rietveld Quantitative Analysis X-Ray Diffraction Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Mineral | Mineral Formula | OW-9 18-20' (wt %) | OW-9 10-12' (wt %) | SB-52B-35'-37' (wt %) | SB-54B-30'-32' (wt %) | SB-56B-30'-32' (wt %) |
|---|---|---|---|---|---|---|
| Quartz | $SiO_2$ | 69 | 60 | 53 | 61 | 72 |
| Pyrite | $FeS_2$ | - | - | 0.39 | 0.10 | 0.12 |
| Marcasite | $FeS_2$ | - | - | 0.22 | - | - |
| Muscovite | $KAl_2(AlSi_3O_{10})(OH)_2$ | 3.6 | 3.5 | 7.8 | 1.7 | 1.3 |
| Biotite | $K(Mg,Fe)_3(AlSi_3O_{10})(OH)_2$ | - | - | 1.1 | 0.57 | 0.16 |
| Chlorite | $(Fe,(Mg,Mn)_5,Al)(Si_3Al)O_{10}(OH)_8$ | - | - | 2.6 | 1.0 | 1.1 |
| Microcline | $KAlSi_3O_8$ | 5.2 | 9.1 | 9.2 | 7.5 | 6.6 |
| Orthoclase | $KAlSi_3O_8$ | - | - | 2.2 | 0.65 | 0.57 |
| Hematite | $Fe_2O_3$ | - | - | 0.26 | 0.44 | 0.57 |
| Dolomite | $CaMg(CO_3)_2$ | 6.5 | 9.8 | 7.9 | 9.6 | 5.3 |
| Calcite | $CaCO_3$ | 4.8 | 3.6 | 4.7 | 5.8 | 3.9 |
| Albite | $NaAlSi_3O_8$ | 8.3 | 11 | 7.3 | 9.1 | 6.4 |
| Epidote | $Ca_2(Al,Fe)Al_2O(SiO_4)(Si_2O_7)(OH)$ | 1.6 | 1.5 | 2.8 | 2.1 | 1.9 |
| Anatase | $TiO_2$ | - | - | - | - | - |
| Cancrinite | $Na_6Ca(CO_3)(AlSiO_4)_6 \cdot 2H_2O$ | 0.87 | 1.7 | - | - | - |
| TOTAL | | 100 | 100 | 100 | 100 | 100 |

**Notes:**

wt % = percent by weight of each mineral

Non-detect minerals within a sample are represented with "-"

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Aluminum | Total Metal Result | 1900 | 3100 J+ | 2200 J+ | 1100 | 1300 | 3200 | 1500 | 1400 | 2000 | 2200 | 1600 |
| Aluminum | SEP Step 1 | 52 U | 48 U | 47 U | 47 U | 51 U | 44 U | 48 U | 44 U | 49 U | 48 U | 49 U |
| Aluminum | SEP Step 2 | 15 J | 63 J | 16 J | 35 UJ | 38 UJ | 8.8 J | 11 J | 33 UJ | 12 J | 36 UJ | 5.9 J |
| Aluminum | SEP Step 3 | 44 | 540 | 60 | 15 | 31 | 33 | 75 | 30 | 34 | 23 | 29 |
| Aluminum | SEP Step 4 | 300 | 1600 | 280 | 160 | 130 | 110 | 130 | 100 | 130 | 100 | 360 |
| Aluminum | SEP Step 5 | 200 UJ | 80 J | 180 U | 170 U | 190 UJ | 28 J | 31 J | 34 J | 180 UJ | 180 UJ | 180 UJ |
| Aluminum | SEP Step 6 | 1000 | 1600 | 840 | 520 | 1100 | 1200 | 750 | 820 | 1400 | 1200 | 1300 |
| Aluminum | SEP Step 7 | 22000 | 11000 | 23000 | 15000 | 23000 | 25000 | 16000 | 19000 | 23000 | 21000 | 25000 |
| Aluminum | SEP SUM | 23000 | 15000 | 24000 | 16000 | 24000 | 26000 | 17000 | 20000 | 24000 | 22000 | 27000 |
| Aluminum | SEP TOTAL | 25000 | 21000 | 29000 | 19000 | 23000 | 28000 | 18000 | 20000 | 29000 | 31000 | 23000 |
| Antimony | Total Metal Result | 7.7 U | 18 U | 17 U | 17 U | 7 U | 6.3 UJ | 6.9 UJ | 6.6 UJ | 7 U | 7 U | 7 U |
| Antimony | SEP Step 1 | 16 U | 14 U | 14 U | 14 U | 15 U | 13 U | 14 U | 13 U | 15 U | 14 U | 15 U |
| Antimony | SEP Step 2 | 12 U | 11 U | 11 U | 10 U | 12 U | 10 U | 11 U | 10 U | 11 U | 11 U | 11 U |
| Antimony | SEP Step 3 | 3.9 U | 3.6 U | 3.5 U | 3.5 U | 3.8 U | 3.3 U | 3.6 U | 3.3 U | 3.7 U | 3.6 U | 3.6 U |
| Antimony | SEP Step 4 | 3.9 U | 3.6 U | 3.5 U | 3.5 U | 3.8 U | 3.3 U | 3.6 U | 3.3 U | 3.7 U | 3.6 U | 3.6 U |
| Antimony | SEP Step 5 | 59 U | 54 U | 53 U | 52 U | 58 U | 50 U | 53 U | 50 U | 55 U | 54 U | 55 U |
| Antimony | SEP Step 6 | 3.9 U | 3.6 U | 3.5 U | 3.5 U | 3.8 U | 3.3 U | 3.6 U | 3.3 U | 3.7 U | 3.6 U | 3.6 U |
| Antimony | SEP Step 7 | 0.45 J | 3.6 U | 3.5 U | 3.5 U | 0.54 J | 3.3 U | 3.6 U | 0.16 J | 0.29 J | 3.6 U | 0.3 J |
| Antimony | SEP SUM | 0.45 J | 3 U | 3 U | 3 U | 0.54 J | 3 U | 3 U | 0.16 J | 0.29 J | 3 U | 0.3 J |
| Antimony | SEP TOTAL | 0.53 J | 3.6 U | 3.5 U | 3.5 U | 0.27 J | 3.3 U | 3.6 J | 3.3 U | 0.33 J | 3.6 U | 0.29 J |
| Arsenic | Total Metal Result | 1.7 J | 0.62 J | 1.7 J | 0.69 J | 1.9 J | 5.4 J | 5 | 1.3 J | 2.3 | 2 J | 5 |
| Arsenic | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Arsenic | SEP Step 2 | 2 U | 1.8 UJ | 1.8 U | 1.7 U | 1.9 U | 0.46 J | 1.8 U | 1.7 U | 1.8 UJ | 1.8 UJ | 1.8 UJ |
| Arsenic | SEP Step 3 | 0.37 J | 0.45 J | 0.43 J | 0.17 J | 0.27 J | 0.83 | 0.83 | 0.44 J | 0.45 J | 0.37 J | 1.9 |
| Arsenic | SEP Step 4 | 0.69 | 0.6 U | 0.94 | 0.73 | 0.66 | 0.71 J+ | 0.59 U | 0.56 U | 0.68 | 0.5 J | 1.1 |
| Arsenic | SEP Step 5 | 9.8 U | 9 U | 8.8 U | 8.7 U | 9.6 U | 8.3 UJ | 8.9 UJ | 8.3 UJ | 9.1 U | 9 U | 9.1 U |
| Arsenic | SEP Step 6 | 1.2 | 0.3 J | 0.56 J | 0.54 J | 1.7 | 2.2 | 1.6 | 0.89 | 1.8 | 1.4 | 3.8 |
| Arsenic | SEP Step 7 | 1.3 U | 0.7 | 0.39 J | 0.34 J | 1.3 U | 1.2 | 1 | 0.88 | 1.2 U | 0.6 U | 1.2 U |
| Arsenic | SEP SUM | 2.2 | 1.4 | 2.3 | 1.8 | 2.6 | 5.4 | 4 | 2.7 | 2.9 | 2.7 | 7.3 |
| Arsenic | SEP TOTAL | 2.1 | 2.2 | 1.9 | 3 | 3.1 | 5.4 J | 5.6 | 2.5 | 4.7 | 3.9 | 6.2 |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Barium | Total Metal Result | 6.9 J+ | 7.3 J+ | 13 | 4.1 | 4.3 J+ | 8.4 J+ | 4.6 J+ | 4.3 J+ | 6.2 | 6.1 | 6.1 |
| Barium | SEP Step 1 | 13 U | 1.1 J | 0.58 J | 12 U | 13 U | 11 U | 12 U | 11 U | 12 U | 12 U | 12 U |
| Barium | SEP Step 2 | 0.5 J | 1.7 J | 0.62 J | 8.7 UJ | 0.46 J | 0.52 J | 0.54 J | 0.54 J | 0.56 J | 0.44 J | 0.96 J |
| Barium | SEP Step 3 | 3.3 U | 3.6 | 2.9 U | 2.9 U | 3.2 U | 2.8 U | 3 U | 2.8 U | 3 U | 3 U | 3 U |
| Barium | SEP Step 4 | 2.2 J | 2.6 J | 5.3 | 1.6 J | 1.4 J | 2.4 J | 0.97 J | 1.1 J | 2.2 J | 1.9 J | 2.2 J |
| Barium | SEP Step 5 | 49 UJ | 45 UJ | 44 UJ | 44 UJ | 48 UJ | 42 UJ | 45 UJ | 42 UJ | 46 UJ | 45 UJ | 46 UJ |
| Barium | SEP Step 6 | 2.3 J | 2.2 J | 2.2 J | 1.2 J | 1.9 J | 2 J | 1.6 J | 1.5 J+ | 2.3 J | 2 J | 2.4 J |
| Barium | SEP Step 7 | 250 | 230 | 350 | 220 | 220 | 250 J | 190 | 220 | 230 | 190 | 260 |
| Barium | SEP SUM | 250 | 240 | 360 | 220 | 230 | 250 | 190 | 220 | 240 | 190 | 260 |
| Barium | SEP TOTAL | 270 | 300 | 390 | 210 | 190 | 200 | 170 | 200 | 220 | 200 | 230 |
| Beryllium | Total Metal Result | 1.3 U | 0.053 J | 0.12 J | 0.064 J | 1.2 U | 0.19 J | 1.1 U | 1.1 U | 1.2 U | 1.2 U | 1.2 U |
| Beryllium | SEP Step 1 | 1.3 U | 1.2 U | 1.2 U | 1.2 U | 1.3 U | 1.1 U | 1.2 U | 1.1 U | 1.2 U | 1.2 U | 1.2 U |
| Beryllium | SEP Step 2 | 0.98 UJ | 0.9 UJ | 0.88 UJ | 0.87 UJ | 0.96 UJ | 0.83 UJ | 0.89 UJ | 0.83 UJ | 0.91 UJ | 0.9 UJ | 0.91 UJ |
| Beryllium | SEP Step 3 | 0.33 U | 0.026 J | 0.021 | 0.29 U | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.3 U | 0.3 U | 0.3 U |
| Beryllium | SEP Step 4 | 0.33 U | 0.026 J | 0.024 J | 0.02 J | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.3 U | 0.3 U | 0.03 J |
| Beryllium | SEP Step 5 | 4.9 UJ | 4.5 UJ | 4.4 UJ | 4.4 UJ | 4.8 UJ | 4.2 UJ | 4.5 UJ | 4.2 UJ | 4.6 UJ | 4.5 UJ | 4.6 UJ |
| Beryllium | SEP Step 6 | 0.045 J | 0.024 J | 0.036 J | 0.027 J | 0.039 J | 0.042 J | 0.026 J | 0.027 J | 0.045 J | 0.037 J | 0.067 J |
| Beryllium | SEP Step 7 | 0.29 J | 0.21 J | 0.39 | 0.24 J | 0.31 J | 0.35 | 0.23 J | 0.28 | 0.3 | 0.25 J | 0.46 |
| Beryllium | SEP SUM | 0.34 | 0.29 | 0.47 | 0.28 | 0.35 | 0.39 | 0.25 | 0.31 | 0.34 | 0.29 | 0.56 |
| Beryllium | SEP TOTAL | 0.37 | 0.3 | 0.41 | 0.28 J | 0.26 J | 0.35 | 0.25 J | 0.27 J | 0.33 | 0.27 J | 0.33 |
| Boron | Total Metal Result | 26 U | 5.5 | 7.4 | 3.6 | 23 U | 21 U | 23 U | 22 U | 23 U | 23 U | 23 U |
| Cadmium | Total Metal Result | 0.64 U | 0.24 U | 0.11 J | 0.072 J | 0.59 U | 0.53 U | 0.57 U | 0.55 U | 0.58 U | 0.58 U | 0.3 J |
| Cadmium | SEP Step 1 | 1.3 U | 1.2 U | 1.2 U | 1.2 U | 1.3 U | 1.1 U | 1.2 U | 1.1 U | 1.2 U | 1.2 U | 1.2 U |
| Cadmium | SEP Step 2 | 0.98 U | 0.9 U | 0.88 U | 0.87 U | 0.96 U | 0.83 U | 0.89 U | 0.83 U | 0.91 U | 0.9 U | 0.91 U |
| Cadmium | SEP Step 3 | 0.33 U | 0.3 UJ | 0.29 UJ | 0.29 UJ | 0.32 U | 0.28 UJ | 0.3 UJ | 0.28 UJ | 0.3 UJ | 0.3 UJ | 0.3 UJ |
| Cadmium | SEP Step 4 | 0.077 J | 0.059 J | 0.09 J | 0.083 J | 0.076 J | 0.086 J | 0.08 J | 0.076 J | 0.069 J | 0.065 J | 0.059 J |
| Cadmium | SEP Step 5 | 4.9 U | 4.5 U | 4.4 U | 4.4 U | 4.8 U | 4.2 U | 4.5 U | 4.2 U | 4.6 U | 4.5 U | 4.6 U |
| Cadmium | SEP Step 6 | 0.33 U | 0.3 U | 0.29 U | 0.29 U | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.026 J | 0.013 J | 0.3 U |
| Cadmium | SEP Step 7 | 0.33 U | 0.3 U | 0.29 U | 0.29 U | 0.32 U | 0.28 U | 0.3 U | 0.28 U | 0.3 U | 0.3 U | 0.3 U |
| Cadmium | SEP SUM | 0.077 J | 0.11 J | 0.09 J | 0.083 J | 0.076 J | 0.086 J | 0.08 J | 0.076 J | 0.095 J | 0.077 J | 0.059 J |
| Cadmium | SEP TOTAL | 0.015 J | 0.3 U | 0.29 U | 0.29 U | 0.065 J | 0.28 U | 0.3 U | 0.28 U | 0.18 J | 0.12 J | 0.058 J |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Chromium | Total Metal Result | 4.3 | 2.9 | 4.4 | 2.5 | 2.8 | 8.2 J | 5.1 | 3.4 | 5 | 6 | 3.2 |
| Chromium | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Chromium | SEP Step 2 | 2 UJ | 1.8 U | 0.28 J | 1.7 U | 1.9 UJ | 0.37 J | 0.37 J | 1.7 U | 0.31 J | 1.8 U | 1.8 U |
| Chromium | SEP Step 3 | 0.29 J | 0.37 J | 0.52 J | 0.16 J | 0.17 J | 1.1 | 0.97 | 0.27 J | 1.1 | 0.14 J | 0.19 J |
| Chromium | SEP Step 4 | 1.2 | 1.1 | 0.94 | 0.57 J | 0.55 J | 0.68 | 0.58 J | 0.51 J | 0.73 | 0.6 | 1 |
| Chromium | SEP Step 5 | 9.8 U | 9 UJ | 1.5 J | 1.3 J | 9.6 U | 8.3 U | 8.9 U | 8.3 U | 9.1 U | 9 U | 9.1 U |
| Chromium | SEP Step 6 | 2.5 | 0.99 | 2.1 | 1.7 | 3.1 | 3.5 | 2.2 | 2.2 | 3.7 | 3.3 | 3 |
| Chromium | SEP Step 7 | 5.5 | 3.7 | 7.3 | 5.2 | 7.2 | 9 | 5 | 7.3 | 8.5 | 6.7 | 13 |
| Chromium | SEP SUM | 9.4 | 8.1 | 13 | 8.8 | 11 | 15 | 9.1 | 10 | 14 | 11 | 17 |
| Chromium | SEP TOTAL | 9.5 | 6.9 | 11 | 8.3 | 8.8 | 16 J | 10 | 8.7 | 17 | 13 | 9.2 |
| Cobalt | Total Metal Result | 3.5 J | 1.1 | 1.8 | 2.2 | 2.9 J | 5.2 J | 5.7 | 2.6 J | 5.7 J | 3.9 J | 3 J |
| Cobalt | SEP Step 1 | 13 U | 12 U | 12 U | 12 U | 13 U | 11 U | 12 U | 11 U | 12 U | 12 U | 12 U |
| Cobalt | SEP Step 2 | 0.54 J | 9 U | 8.8 U | 8.7 U | 0.35 J | 0.44 J | 0.63 J | 0.38 J | 0.62 J | 0.41 J | 0.26 J |
| Cobalt | SEP Step 3 | 0.55 J | 0.1 J | 0.27 J | 0.19 J | 0.37 J | 0.45 J | 1.2 J | 0.53 J | 0.47 J | 0.39 J | 0.37 J |
| Cobalt | SEP Step 4 | 0.83 J | 0.29 J | 0.87 J | 1.2 J | 0.97 J | 0.71 J | 1.1 J | 0.66 J | 1.6 J | 0.91 J | 0.76 J |
| Cobalt | SEP Step 5 | 49 UJ | 45 UJ | 44 UJ | 44 UJ | 48 UJ | 42 UJ | 45 UJ | 42 UJ | 46 UJ | 45 UJ | 46 UJ |
| Cobalt | SEP Step 6 | 1.3 J | 0.3 J | 0.66 J | 0.68 J | 1.8 J | 2.1 J | 1.5 J | 0.97 J | 2.5 J | 1.5 J | 2.9 J |
| Cobalt | SEP Step 7 | 0.8 J | 3 U | 0.69 J | 0.69 J | 1.1 J | 0.82 J | 0.44 J | 0.43 J | 1.5 J | 0.8 J | 0.81 J |
| Cobalt | SEP SUM | 4 | 0.69 J | 2.5 | 2.8 | 4.6 | 4.5 | 4.8 | 3 | 6.7 | 4 | 5.1 |
| Cobalt | SEP TOTAL | 4.2 J | 0.87 J | 2.5 J | 3.2 | 4.8 J | 4.7 J | 5.2 J | 3.2 | 6.1 | 4.3 | 4.5 J |
| Iron | Total Metal Result | 4900 | 1500 | 4400 | 2600 | 3400 | 6800 | 7900 | 3700 | 5800 | 5900 | 5600 |
| Iron | SEP Step 1 | 26 U | 24 U | 23 U | 23 U | 26 U | 22 U | 24 U | 22 U | 24 U | 24 U | 24 U |
| Iron | SEP Step 2 | 260 J | 31 J | 61 J | 29 J | 190 J | 130 J | 200 J | 99 J | 280 J | 160 J | 140 J |
| Iron | SEP Step 3 | 950 | 280 | 710 | 150 | 600 | 590 | 2600 | 470 | 740 | 700 | 1200 |
| Iron | SEP Step 4 | 1100 | 770 | 1700 | 1100 | 1000 | 1200 | 1100 | 830 | 1400 | 1500 | 1400 |
| Iron | SEP Step 5 | 98 UJ | 90 UJ | 88 UJ | 87 UJ | 96 UJ | 83 UJ | 89 UJ | 83 UJ | 91 UJ | 90 UJ | 91 UJ |
| Iron | SEP Step 6 | 2600 | 870 | 2100 | 1500 | 2800 | 3300 | 2600 | 2000 | 3800 | 3300 | 4600 |
| Iron | SEP Step 7 | 1800 | 1300 | 2400 | 2000 | 2900 | 2500 | 2000 | 2100 | 3700 | 2400 | 3100 |
| Iron | SEP SUM | 6700 | 3200 | 7100 | 4700 | 7600 | 7700 | 8500 | 5500 | 9900 | 8100 | 10000 |
| Iron | SEP TOTAL | 6300 | 3400 | 7500 | 5500 | 7000 | 8400 | 8700 | 5700 | 9900 | 8600 | 6800 |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Lead | Total Metal Result | 4.4 | 1.4 | 3.1 | 1.8 | 2.9 | 6.6 J | 3.2 | 2.4 | 4.2 | 3.7 | 3.5 |
| Lead | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Lead | SEP Step 2 | 1.9 J | 1.8 U | 1.8 U | 1.7 U | 0.92 J | 0.85 J | 1.8 U | 0.66 J | 0.86 J | 0.82 J | 0.75 J |
| Lead | SEP Step 3 | 0.66 UJ | 0.61 J | 0.59 UJ | 0.58 UJ | 0.64 UJ | 0.55 UJ | 0.59 UJ | 0.56 UJ | 0.61 UJ | 0.6 UJ | 0.61 UJ |
| Lead | SEP Step 4 | 1.2 | 0.65 | 1.7 | 1.2 | 1.4 | 2.3 | 1.8 | 1.5 | 2.3 | 1.8 | 2 |
| Lead | SEP Step 5 | 9.8 UJ | 9 UJ | 8.8 UJ | 8.7 UJ | 9.6 UJ | 8.3 UJ | 8.9 UJ | 8.3 UJ | 9.1 UJ | 9 UJ | 9.1 UJ |
| Lead | SEP Step 6 | 1.1 | 0.67 | 0.67 | 0.35 J | 0.78 | 1.8 | 1.1 | 0.72 | 1.6 | 1.3 | 3.4 |
| Lead | SEP Step 7 | 3.2 | 3.1 | 5.3 | 3.2 | 3.5 | 3.3 | 2.5 | 2.6 | 2.8 | 4.7 | 2.9 |
| Lead | SEP SUM | 7.4 | 5 | 7.7 | 4.8 | 6.6 | 8.2 | 5.3 | 5.5 | 7.5 | 8.6 | 9.1 |
| Lead | SEP TOTAL | 7 | 5.7 | 7.4 | 5.6 | 5 | 7.5 J | 4.9 | 5.1 | 6.7 | 5.6 | 6.2 |
| Lithium | Total Metal Result | 4.6 J | 1.4 J | 3.6 J | 2.2 J | 3.3 J | 6.6 J+ | 3.1 J+ | 3.4 J+ | 5.4 J | 5.2 J | 3.5 J |
| Lithium | SEP Step 1 | 13 U | 12 U | 12 U | 12 U | 13 U | 11 U | 12 U | 11 U | 12 U | 12 U | 12 U |
| Lithium | SEP Step 2 | 9.8 U | 9 U | 8.8 U | 8.7 U | 9.6 U | 8.3 U | 8.9 U | 8.3 U | 0.71 J | 0.72 J | 9.1 U |
| Lithium | SEP Step 3 | 3.3 U | 3 U | 2.9 U | 2.9 U | 3.2 U | 2.8 U | 3 U | 2.8 U | 3 U | 3 U | 3 U |
| Lithium | SEP Step 4 | 0.78 J | 0.5 J | 0.81 J | 0.55 J | 0.62 J | 1 J | 0.64 J | 0.71 J | 1.1 J | 1 J | 1.3 J |
| Lithium | SEP Step 5 | 49 U | 45 U | 44 U | 44 U | 48 U | 42 U | 45 U | 42 U | 46 U | 45 U | 46 U |
| Lithium | SEP Step 6 | 2.3 J | 1.1 J | 1.8 J | 1.2 J | 2.2 J | 3 | 1.7 J | 1.9 J | 3.5 | 2.9 J | 2.8 J |
| Lithium | SEP Step 7 | 4.4 | 2.5 J | 3.4 | 2.1 J | 3.8 | 6.1 | 2.6 J | 3.1 | 5.6 | 4.2 | 7.1 |
| Lithium | SEP SUM | 12 | 4.1 | 6 | 3.8 | 11 | 14 | 7.8 | 5.7 | 19 | 18 | 19 |
| Lithium | SEP TOTAL | 8 | 4.2 | 6.8 | 5.4 | 7.5 | 10 | 6 | 7.5 | 11 | 10 | 7.2 |
| Molybdenum | Total Metal Result | 5.1 U | 6.3 | 1.1 U | 1.1 U | 4.7 U | 3.8 J | 4 J | 4.4 U | 0.88 J | 4.7 U | 2.1 J |
| Molybdenum | SEP Step 1 | 10 U | 13 | 9.4 U | 9.3 U | 10 U | 8.9 U | 9.5 U | 8.9 U | 9.8 U | 9.6 U | 9.7 U |
| Molybdenum | SEP Step 2 | 7.9 U | 0.51 J | 7 U | 7 U | 7.7 U | 6.7 U | 7.1 U | 6.7 U | 7.3 U | 7.2 U | 7.3 U |
| Molybdenum | SEP Step 3 | 2.6 U | 1.2 J | 2.3 U | 2.3 U | 2.6 U | 0.51 J | 2.2 J | 0.27 J | 0.59 J | 2.4 U | 0.5 J |
| Molybdenum | SEP Step 4 | 2.6 U | 1.3 J | 2.3 U | 2.3 U | 2.6 U | 0.39 J | 0.63 J | 0.24 J | 0.53 J | 2.4 U | 0.36 J |
| Molybdenum | SEP Step 5 | 39 U | 36 U | 35 U | 35 U | 38 U | 33 U | 36 U | 33 U | 37 U | 36 U | 1.7 J |
| Molybdenum | SEP Step 6 | 2.6 U | 0.13 J | 2.3 U | 2.3 U | 2.6 U | 0.21 J | 0.13 J | 2.2 U | 0.18 J | 0.2 J | 1.5 J |
| Molybdenum | SEP Step 7 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 0.16 J |
| Molybdenum | SEP SUM | 2 U | 16 | 2 U | 2 U | 2 U | 1.1 J | 3 | 0.51 J | 1.3 J | 0.2 J | 4.3 |
| Molybdenum | SEP TOTAL | 0.94 J | 15 | 0.22 J | 0.15 J | 0.54 J | 2.4 | 3.8 | 0.67 J | 2.4 | 0.48 J | 2.4 |

**Table 8: Sequential Extraction Procedure and Total Metal Solids Results**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Sample Location | SB-07B | DA-14 | OW-9 | OW-9 | SB-08B | SB-52B | SB-53B | SB-53B | SB-54B | SB-55B | SB-56B |
| | Sample Start Depth (ft bgs) | 35 | 4 | 10 | 18 | 30 | 35 | 25 | 30 | 30 | 30 | 30 |
| | Sample End Depth (ft bgs) | 37 | 6 | 12 | 20 | 32 | 37 | 27 | 32 | 32 | 32 | 32 |
| | Well Type | Background | Drying Well | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient | Downgradient |
| | Unit | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg | mg/kg |
| Analyte | SEP Step | | | | | | | | | | | |
| Selenium | Total Metal Result | 1.9 U | 4.8 U | 4.6 U | 4.6 U | 0.53 J | 1.6 U | 0.51 J | 0.74 J | 0.68 J | 0.65 J | 1.8 U |
| Selenium | SEP Step 1 | 2.6 U | 2.4 U | 2.3 U | 2.3 U | 2.6 U | 2.2 U | 2.4 U | 2.2 U | 2.4 U | 2.4 U | 2.4 U |
| Selenium | SEP Step 2 | 2 U | 1.8 U | 1.8 U | 1.7 U | 1.9 U | 1.7 U | 1.8 U | 1.7 U | 1.8 UJ | 1.8 UJ | 1.8 UJ |
| Selenium | SEP Step 3 | 0.66 U | 0.6 U | 0.22 J | 0.58 U | 0.64 U | 0.55 U | 0.59 U | 0.56 U | 0.61 U | 0.6 U | 0.61 U |
| Selenium | SEP Step 4 | 1.1 J | 0.6 UJ | 0.6 J+ | 0.75 J+ | 1.3 J | 0.64 J | 0.59 UJ | 0.56 UJ | 0.71 J | 0.6 UJ | 0.59 J |
| Selenium | SEP Step 5 | 9.8 U | 9 U | 8.8 U | 8.7 U | 9.6 U | 8.3 U | 3.3 J | 8.3 U | 9.1 U | 9 U | 9.1 U |
| Selenium | SEP Step 6 | 0.66 U | 0.6 U | 0.59 U | 0.58 U | 0.64 U | 0.55 U | 0.59 U | 0.56 U | 0.61 U | 0.6 U | 0.61 U |
| Selenium | SEP Step 7 | 1.3 U | 0.6 U | 0.59 U | 0.58 U | 1.3 U | 1.1 U | 0.59 U | 0.56 U | 0.74 J | 0.6 U | 1.2 U |
| Selenium | SEP SUM | 2.7 | 0.5 U | 0.82 | 0.75 | 2.5 | 0.64 | 3.3 | 0.5 U | 1.5 | 0.5 U | 0.59 |
| Selenium | SEP TOTAL | 1.3 U | 1.2 U | 0.59 U | 0.58 U | 1.3 U | 1.1 U | 1.2 U | 0.56 U | 0.61 U | 0.24 J | 1.2 U |
| Thallium | Total Metal Result | 4.5 U | 7.2 U | 6.9 U | 6.8 U | 4.1 U | 3.7 u | 4 U | 3.9 U | 4.1 U | 4.1 U | 4.1 U |
| Thallium | SEP Step 1 | 9.2 U | 8.4 U | 8.2 U | 8.2 U | 8.9 U | 7.8 U | 8.3 U | 7.8 U | 8.5 U | 8.4 U | 8.5 U |
| Thallium | SEP Step 2 | 6.9 U | 6.3 U | 6.2 U | 6.1 U | 6.7 U | 5.8 U | 6.2 U | 5.8 U | 6.4 U | 6.3 U | 6.4 U |
| Thallium | SEP Step 3 | 2.3 U | 2.1 U | 2.1 U | 2 U | 2.2 U | 1.9 U | 2.1 U | 1.9 U | 2.1 U | 2.1 U | 2.1 U |
| Thallium | SEP Step 4 | 2.3 U | 2.1 U | 2.1 UJ | 2 UJ | 2.2 U | 1.9 U | 2.1 U | 1.9 U | 2.1 U | 2.1 U | 2.1 U |
| Thallium | SEP Step 5 | 34 UJ | 31 UJ | 31 UJ | 31 UJ | 34 UJ | 29 UJ | 31 UJ | 29 UJ | 32 UJ | 32 UJ | 32 UJ |
| Thallium | SEP Step 6 | 2.3 U | 2.1 U | 2.1 U | 2 U | 2.2 U | 1.9 U | 2.1 U | 1.9 U | 2.1 U | 2.1 U | 2.1 U |
| Thallium | SEP Step 7 | 0.48 J | 2.1 U | 0.62 J | 0.56 J | 1.1 J | 3.9 U | 2.1 U | 1.9 U | 0.97 J | 0.74 J | 1.3 J |
| Thallium | SEP SUM | 0.48 J | 1.8 U | 0.62 J | 0.56 J | 1.4 J | 1.8 U | 1.8 U | 1.8 U | 0.97 J | 0.74 J | 1.3 J |
| Thallium | SEP TOTAL | 0.87 J | 4.2 U | 0.58 J | 0.47 J | 0.9 J | 3.9 U | 4.2 U | 1.9 U | 0.88 J | 0.85 J | 1.3 J |

Notes:
All results displayed in milligram per kilogram (mg/kg).
ft bgs = feet below ground surface
SEP: Sequential Extraction Procedure
Step 1 - Exchangeable Phase: This extraction includes trace elements that are reversibly adsorbed to soil minerals, amorphous solids, and organic material by electrostatic forces.
Step 2 - Carbonate Phase: This extraction targets trace elements that are adsorbed or otherwise bound to carbonate minerals.
Step 3 - Non-Crystalline Materials Phase: This extraction targets trace elements that are complexed by amorphous minerals (e.g. iron).
Step 4 - Metal Hydroxide Phase: This extraction targets trace elements bound to hydroxides of iron, manganese, and/or aluminum.
Step 5 - Organic Phase: This extraction targets trace elements strongly bound via chemisorption to organic material.
Step 6 - Acid/Sulfide Fraction: The extraction is used to identify trace elements precipitated as sulfide minerals.
Step 7 - Residual Fraction: Trace elements remaining in the soil after the previous extractions will be distributed between silicates, phosphates, and refractory oxides.
U= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit.
UJ= The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit, the quantitation limit is considered estimated.
J= The analyte was positively identified. The associated numerical value is the approximate concentration.
J+= The analyte was positively identified. The associated numerical value is the approximate concentration of the analyte in the sample and biased high.
Total Metal Results are the results of the 6010C analysis

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

**Table 9: Predicted Range of COI Concentrations in Assessment Wells Assuming Only Dilution and Dispersion**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Constituent | Units | Site-Specific Groundwater Protection Standard[2] | Health-Based Standard | Maximimum concentration observed in Porewater | Maximum concentration at side-gradient Assessment Wells: | | | | Concentration at Assessment Wells assuming 32%[3] dilution of porewater with maximum concentration measured at: | | | | Concentration at Assessment Wells assuming 63%[4] dilution of porewater with maximum concentration measured at: | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | GAMW-52 | GAMW-52B | GAMW-56 | GAMW-56B | GAMW-52 | GAMW-52B | GAMW-56 | GAMW-56B | GAMW-52 | GAMW-52B | GAMW-56 | GAMW-56B |
| Arsenic | mg/L | 0.091 | 0.010 | 0.012 | 0.0025 | 0.0016 | 0.022 | 0.0025 | 0.0090 | 0.0087 | 0.015 | 0.0090 | 0.0060 | 0.0054 | 0.018 | 0.0060 |
| Boron[1] | mg/L | - | 4.0 | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A | #N/A |
| Cobalt | mg/L | 0.010 | 0.0060 | 0.0022 | 0.00058 | 0.00050 | 0.0084 | 0.00050 | 0.0017 | 0.0017 | 0.0042 | 0.0017 | 0.0012 | 0.0011 | 0.0061 | 0.0011 |
| Lithium | mg/L | 0.040 | 0.040 | 0.016 | 0.0062 | 0.0071 | 0.0053 | 0.0062 | 0.013 | 0.013 | 0.013 | 0.013 | 0.0098 | 0.010 | 0.0093 | 0.0098 |
| Molybdenum | mg/L | 0.10 | 0.10 | 0.81 | 0.0064 | 0.015 | 0.013 | 0.0064 | 0.55 | 0.56 | 0.55 | 0.55 | 0.30 | 0.31 | 0.31 | 0.30 |
| Arsenic | Percentage relative to Groundwater Protection Standard | 100% | - | 13% | 3% | 2% | 24% | 3% | 10% | 10% | 17% | 10% | 7% | 6% | 20% | 7% |
| Boron | | 100% | - | 345% | 80% | 33% | 7% | 80% | 260% | 245% | 237% | 260% | 178% | 148% | 132% | 178% |
| Cobalt | | 100% | - | 22% | 6% | 5% | 84% | 5% | 17% | 17% | 42% | 17% | 12% | 11% | 61% | 11% |
| Lithium | | 100% | - | 40% | 16% | 18% | 13% | 16% | 32% | 33% | 31% | 32% | 25% | 26% | 23% | 25% |
| Molybdenum | | 100% | - | 810% | 6% | 15% | 13% | 6% | 553% | 556% | 555% | 553% | 304% | 309% | 308% | 304% |

**Notes:**
(1) Boron does not have a groundwater protection standard, results are compated to the health-based standard
(2) The groundwater protection standard is equal to the higher of the background tolerance limit and the relevant health-based standard
(3) 32% dilution was minimum dilution predicted in Table 8
(4) 63% dilution was maximum dilution predicted in Table 8
ft = feet
mg/L = milligrams per liter

Prepared by GOL
Checked by PJN
Reviewed by RV

**Table 10: Sorption Site and Surface Area Calculations**
**Monitored Natural Attenuation Evaluation**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Units | Minimum | Mean | Maximum |
|---|---|---|---|---|
| **Ferrihydrite** | | | | |
| Amorphous Iron (Step 3 SEP) + Metal Hydroxide Iron (Step 4 SEP) | Sample Name | SB-18B-32/34 | Mean of all samples | SB-53B-25-27 |
| | ppm of Fe | 1278 | 2006 | 3787 |
| | millimoles of Fe | 22.9 | 35.9 | 67.8 |
| | moles of Fe | 0.0229 | 0.0359 | 0.0678 |
| Specific Surface Area | $m^2/g$ | 600 | | |
| Surface Site Concentration | moles weak sites/ mole of Fe | 0.2 | | |
| Surface Sites | moles of weak sites | 0.00458 | 0.00719 | 0.01356 |
| Mass of Ferrihydrite | g | 2.03 | 3.19 | 6.03 |
| Gibbsite | | | | |
| Amorphous Aluminum (Step 3 SEP) + Metal Hydroxide Aluminum (Step 4 SEP) | Sample Name | SB-53B-30-32 | Mean of all samples | OW-9-10-12 |
| | ppm of Al | 130 | 221 | 408 |
| | millimoles of Al | 4.8 | 8.2 | 15.1 |
| | moles of Al | 0.0048 | 0.0082 | 0.0151 |
| Specific Surface Area | $m^2/g$ | 32 | | |
| Surface Site Concentration | moles weak sites/ mole of Al | 0.41 | | |
| Surface Sites | moles of weak sites | 0.00198 | 0.00335 | 0.00619 |
| Mass of Gibbsite | g | 0.38 | 0.64 | 1.18 |

**Notes:**
ppm = parts per million
$m^2/g$ = meters squared per gram
g = grams

Prepared by: GOL
Checked by: PJN
Reviewed by: RV

# Figures




LEGEND

- Assessment Monitoring Well
- Background Monitoring Well
- Downgradient Monitoring Well
- Downgradient Boring Location
- Porewater Sample Location
- CCR Source Material Sample Location
- Generalized Groundwater Flow Direction
- CCR Units
- Approximate Property Line

NOTE(S)

1. THIS FIGURE DEPICTS THE GENERALIZED GROUNDWATER FLOW DIRECTION WITHIN THE UPPER PORTION OF THE SURFICIAL AQUIFER.

REFERENCE(S)

1. SATELLITE IMAGERY OBTAINED FROM ESRI, MAXAR, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, AND THE GIS USER COMMUNITY.

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

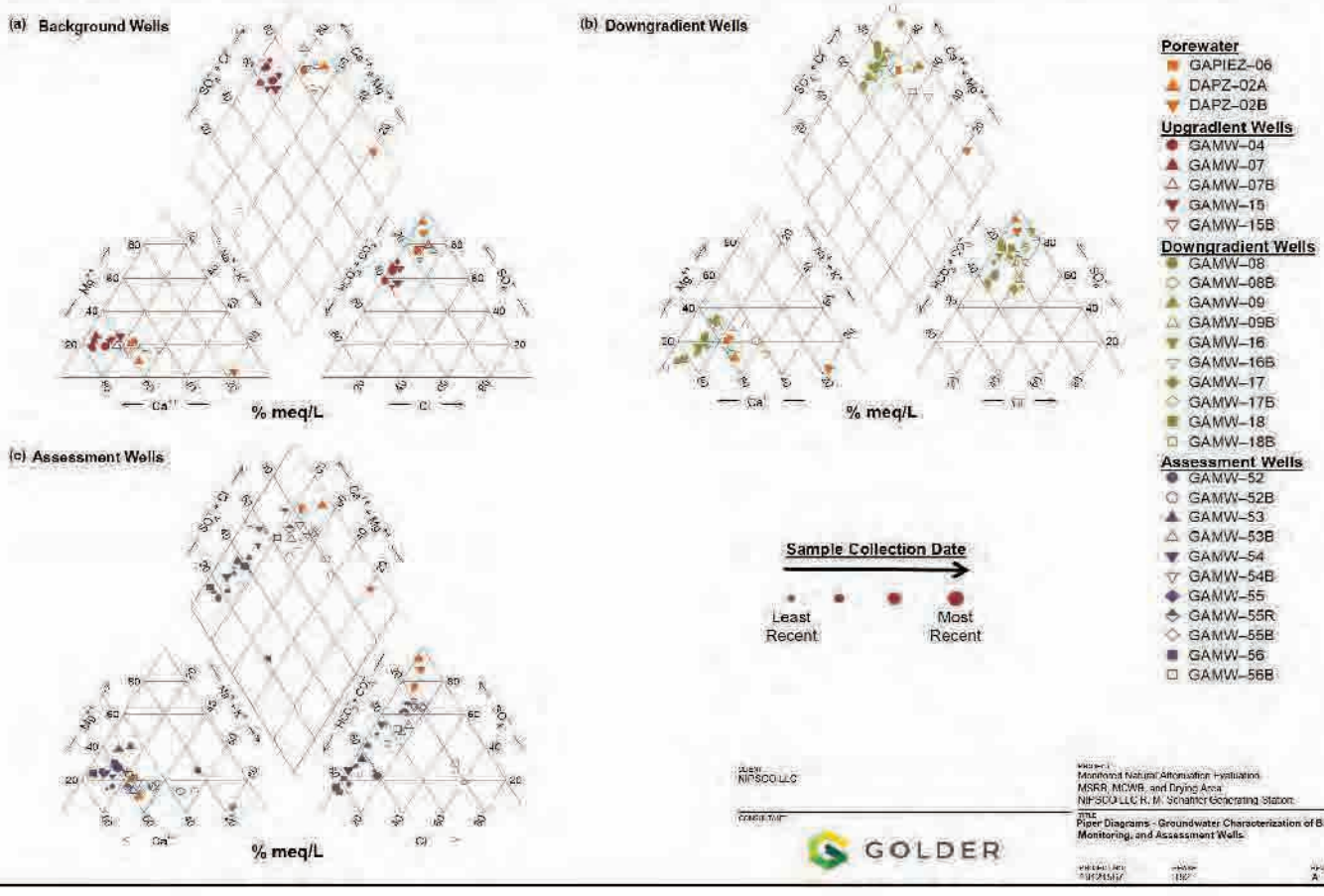
MONITORED NATURAL ATTENUATION EVALUATION
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

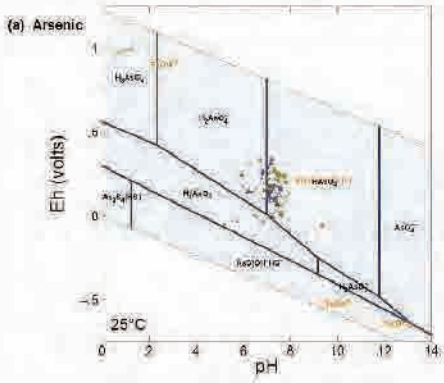
SAMPLE LOCATION MAP

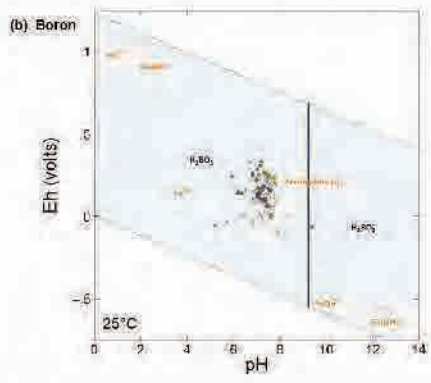
GOLDER

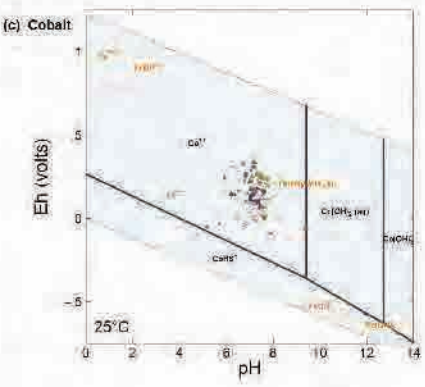
| | |
|---|---|
| DESIGNED | DFS |
| PREPARED | SJB |
| REVIEWED | EAP |
| APPROVED | AMH |

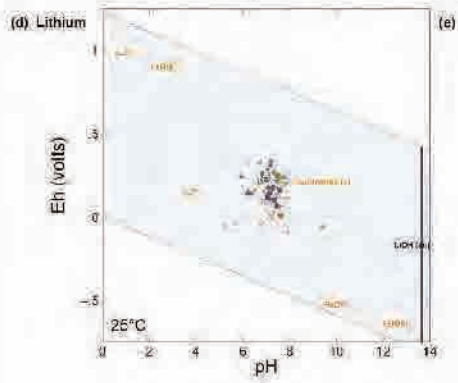
PROJECT NO. 19101587 | CONTROL A | REV. 0 | FIGURE 1

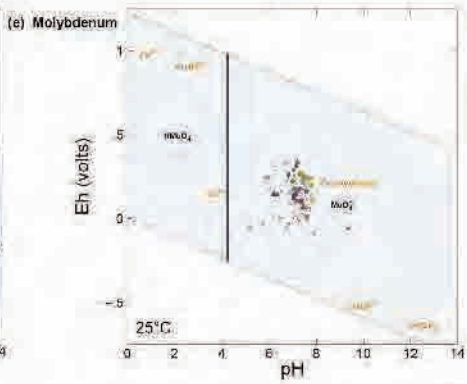

(a) Background Wells
(b) Downgradient Wells
(c) Assessment Wells
% meq/L
% meq/L
% meq/L
Porewater
GAPIEZ-06
DAPZ-02A
DAPZ-02B
Upgradient Wells
GAMW-04
GAMW-07
GAMW-07B
GAMW-15
GAMW-15B
Downgradient Wells
GAMW-08
GAMW-08B
GAMW-09
GAMW-09B
GAMW-16
GAMW-16B
GAMW-17
GAMW-17B
GAMW-18
GAMW-18B
Assessment Wells
GAMW-52
GAMW-52B
GAMW-53
GAMW-53B
GAMW-54
GAMW-54B
GAMW-55
GAMW-55R
GAMW-55B
GAMW-56
GAMW-56B
Sample Collection Date
Least Recent
Most Recent
NIPSCO LLC
GOLDER
Monitored Natural Attenuation Evaluation
MSRR, MCWR, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station
Piper Diagrams - Groundwater Characterization of Background, Monitoring, and Assessment Wells
A
2a-c




**Porewater**
- GAPIEZ–06
- DAPZ–02A
- DAPZ–02B

**Upgradient Wells**
- GAMW–04
- GAMW–07
- GAMW–07B
- GAMW–15
- GAMW–15B

**Downgradient Wells**
- GAMW–08
- GAMW–08B
- GAMW–09
- GAMW–09B
- GAMW–16
- GAMW–16B
- GAMW–17
- GAMW–17B
- GAMW–18
- GAMW–18B

**Assessment Wells**
- GAMW–52
- GAMW–52B
- GAMW–53
- GAMW–53B
- GAMW–54
- GAMW–54B
- GAMW–55
- GAMW–55R
- GAMW–55B
- GAMW–56
- GAMW–56B

**Sample Collection Date**

Least Recent → Most Recent

CLIENT
NRG/SCO LLC

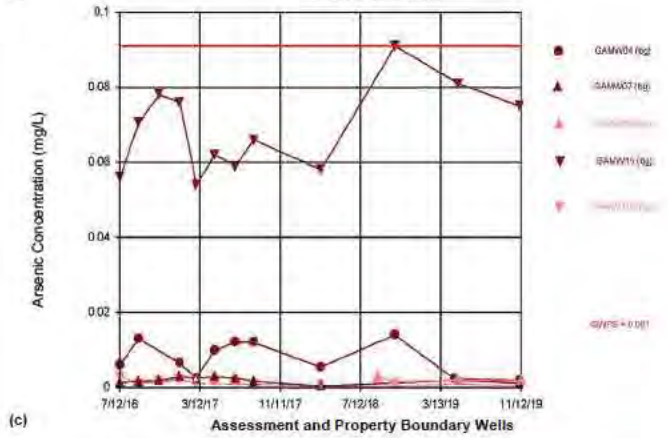
PROJECT
Monitored Natural Attenuation Evaluation
MGWR, MGWR, and Drying Area
NRG/SCO LLC/ R. M. Schahfer Generating Station

TITLE
Pourbaix Diagrams For Arsenic, Boron, Cobalt, Lithium, and Molybdenum

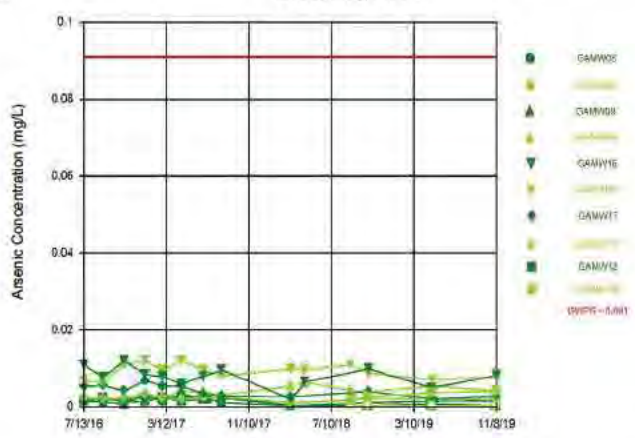
GOLDER

PROJECT NO. 1912165 | REV. 0 | FIG. A | 3a-e

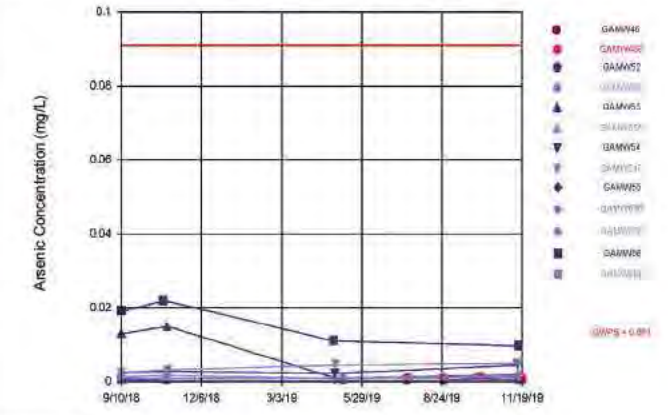
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit.

CLIENT
NIPSCO LLC

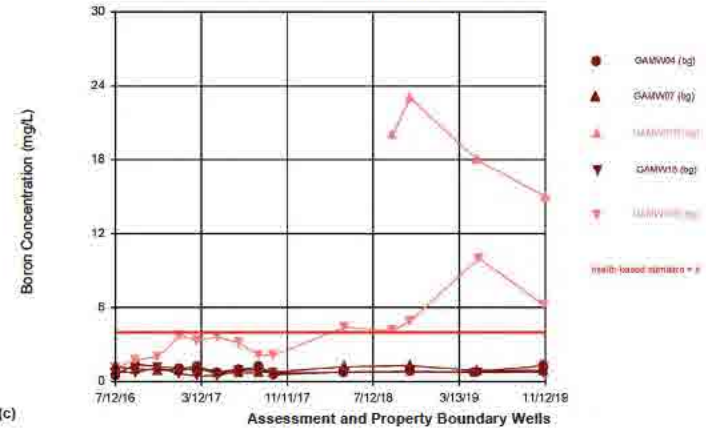
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

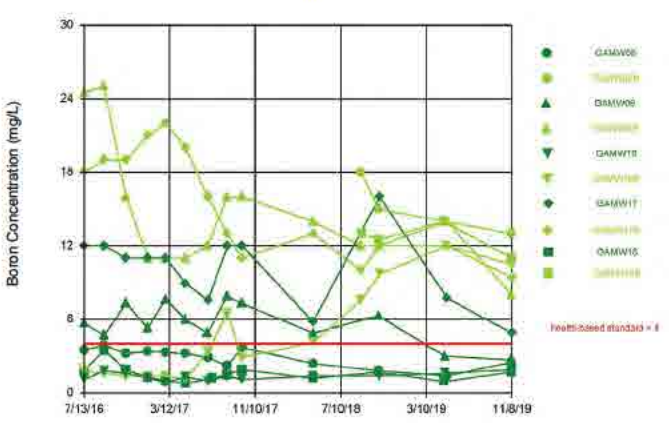
TITLE
Arsenic Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 4a-c |

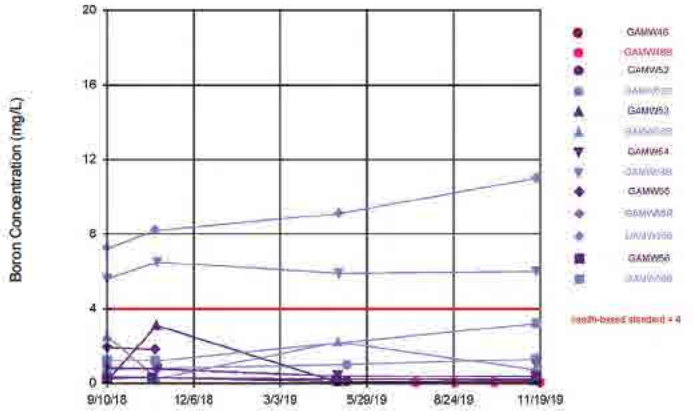
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

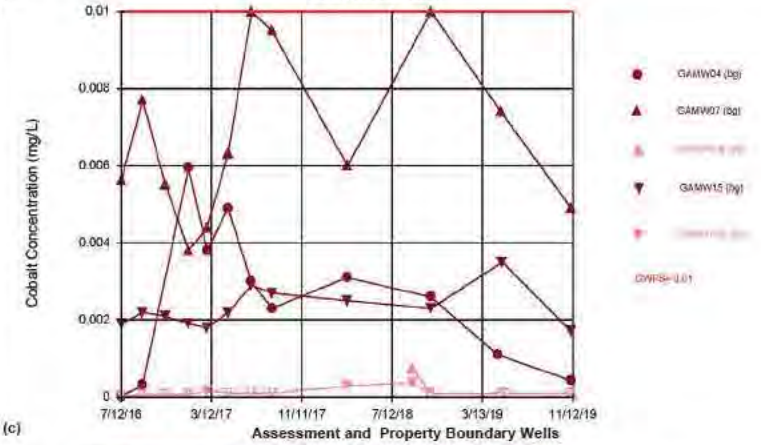
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

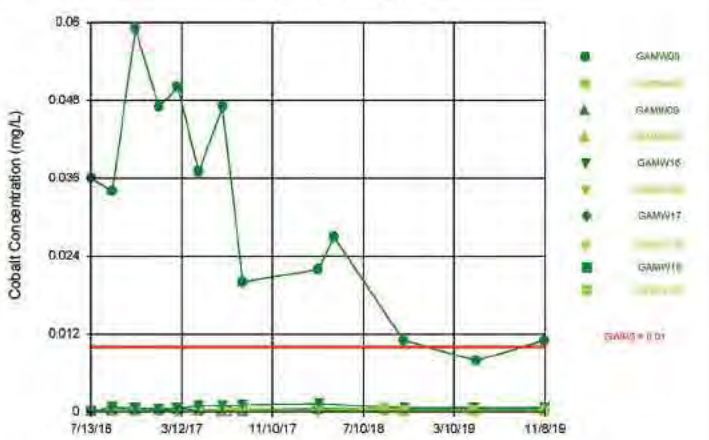
TITLE
Boron Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 192 | A | 5a-c |

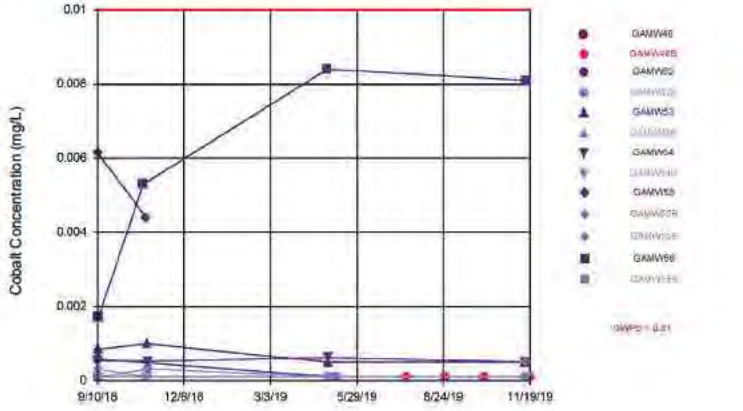
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

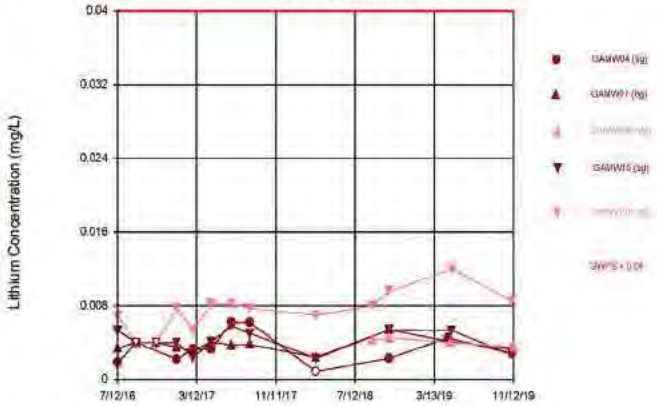
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

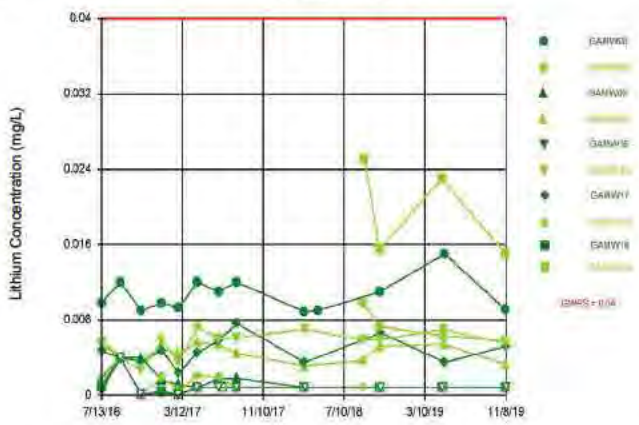
TITLE
Cobalt Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 6a-c |

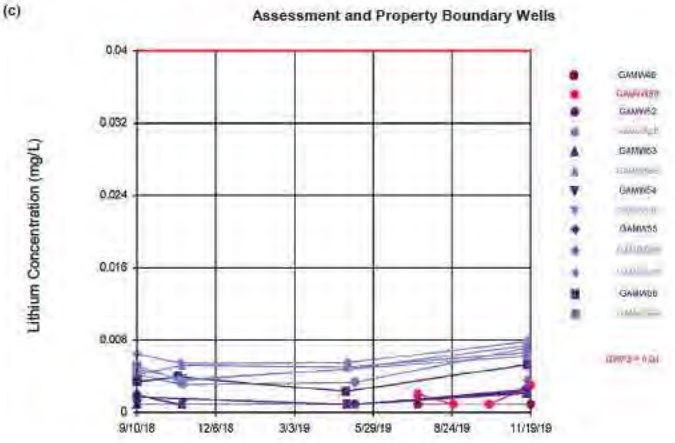
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

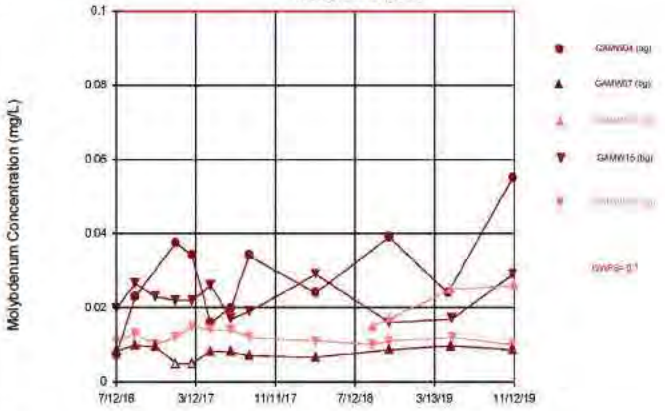
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Lithium Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 7a-c |

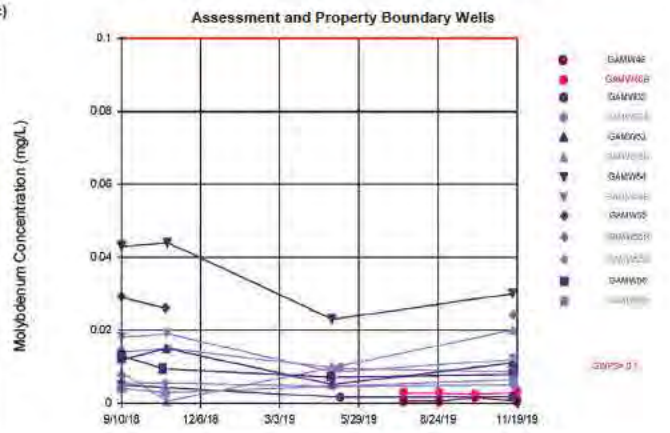
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

CLIENT
NIPSCO LLC

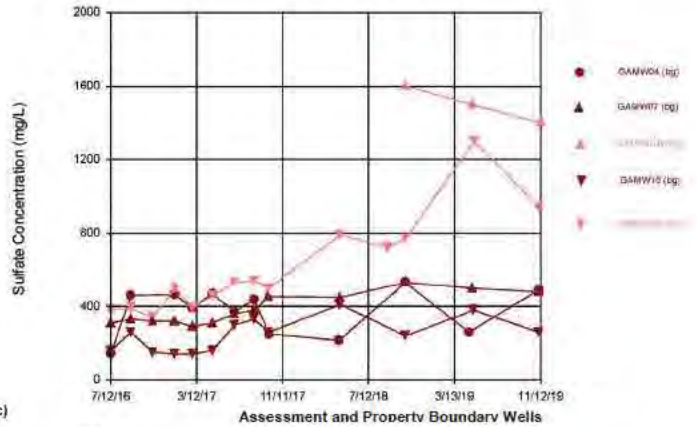
CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

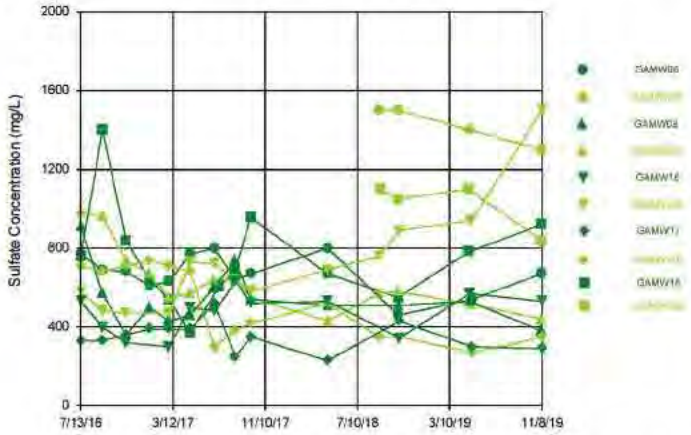
TITLE
**Molybdenum Time Series for Background, Monitoring, and Assessment and Property Boundary Wells**

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 8a-c |

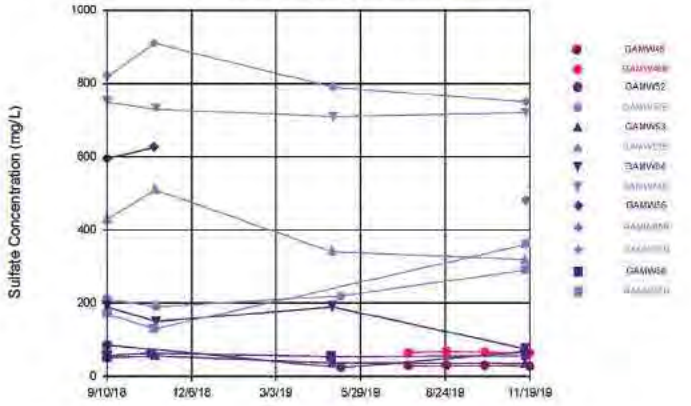
(a)




(b)




(c)




Note: Open symbols reflect sample measurements below the laboratory method detection limit

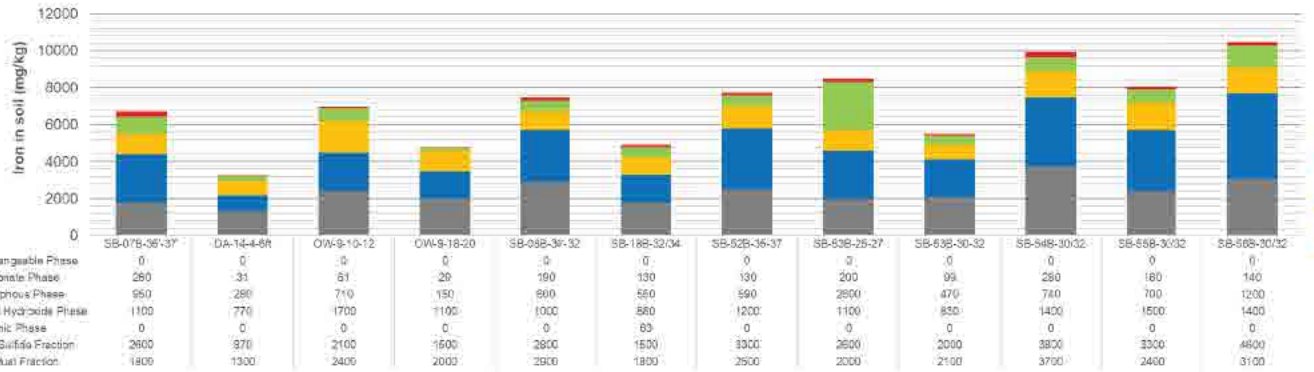
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

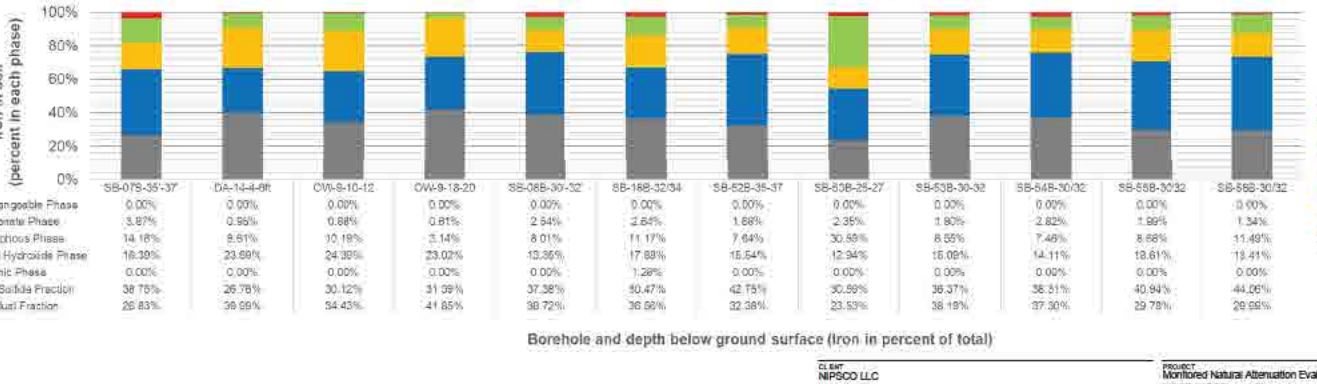
TITLE
Sulfate Time Series for Background, Monitoring, and Assessment and Property Boundary Wells

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 192 | A | 9a-c |




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 260 | 31 | 61 | 29 | 190 | 130 | 130 | 200 | 99 | 280 | 180 | 140 |
| Amorphous Phase | 950 | 280 | 710 | 150 | 660 | 550 | 590 | 2800 | 470 | 740 | 700 | 1200 |
| Metal Hydroxide Phase | 1100 | 770 | 1700 | 1100 | 1000 | 880 | 1200 | 1100 | 850 | 1400 | 1500 | 1400 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 63 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 2600 | 970 | 2100 | 1500 | 2800 | 1500 | 3300 | 2600 | 2000 | 3800 | 3300 | 4600 |
| Residual Fraction | 1800 | 1300 | 2400 | 2000 | 2900 | 1800 | 2500 | 2000 | 2100 | 3700 | 2400 | 3100 |

**Borehole and depth below ground surface (Iron in mg/kg soil)**




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 3.87% | 0.95% | 0.88% | 0.81% | 2.54% | 2.64% | 1.68% | 2.35% | 1.80% | 2.82% | 1.99% | 1.34% |
| Amorphous Phase | 14.16% | 8.61% | 10.19% | 3.14% | 8.81% | 11.17% | 7.64% | 32.93% | 8.55% | 7.46% | 8.68% | 11.49% |
| Metal Hydroxide Phase | 16.39% | 23.69% | 24.39% | 23.02% | 13.36% | 17.88% | 15.54% | 12.94% | 15.09% | 14.11% | 18.61% | 13.41% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 1.28% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 38.75% | 29.78% | 30.12% | 31.39% | 37.38% | 30.47% | 42.75% | 30.59% | 36.37% | 38.31% | 40.94% | 44.06% |
| Residual Fraction | 26.83% | 39.99% | 34.43% | 41.65% | 38.72% | 36.56% | 32.38% | 27.53% | 38.19% | 37.30% | 29.79% | 29.69% |

**Borehole and depth below ground surface (Iron in percent of total)**

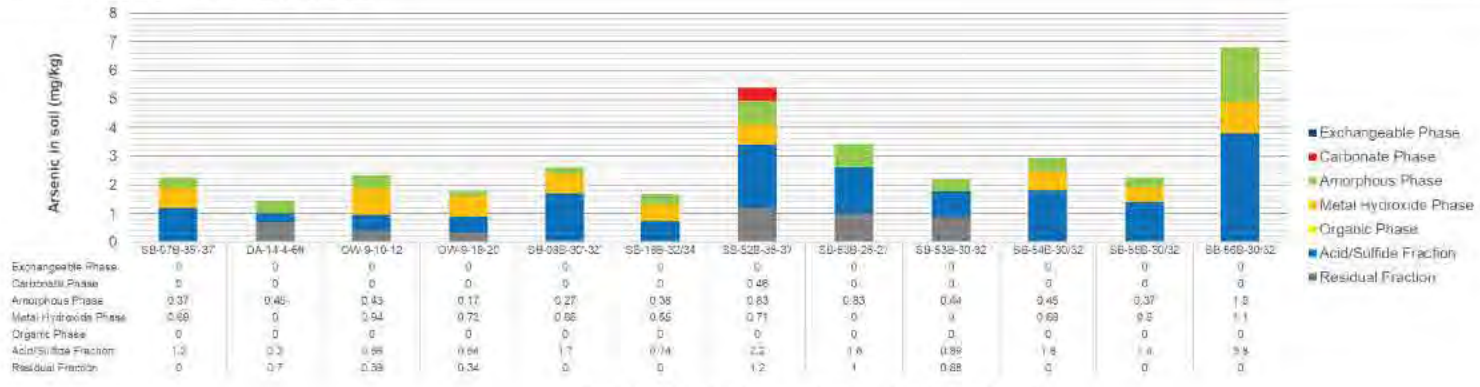
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

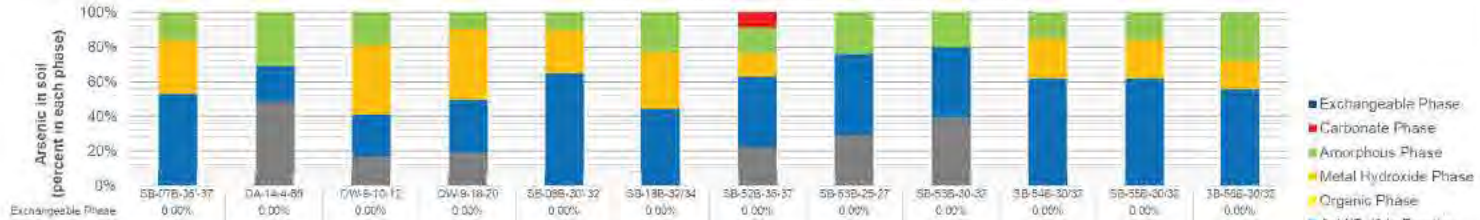
TITLE
Iron Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 192 | A | 10 |




| | SB-07B-35/37 | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30/32 | SB-18B-32/34 | SB-52B-35/37 | SB-53B-25/27 | SB-53B-30/32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0.46 | 0 | 0 | 0 | 0 | 0 |
| Amorphous Phase | 0.37 | 0.46 | 0.43 | 0.17 | 0.27 | 0.38 | 0.83 | 0.83 | 0.64 | 0.45 | 0.37 | 1.9 |
| Metal Hydroxide Phase | 0.69 | 0 | 0.94 | 0.72 | 0.66 | 0.55 | 0.71 | 0 | 0 | 0.69 | 0.5 | 1.1 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 1.2 | 0.3 | 0.88 | 0.84 | 1.7 | 0.74 | 2.2 | 1.6 | 0.89 | 1.8 | 1.4 | 3.5 |
| Residual Fraction | 0 | 0.7 | 0.39 | 0.34 | 0 | 0 | 1.2 | 1 | 0.88 | 0 | 0 | 0 |

Borehole and depth below ground surface (Arsenic in mg/kg soil)




| | SB-07B-35/37 | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30/32 | SB-18B-32/34 | SB-52B-35/37 | SB-53B-25/27 | SB-53B-30/32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 8.52% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 16.37% | 31.03% | 18.53% | 9.55% | 10.27% | 22.75% | 15.37% | 24.20% | 19.91% | 16.36% | 16.30% | 27.94% |
| Metal Hydroxide Phase | 30.53% | 0.00% | 40.52% | 41.01% | 25.10% | 32.93% | 13.15% | 0.00% | 0.00% | 25.21% | 22.03% | 16.18% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 53.10% | 20.69% | 24.14% | 30.34% | 64.64% | 44.31% | 40.74% | 46.65% | 40.27% | 61.43% | 61.67% | 55.88% |
| Residual Fraction | 0.00% | 48.28% | 18.81% | 19.10% | 0.00% | 0.00% | 22.22% | 29.15% | 39.82% | 0.00% | 0.00% | 0.00% |

Borehole and depth below ground surface (Arsenic in percent of total)

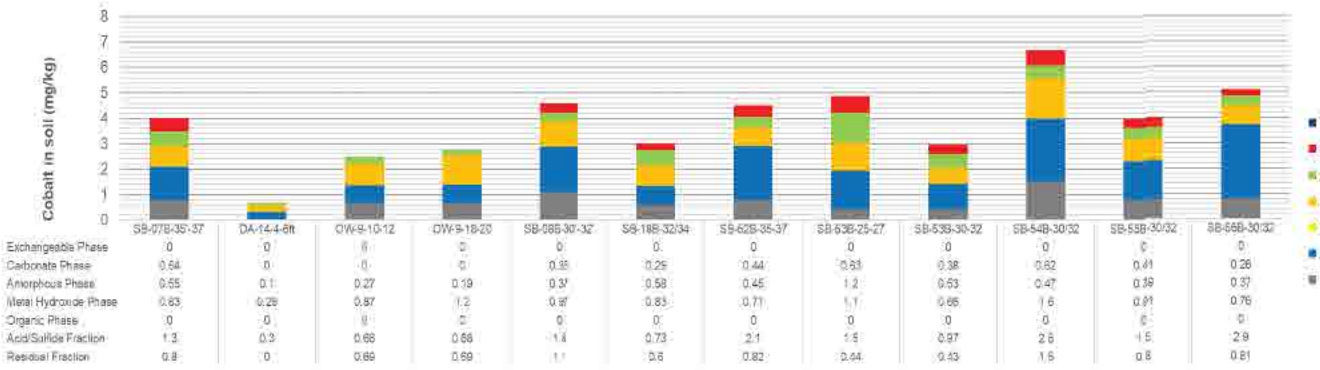
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

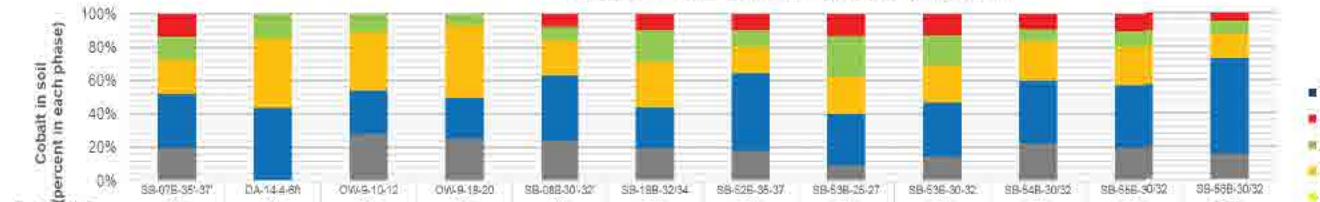
TITLE
Arsenic Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 11 |




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32' | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-55B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0.64 | 0 | 0 | 0 | 0.35 | 0.25 | 0.44 | 0.83 | 0.38 | 0.62 | 0.41 | 0.26 |
| Amorphous Phase | 0.55 | 0.1 | 0.27 | 0.19 | 0.3' | 0.58 | 0.45 | 1.2 | 0.53 | 0.47 | 0.39 | 0.37 |
| Metal Hydroxide Phase | 0.83 | 0.29 | 0.87 | 1.2 | 0.9' | 0.83 | 0.71 | 1.1 | 0.66 | 1.6 | 0.91 | 0.76 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 1.3 | 0.3 | 0.68 | 0.56 | 1.4 | 0.73 | 2.1 | 1.5 | 0.97 | 2.6 | 1.5 | 2.9 |
| Residual Fraction | 0.8 | 0 | 0.69 | 0.69 | 1.1 | 0.6 | 0.82 | 0.64 | 0.43 | 1.5 | 0.8 | 0.81 |

Borehole and depth below ground surface (Cobalt in mg/kg soil)




| | SB-07B-35'-37' | DA-14-4-6ft | OW-9-10-12 | OW-9-18-20 | SB-08B-30'-32' | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-55B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 13.43% | 0.00% | 0.60% | 0.60% | 7.65% | 9.57% | 9.75% | 12.94% | 12.79% | 9.27% | 10.22% | 6.10% |
| Amorphous Phase | 13.68% | 14.49% | 10.84% | 6.88% | 8.06% | 19.14% | 9.96% | 24.64% | 17.85% | 7.03% | 9.73% | 7.25% |
| Metal Hydroxide Phase | 20.85% | 42.03% | 34.94% | 43.48% | 21.13% | 27.39% | 15.71% | 22.59% | 22.22% | 23.92% | 22.69% | 14.90% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 32.34% | 43.48% | 26.51% | 24.64% | 39.22% | 24.09% | 46.48% | 30.80% | 32.66% | 37.37% | 37.41% | 56.86% |
| Residual Fraction | 19.90% | 0.00% | 27.71% | 25.00% | 23.97% | 18.80% | 18.14% | 9.03% | 14.48% | 22.42% | 19.95% | 15.88% |

Borehole and depth below ground surface (Cobalt in percent of total)

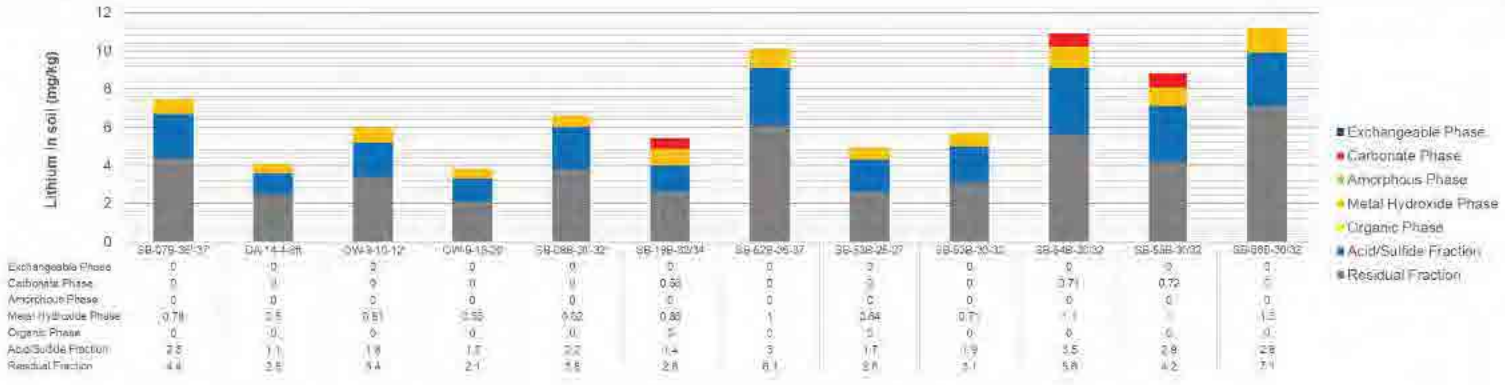
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

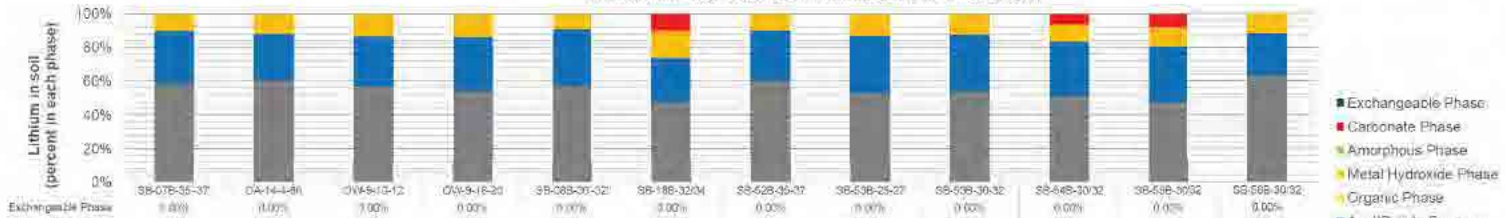
TITLE
Cobalt Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 192 | A | 12 |




| | SB-07B-35-37 | DA-14-4-6ft | OW9-10-12 | OW9-18-20 | SB-08B-30-32 | SB-19B-32/34 | SB-62B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-64B-30/32 | SB-59B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0 | 0 | 0 | 0 | 0.56 | 0 | 0 | 0 | 0.71 | 0.72 | 0 |
| Amorphous Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Metal Hydroxide Phase | 0.78 | 0.5 | 0.51 | 0.55 | 0.52 | 0.89 | 1 | 0.84 | 0.71 | 1.1 | 1 | 1.3 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Acid/Sulfide Fraction | 2.8 | 1.1 | 1.8 | 1.5 | 2.2 | 1.4 | 3 | 1.7 | 1.9 | 3.5 | 2.8 | 2.8 |
| Residual Fraction | 4.4 | 2.5 | 3.4 | 2.1 | 3.8 | 2.8 | 6.1 | 2.8 | 3.1 | 5.8 | 4.2 | 3.1 |

Borehole and depth below ground surface (Lithium in mg/kg soil)




| | SB-07B-35-37 | DA-14-4-6ft | OW9-10-12 | OW9-18-20 | SB-08B-30-32 | SB-19B-32/34 | SB-62B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-64B-30/32 | SB-59B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 10.33% | 0.00% | 0.00% | 0.00% | 6.51% | 8.16% | 0.00% |
| Amorphous Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Metal Hydroxide Phase | 10.43% | 12.20% | 13.48% | 14.29% | 9.37% | 16.67% | 9.90% | 12.86% | 12.43% | 10.09% | 11.34% | 11.61% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Acid/Sulfide Fraction | 30.75% | 26.83% | 25.35% | 31.17% | 32.23% | 25.83% | 29.70% | 34.41% | 33.21% | 32.08% | 32.68% | 29.00% |
| Residual Fraction | 58.82% | 60.98% | 56.67% | 54.55% | 57.40% | 47.07% | 60.40% | 52.63% | 54.29% | 51.33% | 47.02% | 59.39% |

Borehole and depth below ground surface (Lithium in percent of total)

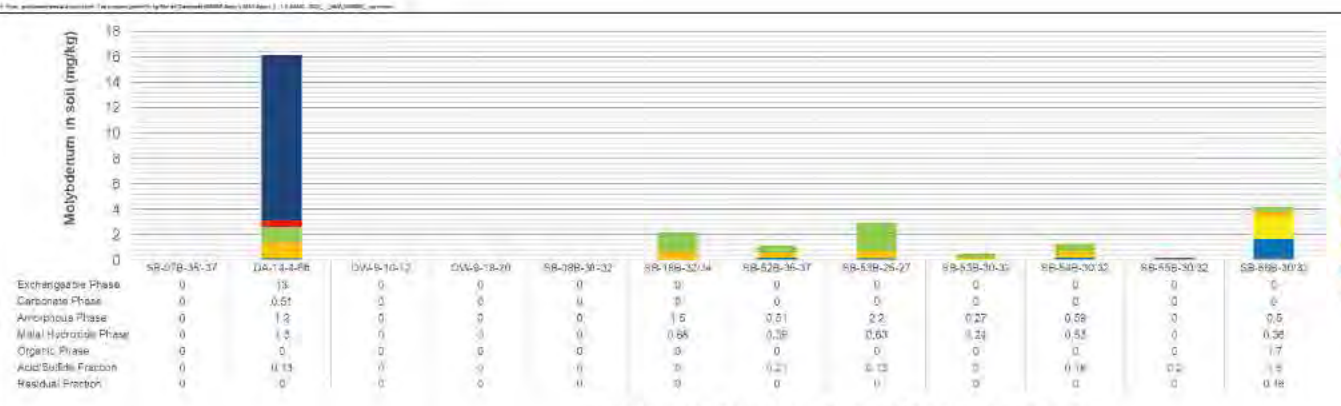
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

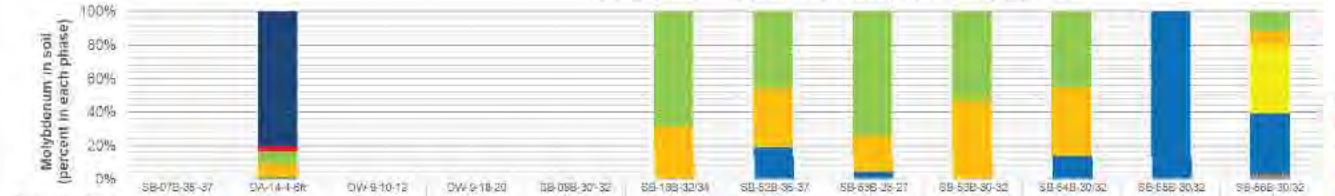
TITLE
Lithium Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 13 |




| | SB-07B-35-37 | DA-14-4-5R | OW-9-10-12 | OW-9-18-20 | SB-09B-30-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Carbonate Phase | 0 | 0.51 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Amorphous Phase | 0 | 1.2 | 0 | 0 | 0 | 1.5 | 0.51 | 2.2 | 0.27 | 0.89 | 0 | 0.5 |
| Metal Hydroxide Phase | 0 | 1.5 | 0 | 0 | 0 | 0.68 | 0.39 | 0.63 | 0.24 | 0.53 | 0 | 0.36 |
| Organic Phase | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 |
| Acid/Sulfide Fraction | 0 | 0.13 | 0 | 0 | 0 | 0 | 0.21 | 0.13 | 0 | 0.19 | 0.2 | 1.5 |
| Residual Fraction | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.18 |

Borehole and depth below ground surface (Molybdenum in mg/kg soil)




| | SB-07B-35-37 | DA-14-4-5R | OW-9-10-12 | OW-9-18-20 | SB-09B-30-32 | SB-18B-32/34 | SB-52B-35-37 | SB-53B-25-27 | SB-53B-30-32 | SB-54B-30/32 | SB-55B-30/32 | SB-56B-30/32 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Exchangeable Phase | 0.00% | 80.65% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Carbonate Phase | 0.00% | 3.16% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% |
| Amorphous Phase | 0.00% | 7.43% | 0.00% | 0.00% | 0.00% | 68.81% | 45.95% | 74.32% | 52.94% | 45.39% | 0.00% | 11.65% |
| Metal Hydroxide Phase | 0.00% | 9.05% | 0.00% | 0.00% | 0.00% | 31.19% | 35.14% | 21.28% | 47.06% | 40.77% | 0.00% | 8.53% |
| Organic Phase | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 40.28% |
| Acid/Sulfide Fraction | 0.00% | 0.81% | 0.00% | 0.00% | 0.00% | 0.00% | 18.92% | 4.39% | 0.00% | 13.85% | 100.00% | 35.85% |
| Residual Fraction | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 0.00% | 3.79% |

Borehole and depth below ground surface (Molybdenum in percent of total)

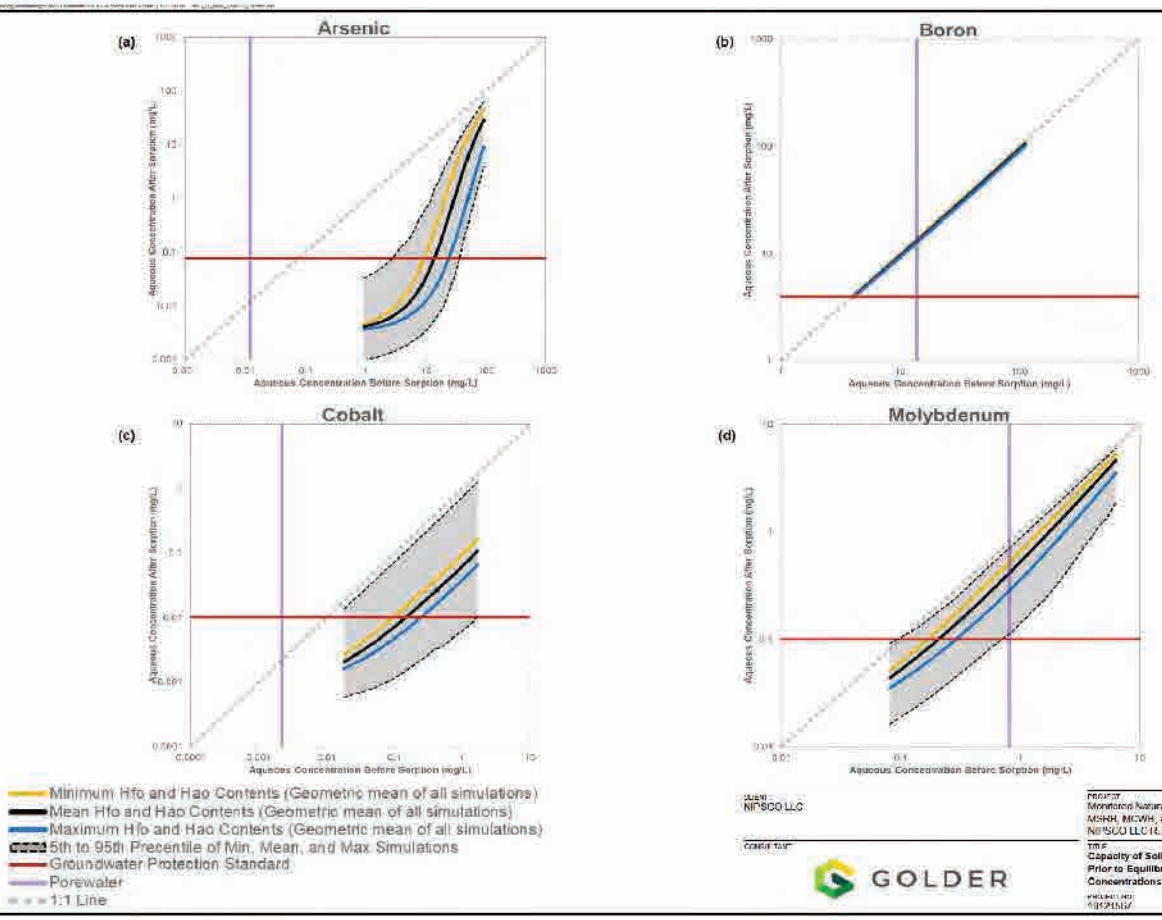
CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSRB, MCWB, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Molybdenum Sequential Extraction Results

| PROJECT NO. | PHASE | REV. | FIGURE |
|---|---|---|---|
| 19121567 | 152 | A | 14 |



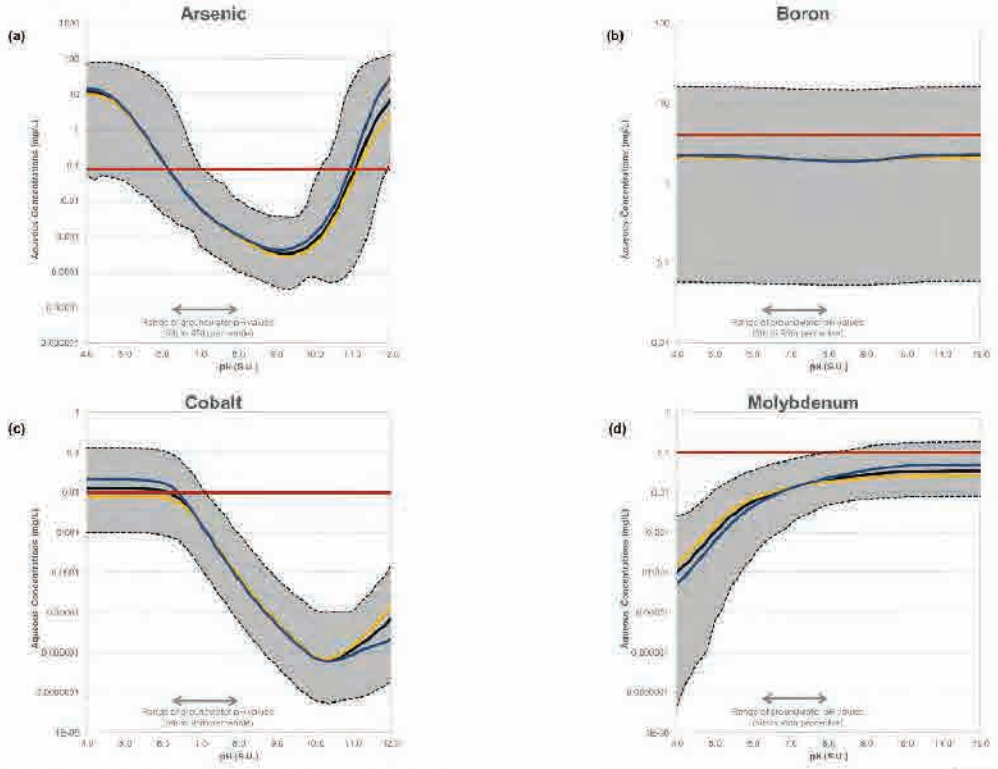

CLIENT
NRGCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWH, MCWH, and Haying Area
NRGCO LLC R. M. Schahfer Generating Station

TITLE
Capacity of Soils to Adsorb Constituents: Aqueous Concentrations Prior to Equilibrating with Hfo and Hao versus Aqueous Concentrations After Equilibrating

PROJECT NO. 19121557 | PHASE 150 | REV. A | FIGURE 15




Minimum Hfo and Hao Contents (Geometric mean of all simulations)
Mean Hfo and Hao Contents (Geometric mean of all simulations)
Maximum Hfo and Hao Contents (Geometric mean of all simulations)
5th to 95th Precentile of Min, Mean, and Max Simulations
Groundwater Protection Standard

CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IBCWF, and Haying Area
NIPSCO LLC R. M. Schahfer Generating Station

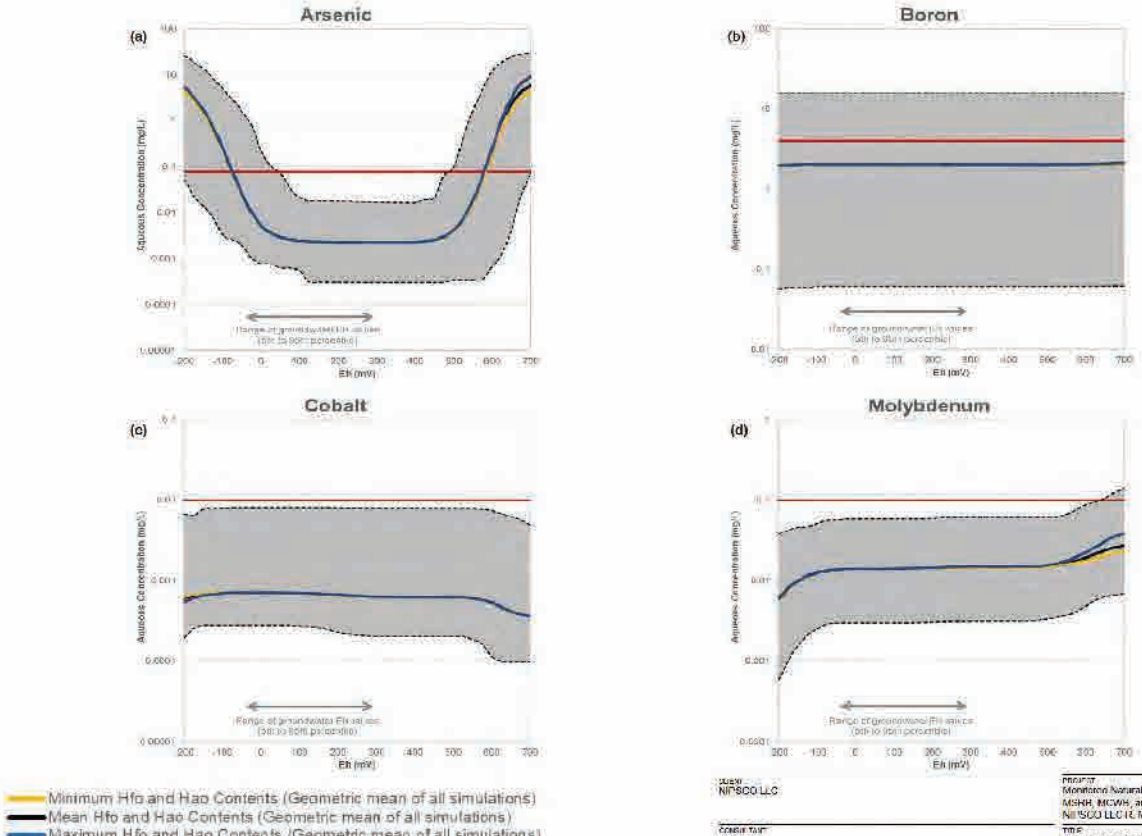
TITLE
Stability of Adsorbed Constituents Versus pH

PROJECT NO.
19121567

PHASE
150

REV.
A

FIGURE
16




CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, IBCWF, and Haying Area
NIPSCO LLC R. M. Schahfer Generating Station

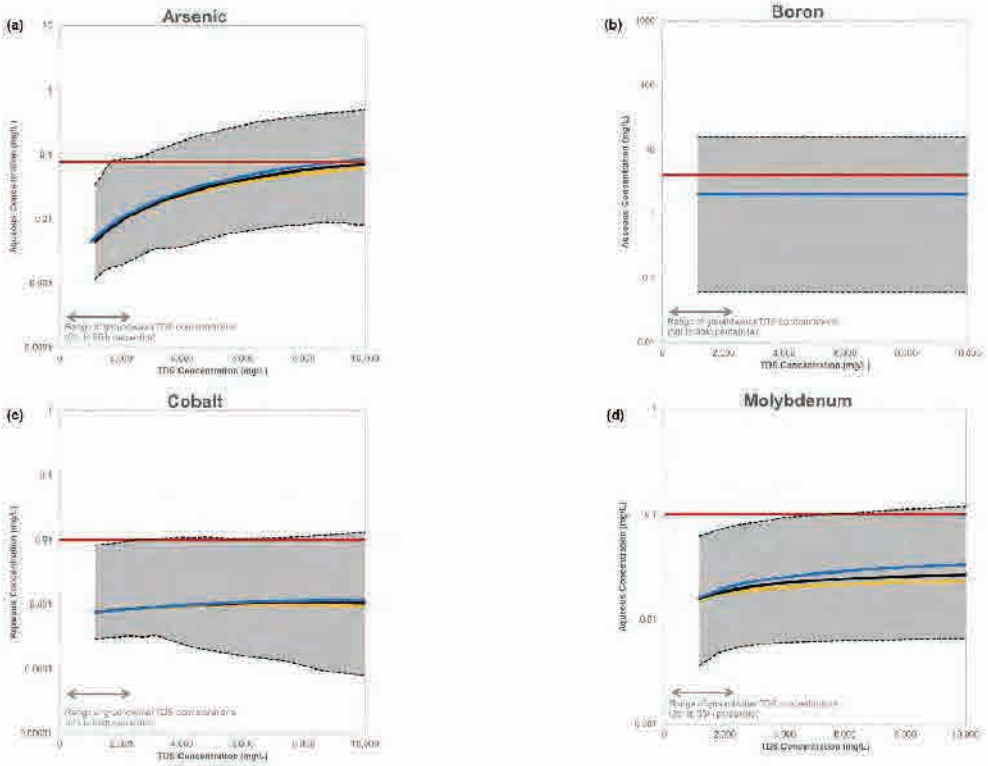
TITLE
Stability of Adsorbed Constituents Versus Eh

PROJECT NO.
1912150

PHASE
150

REV.
A

FIGURE
17




CLIENT
NIPSCO LLC

CONSULTANT
GOLDER

PROJECT
Monitored Natural Attenuation Evaluation
MSWF, MCWF, and Drying Area
NIPSCO LLC R. M. Schahfer Generating Station

TITLE
Stability of Adsorbed Constituents Versus TDS

PROJECT NO.
1912150

PHASE
150

REV.
A

FIGURE
18

APPENDIX A

# Groundwater and Porewater Monitoring Data

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW04 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-12 | 2016-09-08 | 2016-11-09 | 2017-01-10 | | 2017-03-01 | 2017-04-26 | 2017-06-28 | 2017-08-22 | 2017-10-04 | 2018-03-13 | | 2018-04-20 | | 2018-10-25 | 2019-04-23 | 2019-11-07 |
| Samp e Type | | N | N | N | FD | N | N | N | N | N | N | FD | N | FD | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.48 | 1.4 | 2.4 | 1.1 | 1 | 1.2 | 0.74 | 0.92 | 1.2 | 0.54 | | | 0.74 | 0.72 | 0.78 | 0.74 | 1 3 |
| Ca cium | mg/L | 110 | 230 | 300 | 270 | 240 | 230 | 220 | 200 | 200 | 140 | | | 140 | 140 | 210 | 130 | 190 |
| Ch oride | mg/L | 2.2 | 27 | 69 | 13 | 14 | 13 | 5.4 | 12 | 13 | 4.5 | | | 3.7 J | 4.4 | 10 | 3.7 | 9 5 |
| Fluoride | mg/L | 0.92 J | 0 2 J | 10 U | 0.19 J | 0.17 J | 5 U | 5 U | 0.19 J | 0.21 J | 0.24 J | 0.15 J | 5 U | 5 U | 0.17 J- | 0.26 | 0.16 J | 0.23 |
| pH | SU | 7.22 | 6.83 | 6.75 | | 6.93 | 7 01 | 6.76 | 6.88 | 7.21 | 7.28 | | 6.95 | | 7 2 | 6.39 | 7 | 7.14 |
| Su fate | mg/L | 140 J- | 460 | 480 | 460 | 470 | 390 | 470 | 370 | 440 | 250 | | | 220 | 210 | 530 | 260 | 490 |
| Total Dissolved Solids | mg/L | 420 | 990 | 1400 | 1000 | 1000 | 890 | 870 | 880 | 920 | 610 | | | 580 J | 580 | 980 | 600 | 900 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.00027 J | 0.002 U | 0.00057 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | | | 0.002 U | 0.00065 J | 0.00092 J |
| Arsenic | mg/L | 0 0059 | 0.013 | 0.0052 | 0.0058 | 0.0072 | 0.005 U | 0.0099 | 0.012 | 0.012 | | 0.004 J | 0.0054 | | | 0.014 | 0.0023 J | 0.0018 J |
| Barium | mg/L | 0.041 | 0.077 | 0.11 | 0.095 | 0.079 | 0.089 | 0.069 | 0.084 | 0.09 | | 0.11 | 0.077 | | | 0.074 | 0.068 | 0.066 |
| Beryllium | mg/L | 0 00027 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.00048 J | 0.00053 J | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.00036 J | 0.00036 J | 0.0052 J | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.0011 J | 0.0012 J | | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00031 J | 0.00064 J | 0.0061 | 0.0058 | 0.0038 | 0.0049 | 0.003 | 0.0023 | | 0.0028 | 0.0031 | | | 0.0026 | 0.0011 | 0.00043 J |
| Fluoride | mg/L | 0.92 J | 0 2 J | 10 U | 0.19 J | 0.17 J | 5 U | 5 U | 0.19 J | 0.21 J | 0.24 J | 0.15 J | 5 U | 5 U | 0.17 J- | 0.26 | 0.16 J | 0.23 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0018 J | 0.008 U | 0.008 U | 0.0021 J | 0.0023 J | 0.0033 J | 0.0033 J | 0.0062 J | 0.0062 J | | 0.008 U | 0 008 U | | | 0.0023 J | 0.0045 J | 0.0028 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | 0.0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.0075 J | 0.023 | 0.073 | 0.037 | 0.038 | 0.034 | 0.016 | 0 02 | 0.034 | | 0.0048 J | 0.024 | | | 0.039 | 0.024 | 0.055 |
| Radium Total | pci/L | 5 U | 0.583 | 0.697 | 0.804 | 0.515 U | 0.362 U | 0.379 U | 0.364 U | 0.352 U | | 1.35 J | 0.778 J | | | 0.473 | 0.591 | |
| Radium-226 | pci/L | 1 U | 0.138 U | 0.346 U | 0.301 U | 0.242 U | 0.121 U | 0.117 U | 0.119 J | 0.118 | | 0.177 | 0.0881 | | | 0.306 | 0.311 U | |
| Radium-228 | pci/L | 1 U | 0.498 U | 0.495 U | 0.677 J | 0.515 U | 0.362 U | 0.379 U | 0.364 U | 0.352 U | | 1.17 J | 0.69 J | | | 0.462 U | 0.405 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.00064 J | 0.0017 J | 0.0021 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | | 0.001 J | 0.001 J | | | 0.005 U | 0.0013 J | 0.0052 |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0 001 U | | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | | 230 | 190 | 270 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | | 6.9 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | | 3.1 J | | |
| Iron | mg/L | | | | | | | | | | | | | | | | 2.3 | 0.083 J |
| Magnesium | mg/L | | | | | | | | | | | | | | | 31 | 18 | 31 |
| Manganese | mg/L | | | | | | | | | | | | | | | | 0.012 J- | 0.0078 J |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | 0.39 | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | | 0.9 | 0.31 U | 0.31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | | 3.3 J | 3.1 J | 3.2 J |
| Sodium | mg/L | | | | | | | | | | | | | | | 13 | 12 | 36 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.09 | 0.58 | 0.37 | | 1.82 | 1.47 | 0.12 | 0.3 | 0.52 | 0.09 | | 0.66 | | 2 3 | 0.15 | 7.08 | 2.55 |
| Oxidation Reduction Potent al | mV | 59.6 | -24 | -6.9 | | -31.7 | 14 | -57.8 | -45 | -27 | -105.8 | | -181.8 | | -81 2 | -58.1 | 19 | -60.7 |
| Eh | mV | 259.6 | 176.0 | 193.1 | | 168.3 | 214.0 | 142.2 | 155.0 | 173.0 | 94.2 | | 18.2 | | 118.8 | 141.9 | 219.0 | 139.3 |
| pH | SU | 7.22 | 6.83 | 6.75 | | 6.93 | 7.01 | 6.76 | 6.88 | 7.21 | 7.28 | | 6.95 | | 7 2 | 6.39 | 7 | 7.14 |
| Spec f c Conductance | uS/cm | 595 | 1345 | 1681 | | 1109 | 910 | 1137 | 911 | 1153 | 813 | | 562 | | 770 | 1311 | 549 | 866 |
| Temperature | deg C | 13 | 17.3 | 16.3 | | 10.5 | 8 05 | 10.2 | 13.1 | 15.9 | 16.1 | | 7.55 | | 3 5 | 15.5 | 4.2 | 13.2 |
| Turb dity | NTU | 4.04 | 1.48 | 2.21 | | 2.28 | 4 26 | 4 04 | 4.88 | 1.65 | 0.51 | | 4.92 | | 3.12 | 1.92 | 4.48 | 1.38 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW07 | | | | | | | | | | | | | | | GAMW07B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-12 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-06-29 | 2017-08-23 | 2017-10-03 | | 2018-03-15 | 2018-04-23 | 2018-10-26 | 2019-05-02 | 2019-11-08 | 2018-09-06 | 2018-10-26 | 2019-05-02 | 2019-11-12 |
| Samp e Type | | N | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.2 | 1 | 0.91 | 0.91 | 1 | 0.68 | 0.67 | 0.68 | 0.71 | 0.72 | | 1.2 | 1.3 | 0.85 | 0.85 | 20 | 23 | 18 | 15 |
| Ca cium | mg/L | 170 | 190 | 200 | 170 | 170 | 190 | 220 | 190 | 220 | 220 | | 210 | 230 | 220 | 180 | 370 | 430 | 380 | 400 |
| Ch oride | mg/L | 7.8 | 6.6 | 5.3 | 6 | 7 6 | 2.8 | 3 J | 3.2 J | 3 J | 3 6 J | | 4.7 J | 6 3 | 6 5 | 4.8 | 10 U | 250 | 170 | 150 |
| Fluoride | mg/L | 0.72 J | 0.91 J | 0.8 J | 0.85 J | 0.66 J | 0.76 J | 0.79 J | 0.66 J | 1.1 J | 0.93 J | 0.58 J | 0.57 J | 0.73 | 0.97 | 0.88 | 10 U | 1.5 | 1.3 | 1.2 |
| pH | SU | 7.03 | 7.27 | 7.04 | 7.15 | 7.2 | 7.17 | 6.57 | 7.2 | | 7.1 | 7.28 | 7.35 | 5.71 | 7.2 | 7.44 | 8.29 | 6.78 | 7.58 | 7.13 |
| Su fate | mg/L | 310 J- | 330 | 320 | 320 | 290 | 310 | 360 | 380 | 460 | 450 | | 450 | 530 | 500 | 480 | 10 U | 1600 | 1500 | 1400 |
| Total Dissolved Solids | mg/L | 770 | 830 | 840 | 750 | 710 | 810 | 970 | 910 | 970 | 1000 | | 900 | 970 | 1100 | 940 | 2700 | 2600 | 920 | 2300 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 00035 J | 0.00039 J | 0.00035 J | 0.00028 J | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0013 J | 0.0016 J | 0.0018 J | 0.0028 J | 0.005 U | 0.0028 J | 0 0025 J | 0.0016 J | | | 0.005 U | | 0.0012 J | 0.0019 J | 0.0011 J | 0.0028 J | 0.0015 J | 0.0019 J | 0.0017 J |
| Barium | mg/L | 0.052 | 0.055 | 0.056 | 0.042 | 0.05 | 0.05 | 0.059 | 0.059 | | | 0.056 | | 0.064 | 0 053 | 0.043 | 0.072 | 0.063 | 0.053 | 0.043 |
| Beryllium | mg/L | 0 00011 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 0003 J | 0.00022 J | | | 0.001 U | | 0.00047 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.00047 J | 0.00046 J | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0 0056 | 0.0077 | 0.0055 | 0.0038 | 0.0044 | 0.0063 | 0.01 | 0.0095 | | | 0.006 | | 0.01 | 0.0074 | 0.0049 | 0.00074 J | 0 001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 0.72 J | 0.91 J | 0.8 J | 0.85 J | 0.66 J | 0.76 J | 0.79 J | 0.66 J | 1.1 J | 0.93 J | 0.58 J | 0.57 J | 0.73 | 0.97 | 0.88 | 10 U | 1.5 | 1.3 | 1.2 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.0007 J | | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0034 J | 0.008 U | 0.008 U | 0.0035 J | 0.0031 J | 0.0041 J | 0 0037 J | 0.0038 J | | | 0.0024 J | | 0.0054 J | 0.0041 J | 0.0033 J | 0.0043 J | 0.0045 J | 0.004 J | 0.0035 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U |
| Molybdenum | mg/L | 0.0084 J | 0.0098 J | 0.0095 J | 0.01 U | 0.01 U | 0.0083 J | 0 0081 J | 0.007 J | | | 0.0066 J | | 0.0087 J | 0.0097 J | 0.0087 J | 0.015 | 0.017 | 0.025 | 0.026 |
| Radium Total | pci/L | 1 59 | 0.696 | 0.548 | 0.412 U | 0.42 U | 0.371 U | 0.45 | 0.588 | | | 0.749 J | | 0.823 J | 0.37 U | | 2.63 | 2 6 J | 2.31 | |
| Radium-226 | pci/L | 0.667 J | 0.289 | 0.374 | 0.237 U | 0.186 | 0.155 | 0.232 J | 0.3 | | | 0.163 | | 0.483 J | 0.305 U | | 1.16 | 1.56 J | 1.17 | |
| Radium-228 | pci/L | 0.923 | 0.406 | 0.462 U | 0.412 U | 0.42 U | 0.371 U | 0 262 U | 0.413 U | | | 0.585 J | | 0.365 U | 0.37 U | | 1.47 | 1.04 | 1 14 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.003 J | 0.003 J | 0.005 U | 0.008 | 0.0054 | 0.005 | | | 0.0028 J | | 0.0016 J | 0.0045 J | 0 0019 J | 0.0012 J | 0 005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0 00011 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | | 0.001 U | | 0.00024 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | 180 | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | 5 U | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | 5 U | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 260 | 270 | 250 | 180 | 180 | 170 | 170 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 0.035 J | | | 6.7 J | 6.8 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 0.05 UJ | | | 0.1 R | 1.1 J | | |
| Iron | mg/L | | | | | | | | | | | | | | 0.067 J | 0.09 J | | | 5.3 | 5.5 |
| Magnesium | mg/L | | | | | | | | | | | | | 39 | 41 | 38 | 72 | 87 | 73 | 72 |
| Manganese | mg/L | | | | | | | | | | | | | | 0.46 | 0.61 | | | 0.46 | 0.49 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 3.3 | 1.6 | 0.05 R | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | 0.05 R | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.53 | | | | 0.049 J | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 0.31 U | 0.31 U | 0.31 U | 0.031 U | 0.31 U | 0.31 U | 0.31 U |
| Potassium | mg/L | | | | | | | | | | | | | 6.6 | 5.5 | 6.5 | 12 | 13 | 13 | 13 |
| Sodium | mg/L | | | | | | | | | | | | | 14 | 14 | 9.9 | 290 | 240 | 230 | 120 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.6 | 1.81 | 0.59 | 0.52 | 0.51 | 1.96 | 1.02 | 0 84 | | 0.48 | 0.8 | 3.52 | 2.64 | 0.81 | 0.38 | 0.13 | 0.67 | 0.19 | 0.2 |
| Oxidation Reduction Potential | mV | 111.2 | 64.2 | -6.4 | 71.3 | 65.3 | 76.9 | 291.1 | 8.5 | | 95.4 | -55 | -98.7 | -233.3 | 135.1 | -131.8 | -197.6 | -230.2 | 34.9 | -196.7 |
| Eh | mV | 311.2 | 264.2 | 193.6 | 271.3 | 265.3 | 276.9 | 491.1 | 208.5 | | 295.4 | 145.0 | 101.3 | -33.3 | 335 1 | 68.2 | 2.4 | -30.2 | 234.9 | 3.3 |
| pH | SU | 7.03 | 7.27 | 7.04 | 7.15 | 7.2 | 7.17 | 6.57 | 7.2 | | 7.1 | 7.28 | 7.35 | 5.71 | 7.2 | 7.44 | 8.29 | 6.78 | 7.58 | 7.13 |
| Spec f c Conductance | uS/cm | 966 | 1072 | 1106 | 928 | 832 | 1121 | 1151 | 1157 | | 1273 | 760 | 1060 | 1240 | 975 | 828 | 5178 | 3237 | 2357 | 1686 |
| Temperature | deg C | 14.4 | 19.2 | 16.7 | 12.9 | 10.63 | 11.8 | 14.6 | 16.5 | | 18 | 10 | 10 | 16.95 | 10.3 | 15.3 | 15.03 | 13.86 | 12.4 | 12.9 |
| Turb dity | NTU | 4.6 | 4.51 | 1.26 | 3.2 | 4.76 | 2.17 | 2.87 | 0.9 | | 0.49 | 1.3 | 1.75 | 1.08 | 2.72 | 4.58 | 4.48 | 3.01 | 2.86 | 1.11 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW08 | | | | | | | | | | | | | | GAMW08B | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-04 | 2018-03-14 | 2018-04-23 | 2018-10-26 | 2019-05-08 | 2019-11-07 | 2018-09-07 | | 2018-10-26 | | 2019-05-03 | 2019-11-07 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | FD | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 3.5 | 3.9 | 3.2 | 3.4 | 3 3 | 3.2 | 2.9 | 2.2 | 3.7 | | 2.4 | 1.8 | 1.4 | 2 5 | | 18 | | 15 | 14 | 13 |
| Ca cium | mg/L | 310 | 310 | 300 | 260 | 270 | 310 | 340 | 270 | 290 | | 360 | 230 | 250 | 280 | | 380 | | 370 | 350 | 340 |
| Ch oride | mg/L | 88 | 71 | 89 | 99 | 110 | 86 | 83 | 39 | 87 | | 64 | 56 | 49 | 66 | | 240 | | 180 | 160 | 180 |
| Fluoride | mg/L | 1 J | 1 2 J | 0.73 J | 0.87 J | 0.94 J | 0.92 J | 1.3 J | 2 J | 0.68 J | 1 2 J | 1.3 J- | 1.6 | 2 2 | 1.9 | | 1.6 J | | 1.5 | 1.9 | 1.7 |
| pH | SU | 6.92 | 7.03 | 6.85 | 7.02 | 7.09 | 6.93 | 7 | 7 27 | 6 89 | 7.41 | 7.41 | 6.99 | 7.37 | 7.5 | | 7.7 | | 7.45 | 7.57 | 7.85 |
| Su fate | mg/L | 770 J- | 690 | 680 | 610 | 630 | 770 | 800 | 640 | 670 | | 800 | 460 | 540 | 670 | | 1500 | | 1500 | 1400 | 1300 |
| Total Dissolved Solids | mg/L | 1600 | 1500 | 1600 | 1300 | 1400 | 1700 | 2000 | 1400 | 1500 | | 1700 | 1100 | 1300 | 1300 | | 1900 J | | 2300 | 2300 | 2200 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 00073 J | 0.00069 J | 0.0014 J | 0.00041 J | 0.00043 J | 0 002 U | 0.00059 J | 0.00075 J | | 0.002 U | | 0.00082 J | 0.00076 J | 0.00077 J | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0018 J | 0.0019 J | 0.0018 J | 0.0027 J | 0.0016 J | 0.0031 J | 0 0027 J | 0.0023 J | | 0.005 U | | 0.0011 J | 0.0015 J | 0.0016 J | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U |
| Barium | mg/L | 0.068 | 0.065 | 0.065 | 0.05 | 0 055 | 0.064 | 0.074 | 0.077 | | 0.066 | 0.069 | 0.053 | 0.058 | 0.066 | | 0.042 | | 0.03 | 0 025 | 0 023 |
| Beryllium | mg/L | 0 00017 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.0004 J | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 7.4E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.00037 J | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.00029 J | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.036 | 0.034 | 0.059 | 0.047 | 0.05 | 0.037 | 0.047 | 0.02 | | 0.022 | 0.027 | 0.011 | 0.0079 | 0.011 | | 0.00066 J | | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 1 J | 1 2 J | 0.73 J | 0.87 J | 0.94 J | 0.92 J | 1.3 J | 2 J | 0.68 J | 1 2 J | 1.3 J- | 1.6 | 2 2 | 1.9 | | 1.6 J | | 1.5 | 1.9 | 1.7 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0 0098 | 0.012 | 0.009 | 0.0098 | 0.0093 | 0.012 | 0.011 | 0.012 | | 0 0089 | 0 009 | 0.011 | 0.015 | 0.0091 | | 0.0098 | | 0.0073 J | 0.0063 J | 0.0058 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.034 | 0.036 | 0.024 | 0.02 | 0 019 | 0.038 | 0.049 | 0.083 | | 0.058 | 0.058 | 0.059 | 0.08 | 0.068 | | 0.037 | | 0.039 | 0 057 | 0 044 |
| Radium Total | pci/L | 1 07 | 1 08 | 1.09 | 0.581 | 0.777 | 0.632 | 1.11 | 0.762 | | 1.13 J | 0.99 | 1 J | 0.473 | | | 1.67 J | | 1 02 J | 0 704 | |
| Radium-226 | pci/L | 0.501 J | 0.469 | 0.557 | 0.375 | 0 368 | 0.383 | 0 613 J | 0.591 | | 0.267 | 0.437 | 0.582 J | 0.312 U | | | 1.09 J | | 0.596 J | 0.438 | |
| Radium-228 | pci/L | 1 U | 0.609 | 0.533 | 0.43 U | 0.423 U | 0 365 U | 0.499 | 0.341 U | | 0.865 J | 0.552 | 0.423 | 0.456 U | | | 0.579 | | 0.454 U | 0.518 U | |
| Selenium | mg/L | 0.005 U | 0.0065 | 0.0033 J | 0.0014 J | 0.0032 J | 0.011 | 0.0088 | 0.0081 | | 0.024 | 0.022 | 0.0021 J | 0.016 | 0.0036 J | | 0 0014 J | | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.00045 J | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | 160 | 160 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | 350 | 380 | 380 | 160 | 160 | 160 | 160 | 130 | 160 |
| Ferr c Iron | mg/L | | | | | | | | | | | | 0.083 J | | | 6.1 J | 6.9 J | 6 5 | 6.2 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | 0.05 UJ | | | 0.1 R | 0.1 R | 0.79 J | 0.98 J | | |
| Iron | mg/L | | | | | | | | | | | | | 0.2 U | 0.2 U | | | | | 5.6 | 5.1 |
| Magnesium | mg/L | | | | | | | | | | | | 44 | 53 | 56 | 58 | 66 | 63 | 62 | 45 | 42 |
| Manganese | mg/L | | | | | | | | | | | | | 0.22 | 0.37 | | | | | 0.49 | 0.45 |
| Nitrate as N | mg/L | | | | | | | | | | | | | 7.7 | 0.25 | 0 05 R | 0.05 R | | | 0.075 J | 0.43 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | 0 05 R | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | 0.06 | | | | | 0.05 U | 0 05 U | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | 0.31 U | 0.15 J | 0.11 J- | 0.028 J | 0.031 U | 0.31 U | 0 31 U | 0.31 U | 0.19 J- |
| Potassium | mg/L | | | | | | | | | | | | 12 | 13 | 12 | 5.6 | 6.4 | 5 5 | 5.5 | 5.6 | 5.3 |
| Sodium | mg/L | | | | | | | | | | | | 45 | 45 | 51 | 260 | 300 | 200 | 200 | 240 | 200 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 1.9 | 0.38 | 1.62 | 1.27 | 0.96 | 0.63 | 1.96 | 0.93 | 0 21 | 0.97 | 5.09 | 0.21 | 0.44 | 4.2 | | 0.42 | | 0.12 | 0.13 | 2.61 |
| Oxidation Reduction Potential | mV | 159.7 | 64.6 | -8 | 58.4 | 49.9 | 60.4 | 242.5 | 61.9 | -15.9 | 110.1 | -106.4 | 27.7 | 62.2 | 44.1 | | -185.5 | | -67 | 7.9 | -67 |
| Eh | mV | 359.7 | 264.6 | 192.0 | 258.4 | 249.9 | 260.4 | 442.5 | 261.9 | 184.1 | 310.1 | 93.6 | 227.7 | 262.2 | 244.1 | | 14.5 | 200.0 | 133.0 | 207.9 | 133.0 |
| pH | SU | 6.92 | 7.03 | 6.85 | 7.02 | 7.09 | 6.93 | 7 | 7.27 | 6 89 | 7.41 | 7.41 | 6.99 | 7.37 | 7.5 | | 7.7 | | 7.45 | 7.57 | 7.85 |
| Spec f c Conductance | uS/cm | 1925 | 1807 | 1664 | 1517 | 1494 | 2098 | 1834 | 1713 | 1840 | 1121 | 1732 | 1440 | 1102 | 1322 | | 2538 | | 2375 | 2190 | 1896 |
| Temperature | deg C | 15 5 | 18.78 | 17.75 | 12.2 | 10.06 | 11.1 | 15.8 | 18.5 | 18.3 | 9.6 | 10.2 | 17.2 | 11 | 10.84 | | 14.6 | | 14.5 | 12.8 | 8.05 |
| Turb dity | NTU | 2.3 | 3.22 | 0.58 | 1.26 | 1.56 | 1.1 | 2.41 | 0 68 | 4 38 | 1.11 | 1.54 | 1.4 | 1.81 | 0.31 | | 3.4 | | 1.63 | 1.72 | 2.89 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW09 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | | 2017-04-26 | | 2017-06-28 | 2017-08-23 | 2017-10-03 | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-05-02 | | 2019-11-07 |
| Samp e Type | | N | N | N | N | FD | N | FD | N | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 5.7 | 4.7 | 7.3 | 5.3 | 7.7 | 7.6 | 5.9 | 6.1 | 4.9 | 7.9 | 7.3 | | 4.9 | 6.3 | 3 | 3 | 2.7 |
| Ca cium | mg/L | 320 | 240 | 210 | 210 | 200 | 200 | 220 | 240 | 270 | 280 | 220 | | 220 | 220 | 200 | 200 | 150 |
| Ch oride | mg/L | 63 | 55 | 58 | 58 | 75 | 73 | 71 | 67 | 53 | 39 | 64 | | 58 | 82 | 46 | 46 | 39 |
| Fluoride | mg/L | 0.15 J | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0 16 J | 0.13 J | 0.18 J | 2 J | 0.21 J | 5 U | 0.26 J- | 0.28 | 0.27 | 0 27 | 0.33 |
| pH | SU | 7.27 | 7.25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7.31 | 7.3 | 7.28 | 6.87 | 6 88 | | 7.1 | 7.06 |
| Su fate | mg/L | 910 J- | 570 | 360 | 500 | 440 | 420 | 460 | 460 | 600 | 740 | 540 | | 510 | 510 J- | 530 | 530 | 380 |
| Total Dissolved Solids | mg/L | 1500 | 1100 | 880 | 980 | 1000 | 990 | 1000 | 960 | 1300 | 1400 | 1100 | | 930 | 1100 | 970 | 980 | 770 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0015 J | 0.0013 J | 0.00076 J | 0.0031 J | 0.005 U | 0 005 U | 0.0028 J | 0.0029 J | 0.002 J | 0.0027 J | | 0 005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Barium | mg/L | 0.059 | 0.043 | 0.036 | 0.039 | 0.035 | 0.037 | 0.039 | 0.042 | 0 047 | 0.054 | | 0.041 | 0.039 | 0.039 | 0.041 | 0.041 | 0.036 |
| Beryllium | mg/L | 0 00012 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00036 J | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.00092 J | 0.00058 J | 0.00052 J | 0.00049 J |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.00033 J | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0 0036 | 0.002 U | 0.00062 J | 0.0013 J | 0.002 U | 0 002 U | 0.002 U | 0 002 U | 0.0011 J | 0.0015 J | | 0 0016 J | | 0.002 U | 0.0012 J | 0.0012 J | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00018 J | 0.0002 J | 0.0002 J | 0.001 U | 0 001 U | 0.00029 J | 0.00025 J | 0.001 U | 0.001 U | | 0 001 U | | 0.00038 J | 0.00049 J | 0.00055 J | 0.00035 J |
| Fluoride | mg/L | 0.15 J | 10 U | 10 U | 0.22 J | 0.13 J | 0.14 J | 0 16 J | 0.13 J | 0.18 J | 2 J | 0.21 J | 5 U | 0.26 J- | 0.28 | 0.27 | 0 27 | 0.33 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0019 J | 0.008 U | 0.008 U | 0.0016 J | 0.0011 J | 0 0012 J | 0.008 U | 0 008 U | 0.0017 J | 0.0018 J | | 0 008 U | | 0.008 U | 0.008 U | 0.008 U | 0.008 U |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.02 | 0.017 | 0.029 | 0.023 | 0.027 | 0.027 | 0.021 | 0.021 | 0 028 | 0 032 | | 0.025 | 0.035 | 0.04 | 0.043 | 0.043 | 0.035 |
| Radium Total | pci/L | 1.5 | 0.568 | 0.477 U | 0.467 U | 0.55 | 0.469 | 0.593 | 0.414 | 0 707 | 0 803 | | 1.45 J | 0.096 | 0.679 | 0.505 | 0.427 U | |
| Radium-226 | pci/L | 0.506 J | 0.231 | 0.397 U | 0.257 | 0.134 | 0.166 | 0.194 | 0.205 | 0.255 J | 0 357 | | 0.188 | 0.204 | 0.446 | 0.33 | 0.355 U | |
| Radium-228 | pci/L | 0.994 | 0.349 U | 0.477 U | 0.467 U | 0.427 U | 0.432 U | 0.398 | 0.36 U | 0.452 | 0.446 | | 1.26 J | -0.108 | 0.361 U | 0.428 U | 0.427 U | |
| Selenium | mg/L | 0.014 | 0.0091 | 0.0049 J | 0.011 | 0.014 | 0.014 | 0.019 | 0.02 | 0 013 | 0 027 | | 0.0082 | 0.011 | 0 0098 | 0.012 | 0.012 | 0.0077 |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | 150 | 110 | 100 | 110 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | 0.042 J | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | 0.05 UJ | | | |
| Iron | mg/L | | | | | | | | | | | | | | | 0.027 J | 0.038 J | 0.037 J |
| Magnesium | mg/L | | | | | | | | | | | | | | 21 | 21 | 19 | 16 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.011 J | 0.013 J | 0.0083 J |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | 5 6 | 5.6 | 7.1 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 1.4 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | 0.31 U | 0.31 U | 0.31 U | 0.31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | 9 | 7 2 | 7.1 | 5.6 |
| Sodium | mg/L | | | | | | | | | | | | | | 38 | 35 | 33 | 28 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 3.59 | 6.69 | 1.98 | 6.1 | | 3.41 | | 3.92 | 5.27 | 3.24 | 5.98 | 6.71 | 5.43 | 0 22 | | 5.82 | 5.54 |
| Oxidation Reduction Potential | mV | -1.4 | 75.7 | 27.6 | 236 | | 90.5 | | 152.6 | 280.8 | 58.9 | 139.5 | -116.3 | -90.8 | -48.8 | | 53.6 | -25.7 |
| Eh | mV | 198.6 | 275.7 | 227.6 | 436.0 | | 290.5 | | 352.6 | 480.8 | 258.9 | 339.5 | 83.7 | 109.2 | 151.2 | | 253.6 | 174 3 |
| pH | SU | 7.27 | 7.25 | 7.12 | 6.68 | | 7.44 | | 7.15 | 7.25 | 7.31 | 7 3 | 7.28 | 6.87 | 6 88 | | 7.1 | 7.06 |
| Spec f c Conductance | uS/cm | 1671 | 736 | 1110 | 822 | | 1041 | | 1209 | 702 | 1542 | 1331 | 600 | 1156 | 1274 | | 888 | 685 |
| Temperature | deg C | 14.4 | 18.4 | 16.9 | 11.9 | | 10.75 | | 11.9 | 14.7 | 17.2 | 18.2 | 10.2 | 10.6 | 17.9 | | 11.4 | 15.9 |
| Turb dity | NTU | 1.59 | 3.92 | 1.15 | 1.34 | | 3.12 | | 1.88 | 1.91 | 0.91 | 0.39 | 0.82 | 2.44 | 2.41 | | 3.41 | 1.55 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW09B | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-06-28 | 2017-08-23 | | 2017-10-03 | 2018-03-14 | 2018-04-23 | 2018-09-06 | 2018-10-26 | 2019-05-08 | | 2019-11-07 |
| Samp e Type | | FD | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | FD | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 24 | 25 | 25 | 16 | 11 | 11 | 11 | 12 | 16 | 16 | 16 | | 14 | 12 | 12 | | 14 | 8 |
| Ca cium | mg/L | 260 | 280 | 270 | 190 | 200 | 170 | 170 | 180 | 180 | 180 | 160 | | 160 | 150 | 180 | | 150 | 150 |
| Ch oride | mg/L | 210 | 180 | 190 | 130 | 110 | 120 | 130 | 150 | 170 | 160 | 140 | | 150 | 180 | 150 | | 140 | 110 |
| Fluoride | mg/L | 0.54 J | 0.55 J | 0.67 J | 0.68 J | 0.1 J | 1.3 J | 1.2 J | 1.4 J | 1.2 J | 0.37 J | 1.5 J | 1.4 J | 1.6 J | 1.8 J | 1.6 | | 1.6 | 1.5 |
| pH | SU | | 7.08 | 7.15 | 6.96 | 7.36 | 7.44 | 7 29 | 7.36 | | 7.46 | 7.36 | 7.56 | 7.43 | 7 32 | 7.46 | | 7.49 | 7.56 |
| Su fate | mg/L | 970 J- | 1000 J- | 960 | 740 | 670 J | 550 | 570 | 640 | 630 | 650 | 550 | | 430 | 570 | 580 | | 520 | 440 |
| Total Dissolved Solids | mg/L | 2100 | 2000 | 2100 | 1700 | 1300 | 1200 | 1200 | 1500 | 1500 | 1500 | 1300 | | 990 | 1300 | 1200 | | 1200 | 990 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0024 J | 0.0026 J | 0.002 J | 0.0014 J | 0 0027 J | 0.005 U | 0.004 J | 0.004 J | 0.0031 J | 0.0031 J | | 0.0054 | 0.0064 | 0.0044 J | 0 004 J | | 0.0057 | 0.0042 J |
| Barium | mg/L | 0 069 | 0.071 | 0.076 | 0.062 | 0.048 | 0.04 | 0.046 | 0.055 | 0.062 | 0.058 | | 0.045 | 0.04 | 0.049 | 0.047 | | 0.041 | 0 029 |
| Beryllium | mg/L | 0.00012 J | 9.1E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.00027 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| Chromium | mg/L | 0 002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0 002 U | | 0.002 U | 0.002 U | | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0 001 U | 0 001 U | 0.00069 J | 0.00028 J | 0.00045 J | 0.001 U | 0 00028 J | 0 00045 J | 0.00041 J | 0.00041 J | | 0 001 U | | 0.00058 J | 0.00028 J | | 0.00025 J | 0.001 U |
| Fluoride | mg/L | 0.54 J | 0.55 J | 0.67 J | 0.68 J | 0.1 J | 1.3 J | 1.2 J | 1.4 J | 1.2 J | 0.37 J | 1.5 J | 1.4 J | 1.6 J | 1.8 J | 1.6 | | 1.6 | 1.5 |
| Lead | mg/L | 0 001 U | 0 001 U | 0.001 U | 0.00017 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0055 J | 0.0065 J | 0.008 U | 0.008 U | 0 0049 J | 0.0045 J | 0.0056 J | 0.0054 J | 0.0047 J | 0.0042 J | | 0.0031 J | | 0.0037 J | 0.0052 J | | 0.0055 J | 0.0033 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.01 U | 0.0079 J | 0.0075 J | 0.0097 J | 0.013 | 0.015 | 0.015 | 0.013 | 0.0094 J | 0.01 | | 0.014 | 0.012 | 0.01 | 0.011 | | 0.012 | 0.0096 J |
| Radium Total | pci/L | 1.12 | 1.86 | 1.65 | 1.14 | 0.453 | 1.09 | 0.774 | 1 85 | 1.01 | 1.27 | | 1.18 J | 0.868 | 1.04 | 1.24 J | | 1.01 | |
| Radium-226 | pci/L | 0.809 J | 0.947 J | 0.907 | 0.579 | 0.476 | 0.585 | 0.316 | 0.781 J | 0.585 | 0.709 | | 0.482 | 0.301 | 0.653 | 0.69 J | | 0.449 | |
| Radium-228 | pci/L | 1 U | 0.913 | 0.743 | 0.559 | 0.41 U | 0.508 | 0.458 | 1 07 | 0.422 | 0.563 | | 0.699 J | 0.567 | 0.386 | 0.546 | | 0.564 | |
| Selenium | mg/L | 0 005 U | 0 005 U | 0.005 U | 0.005 U | 0.002 J | 0.005 U | 0.0014 J | 0.001 J | 0.0015 J | 0.0016 J | | 0 005 U | | 0.002 J | 0.0019 J | | 0.005 U | 0.0011 J |
| Thallium | mg/L | 0.0003 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0 001 U | | 0.001 U | 0.001 U | | 0.0002 J | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | 190 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | 190 | 200 | 200 | 200 | 170 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | 2.5 J | 2.1 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | 0.1 R | 0.55 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | | | 3 2 | 3.2 | 3 |
| Magnesium | mg/L | | | | | | | | | | | | | | 57 | 60 | 64 | 63 | 54 |
| Manganese | mg/L | | | | | | | | | | | | | | | | 1 2 | 1.2 | 1 2 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 0.05 R | | 0.1 U | 0.1 U | 0.12 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | 0.077 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | 0.09 | 0.31 U | 0.31 U | 0.31 U | 0.31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | 4 J | 3.8 J | 4 J | 4 J | 2.4 J |
| Sodium | mg/L | | | | | | | | | | | | | | 150 | 94 | 110 | 110 | 46 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | | 0.44 | 1.06 | 0.43 | 0.38 | 0.44 | 0 61 | 0.71 | | 0.57 | 0.45 | 0.1 | 0.04 | 0 61 | 0.28 | | 0.04 | 0.35 |
| Oxidation Reduction Potential | mV | | -57.7 | 67.3 | -76.4 | -100.1 | -80.6 | -102.6 | 68 2 | | 19.7 | -46 8 | -121.6 | -130.5 | -100.5 | -101 1 | | -16.8 | -131.8 |
| Eh | mV | | 142.3 | 267.3 | 123 6 | 99.9 | 119.4 | 97.4 | 268.2 | | 219.7 | 153 2 | 78.4 | 69.5 | 99 5 | 98.9 | | 183.2 | 68.2 |
| pH | SU | | 7.08 | 7.15 | 6.96 | 7.36 | 7.44 | 7 29 | 7.36 | | 7.46 | 7.36 | 7.56 | 7.43 | 7 32 | 7.46 | | 7.49 | 7.56 |
| Spec f c Conductance | uS/cm | | 2356 | 2435 | 2088 | 1559 | 1352 | 1592 | 1561 | | 1922 | 1722 | 1053 | 1301 | 1556 | 1693 | | 1165 | 9.24 |
| Temperature | deg C | | 14.1 | 14.7 | 15.1 | 13.6 | 13.45 | 14.5 | 14 8 | | 15.5 | 16 | 14 | 14.4 | 16.1 | 16 | | 14.2 | 14.4 |
| Turb dity | NTU | | 3.48 | 4.29 | 2.17 | 0.99 | 2.58 | 1 88 | 1.69 | | 2.54 | 1.96 | 4.18 | 4.11 | 2.96 | 1.39 | | 4.7 | 3.36 |

Notes:
CCR = coal combustion res dual
mg/L = m ligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW15 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-03 | 2018-03-15 | 2018-04-24 | 2018-10-26 | 2019-05-06 | 2019-11-08 |
| Samp e Type | | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0 75 | 0.45 J | 1 J | 1.1 | 0.6 | 0.44 | 0.45 | 0 87 | 0.91 | 0.66 | | 0.72 | 0.76 | 0.71 | 0.73 |
| Ca cium | mg/L | 100 | 130 | 120 | 100 | 82 | 81 | 95 | 160 | 150 | 77 | | 170 | 120 | 140 | 100 |
| Ch oride | mg/L | 28 | 31 | 31 | 27 | 28 | 27 | 27 | 27 | 25 | 19 | | 24 | 21 | 22 | 28 |
| Fluoride | mg/L | 1.2 J | 0.85 J | 0.85 J | 0 74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.93 J | 0.67 J | 0.76 J | 0.69 | 0.52 | 0.73 |
| pH | SU | 6.88 | | 6.98 | 6.83 | 6.96 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7 34 |
| Su fate | mg/L | 160 J- | 260 | 260 | 150 | 140 | 140 | 160 | 300 | 330 | 260 | | 410 | 240 | 380 | 260 |
| Total Dissolved Solids | mg/L | 570 | 660 | 630 | 520 | 400 | 400 | 420 | 780 | 750 | 660 | | 790 | 5900 | 740 | 640 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.00041 J | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.056 | 0.072 | 0 069 | 0.078 | 0.076 | 0.054 | 0.062 | 0.059 | 0.066 | | 0 058 | | 0.091 | 0.081 | 0.075 |
| Barium | mg/L | 0.044 | 0.053 | 0 053 | 0.039 | 0.032 | 0.031 | 0.034 | 0.054 | 0.058 | | 0.047 | | 0.046 | 0.047 | 0.037 |
| Beryllium | mg/L | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0 002 U | 0.002 U | 0.00027 J | 0.00028 J | 0.00029 J | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0 0019 | 0.0022 | 0.0022 | 0.0021 | 0.0019 | 0.0018 | 0.0022 | 0 0029 | 0.0027 | | 0.0025 | | 0.0023 | 0.0035 | 0.0017 |
| Fluoride | mg/L | 1.2 J | 0.85 J | 0.85 J | 0.74 J | 0.8 J | 0.77 J | 0.74 J | 0.82 J | 0.82 J | 0.93 J | 0.67 J | 0.76 J | 0.69 | 0.52 | 0.73 |
| Lead | mg/L | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0053 J | 0 008 U | 0.008 U | 0.008 U | 0.004 J | 0.0024 J | 0.0041 J | 0.0058 J | 0.005 J | | 0.0023 J | | 0 0054 J | 0.0053 J | 0.0027 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0 02 | 0.027 | 0 026 | 0.023 | 0.022 | 0.022 | 0.026 | 0.017 | 0.019 | | 0 029 | | 0.016 | 0.017 | 0.029 |
| Radium Total | pci/L | 5 U | 0.479 | 0 513 | 0.646 U | 0.555 J | 0.339 U | 0.463 U | 0.335 | 0.342 U | | 0.657 J | | 0.858 J | 0.476 U | |
| Radium-226 | pci/L | 1 U | 0.202 | 0.145 | 0.337 U | 0.38 | 0.127 U | 0.1 | 0.0965 J | 0.104 | | 0.0617 | | 0.527 J | 0.28 U | |
| Radium-228 | pci/L | 1 U | 0 397 U | 0.382 U | 0.646 U | 0.401 U | 0 339 U | 0.463 U | 0.278 U | 0.342 U | | 0.576 J | | 0.407 U | 0.476 U | |
| Selenium | mg/L | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 180 | 180 | 170 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 4.3 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 5.2 J | | |
| Iron | mg/L | | | | | | | | | | | | | | 11 | 5.4 |
| Magnesium | mg/L | | | | | | | | | | | | | 24 | 30 | 24 |
| Manganese | mg/L | | | | | | | | | | | | | | 0.089 | 0.055 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.05 U | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 4 | 1.4 | 1.3 |
| Potassium | mg/L | | | | | | | | | | | | | 2.6 J | 3.2 J | 3.3 J |
| Sodium | mg/L | | | | | | | | | | | | | 24 | 32 | 30 |
| **Sample Parameters** | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.48 | | 0.48 | 0.14 | 0.25 | 0.16 | 0.19 | 1 | 0.32 | 0.29 | 0.06 | 0.02 | 1.97 | 0.15 | 0.12 |
| Oxidation Reduction Potential | mV | -79.2 | | -60.1 | -111 | -114.3 | -104.1 | -104.4 | -46.9 | -43.7 | -13.8 | -56.8 | -99.1 | -254.7 | -27.5 | -100 |
| Eh | mV | 120.8 | | 139.9 | 89.0 | 85.7 | 95.9 | 95 6 | 153.1 | 156.3 | 186.2 | 143.2 | 100.9 | -54.7 | 172.5 | 100.0 |
| pH | SU | 6.88 | | 6.98 | 6.83 | 6.96 | 6.99 | 6.76 | 6.61 | 6.96 | 6.88 | 6.95 | 6.89 | 5.2 | 7.1 | 7 34 |
| Spec f c Conductance | uS/cm | 779 | | 909 | 733 | 594 | 584 | 674 | 9.32 | 1004 | 901 | 581 | 933 | 855 | 730 | 598 |
| Temperature | deg C | 15 3 | | 20.3 | 19.9 | 14.6 | 12.1 | 11 6 | 14.6 | 16.6 | 18.1 | 10.8 | 10.6 | 17.1 | 8.3 | 15.8 |
| Turb dity | NTU | 4.48 | | 2.96 | 3.41 | 3.98 | 4.4 | 4.92 | 4.2 | 3.1 | 4.11 | 3.98 | 4.29 | 3.1 | 4.9 | 6.9 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nepheloметric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW158 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-03 | 2018-03-15 | 2018-04-24 | 2018-09-06 | | 2018-10-26 | 2019-05-08 | 2019-11-08 | |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.1 | 1.7 | 2 | 3.7 | 3.3 | 3.6 | 3.1 | 2.1 | 2.1 | | 4.4 | | 4.1 | 4.9 | 10 | | 6.2 |
| Ca cium | mg/L | 160 | 160 | 160 | 180 | 160 | 170 | 190 | 170 | 73 | | 230 | | 200 | 210 | 280 | | 280 |
| Ch oride | mg/L | 52 | 58 | 62 | 81 | 64 | 65 | 71 | 64 | 64 | | 87 | | 89 | 93 | 110 | | 80 |
| Fluoride | mg/L | 0.65 J | 0.62 J | 0.46 J | 0.74 J | 0.77 J | 0.75 J | 0.72 J | 0.61 J | 0.5 J | 0.69 J | 0.79 J | | 0.6 J | 0.6 | 0.84 J | | 0.89 |
| pH | SU | 7.81 | 7.49 | 7.04 | 7.52 | 7.48 | 7.11 | 7.26 | 7 37 | 7.42 | 7.45 | 7.36 | | 7.8 | 6.74 | 7.43 | | 7.57 |
| Su fate | mg/L | 380 J- | 390 | 340 | 500 | 390 | 460 | 530 | 540 | 500 | | 790 | | 720 | 770 | 1300 | | 940 |
| Total Dissolved Solids | mg/L | 830 | 800 | 840 | 1000 | 890 | 980 | 1200 | 1100 | 1100 | | 1400 | | 1400 | 1400 | 2100 | | 1600 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | | 0.002 U | 0 002 U | 0.002 U | | 0.002 U |
| Arsenic | mg/L | 0.003 J | 0.0011 J | 0.0014 J | 0.0022 J | 0.0011 J | 0.00098 J | 0.00084 J | 0.00081 J | | 0.005 U | | | 0.005 U | 0 005 U | 0.00088 J | | 0.005 U |
| Barium | mg/L | 0.054 | 0.053 | 0.056 | 0.056 | 0 051 | 0.052 | 0.064 | 0.069 | | 0.068 | | | 0.07 | 0.064 | 0.081 | | 0.054 |
| Beryllium | mg/L | 7 8E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U |
| Chromium | mg/L | 0 00062 J | 0.002 U | 0.002 U | 0.00033 J | 0.00034 J | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | | 0.002 U | 0 002 U | 0.002 U | | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.00016 J | 0 001 U | 0 001 U | 0.001 U | | 0 00029 J | | | 0 00037 J | 0 001 U | 0.001 U | | 0.001 U |
| Fluoride | mg/L | 0.65 J | 0.62 J | 0.46 J | 0.74 J | 0.77 J | 0.75 J | 0.72 J | 0.61 J | 0.5 J | 0.69 J | 0.79 J | | 0.6 J | 0.6 | 0.84 J | | 0.89 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.00023 J | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.001 U | | 0.001 U |
| L thium | mg/L | 0.0069 J | 0.008 U | 0.008 U | 0.0077 J | 0.0053 J | 0.0082 | 0.0082 | 0.0077 J | | 0.007 J | | | 0.008 | 0.0096 | 0.012 | | 0.0085 |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U | | 0 0002 U |
| Molybdenum | mg/L | 0.011 | 0.013 | 0.01 | 0.012 | 0 015 | 0.014 | 0.014 | 0.012 | | 0.011 | | | 0.01 | 0.011 | 0.012 | | 0.01 |
| Radium Total | pci/L | 1 26 | 0.594 | 0.61 | 1.14 J | 0.876 | 0.687 | 0.789 | 0.872 | | 1.69 J | | | 1.31 | 1.51 J | 1.61 | | |
| Radium-226 | pci/L | 0.607 J | 0.442 | 0.361 U | 0.785 | 0.441 | 0.442 | 0.537 J | 0.547 | | 0.752 | | | 0.711 | 0.837 J | 1.07 | | |
| Radium-228 | pci/L | 1 U | 0.389 U | 0.498 U | 0.502 U | 0.435 | 0.378 U | 0 329 U | 0.363 U | | 0.94 J | | | 0.603 | 0.676 | 0.544 | | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | | 0.005 U | | | 0.0017 J | 0 005 U | 0.005 U | | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | | 0.001 U | 0 001 U | 0.0003 J | | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | 180 | 180 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | 5 U | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | 180 | 180 | 200 | 200 | 180 | 180 |
| Ferr c Iron | mg/L | | | | | | | | | | | | 2 J | 2.1 J | 1.8 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | 0.1 R | 0.1 R | 0.38 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | | 4.6 | 3 | 3.1 |
| Magnesium | mg/L | | | | | | | | | | | | 36 | 39 | 39 | 62 | 43 | 45 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.59 | 0.54 | 0.57 |
| Nitrate as N | mg/L | | | | | | | | | | | | 0.05 R | 0.05 R | | 0.1 U | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | 0.05 R | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 0.05 U | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | 0.031 U | 0.031 U | 0.31 U | 0.14 J | 0.31 U | 0 31 U |
| Potassium | mg/L | | | | | | | | | | | | 4.5 J | 5 | 4.7 J | 7.2 | 5.1 | 5.3 |
| Sodium | mg/L | | | | | | | | | | | | 140 | 150 | 170 | 280 | 130 | 130 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.22 | 0.91 | 0.56 | 0.22 | 0.46 | 0 3 | 0.43 | 0 64 | 0 23 | 0.08 | 0.04 | | 0.29 | 2.06 | 0 23 | | 0.16 |
| Oxidation Reduction Potential | mV | -129.7 | -21.6 | -94.6 | -132.6 | -81 7 | -79 6 | -21.3 | -36.5 | -42.6 | -64 | -102.4 | | -91.2 | -256.1 | 46 3 | | -189 2 |
| Eh | mV | 70 3 | 178.4 | 105.4 | 67.4 | 118.3 | 120.4 | 178.7 | 163.5 | 157.4 | 136.0 | 97.6 | | 108.8 | -56.1 | 246.3 | | 10.8 |
| pH | SU | 7.81 | 7.49 | 7.04 | 7.52 | 7.48 | 7.11 | 7.26 | 7 37 | 7.42 | 7.45 | 7.36 | | 7.8 | 6.74 | 7.43 | | 7.57 |
| Spec f c Conductance | uS/cm | 834 | 1049 | 1060 | 1237 | 940 | 1096 | 1099 | 1110 | 1294 | 1255 | 1612 | | 2757 | 1889 | 1798 | | 1384 |
| Temperature | deg C | 12.71 | 15.9 | 16.1 | 13.9 | 13.6 | 13 | 13.8 | 14.2 | 14.5 | 13.3 | 13 | | 14.13 | 13 6 | 8.1 | | 13.8 |
| Turb dity | NTU | 4.72 | 1.56 | 1.48 | 3.8 | 2.23 | 3.65 | 3.16 | 1 78 | 0.4 | 4.59 | 4.88 | | 3.59 | 1.35 | 3.56 | | 1.49 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW16 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-15 | 2018-04-24 | 2018-10-29 | | 2019-05-03 | 2019-11-08 | |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.1 | 1.8 | 1.6 | 1.2 | 0.89 | 1.3 | 1 | 1.4 | 1.1 | | 1.4 | 1.4 | 1.4 | 1.6 | | 1.9 |
| Ca cium | mg/L | 230 | 180 | 170 | 120 | 160 | 210 | 220 | 240 | 57 | | 220 | 160 | 160 | 210 | | 210 |
| Ch oride | mg/L | 53 | 37 | 30 | 28 | 24 | 25 | 28 | 31 | 42 | | 58 | 36 | 36 | 28 | | 59 |
| Fluoride | mg/L | 1.4 J | 1 6 J | 1.3 J | 1.5 | 1.3 J | 1.3 J | 1.2 J | 1.3 J | 1.5 J | 1 J | 1.2 J | 1.1 | 1.1 | 0.99 | | 1.1 |
| pH | SU | 7.92 | 7.18 | 7.48 | 7.5 | 7.58 | 7.17 | 7.36 | 7 06 | 7 62 | 7.41 | 7.67 | | 7.28 | 7.46 | | 7.8 |
| Su fate | mg/L | 530 J- | 400 | 320 | 47 | 300 | 500 | 480 | 630 | 520 | | 530 | 340 | 350 | 570 | | 530 |
| Total Dissolved Solids | mg/L | 1100 | 810 | 790 | 570 | 670 | 930 | 1000 | 1100 | 980 | | 1100 | 740 | 730 | 1100 | | 1100 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.00028 J | 0.002 U | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0 002 U | | 0 002 U |
| Arsenic | mg/L | 0.011 | 0.0077 | 0.012 | 0.0084 | 0.0079 | 0.006 | 0.008 | 0.0096 | | 0.002 J | 0.0065 | 0.01 | 0.0098 | 0.005 | | 0.0082 |
| Barium | mg/L | 0.049 | 0.042 | 0.035 | 0.024 | 0 029 | 0.043 | 0.044 | 0.054 | | 0.057 | 0.045 | 0.035 | 0.035 | 0.034 | | 0 034 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| Chromium | mg/L | 0 00062 J | 0.002 U | 0.002 U | 0.0031 | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0 002 U | | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.00068 J | 0.00051 J | 0.00046 J | 0.00055 J | 0.00092 J | 0.00094 J | 0.0011 | | 0 0013 | | 0.00059 J | 0 00061 J | 0.00066 J | | 0.00061 J |
| Fluoride | mg/L | 1.4 J | 1 6 J | 1.3 J | 1.5 | 1.3 J | 1.3 J | 1.2 J | 1.3 J | 1.5 J | 1 J | 1.2 J | 1.1 | 1.1 | 0.99 | | 1.1 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| L thium | mg/L | 0 00043 J | 0.008 U | 0.008 U | 0.00023 J | 0.008 U | 0 008 U | 0 008 U | 0.008 U | | 0.008 U | | 0.008 U | 0.008 U | 0 008 U | | 0 008 U |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U |
| Molybdenum | mg/L | 0.024 | 0.036 | 0.045 | 0.044 | 0.03 | 0.027 | 0.023 | 0.024 | | 0.027 | 0.031 | 0.033 | 0.033 | 0.027 | | 0 028 |
| Radium Total | pci/L | 1 68 | 0.543 | 0.527 U | 0.629 U | 0 648 | 0.392 U | 0 339 U | 0.429 | | 0.862 J | 0.29 | 0.862 J | 1.32 J | 0.685 U | | |
| Radium-226 | pci/L | 0.537 J | 0.249 | 0.363 U | 0.256 U | 0.129 U | 0.094 | 0.106 J | 0.246 | | 0.1 | 0.0822 | 0.214 J | 0.278 J | 0 277 U | | |
| Radium-228 | pci/L | 1 14 | 0.395 U | 0.527 U | 0.629 U | 0 528 | 0.392 U | 0 339 U | 0.322 U | | 0.762 J | 0.208 | 0.648 J | 1.04 J | 0 685 U | | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.0005 J | 0.0005 J | 0.005 U | 0.0012 J | 0 005 U | 0.005 U | | 0.0015 J | | 0.005 U | 0.005 U | 0 005 U | | 0 0015 J |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0 001 U | | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 180 | 200 | 5 U | 210 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 1.8 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 0.19 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | 1.4 | 1.6 | 1 7 |
| Magnesium | mg/L | | | | | | | | | | | | | 23 | 29 | 29 | 31 |
| Manganese | mg/L | | | | | | | | | | | | | | 0.35 | 0.29 | 0.31 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | 0.042 J | 0.1 U | 0 1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.056 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 1.2 | 0.55 | 0.47 | 0.42 |
| Potassium | mg/L | | | | | | | | | | | | | 4.3 J | 4.2 J | 4.9 J | 5 2 |
| Sodium | mg/L | | | | | | | | | | | | | 41 | 41 | 36 | 38 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.16 | 0.27 | 0.48 | 0.31 | 0.36 | 0.14 | 0.5 | 0 14 | 0 06 | 0.22 | 0.22 | | 1.27 | 0.29 | | 4.02 |
| Oxidation Reduction Potential | mV | -18.06 | 711.6 | -124 8 | -78.8 | -136.9 | -73 6 | -114.2 | 9.6 | -158.4 | -55.9 | -106.5 | | -216.8 | 8 | | -2 |
| Eh | mV | 181.9 | 911.6 | 75.2 | 121.2 | 63.1 | 126.4 | 85.8 | 209.6 | 41.6 | 144.1 | 93.5 | | -16.8 | 208.0 | | 198.0 |
| pH | SU | 7.92 | 7.18 | 7.48 | 7.5 | 7.58 | 7.17 | 7.36 | 7.06 | 7 62 | 7.41 | 7.67 | | 7.28 | 7.46 | | 7.8 |
| Spec f c Conductance | uS/cm | 1331 | 1112 | 927 | 751 | 821 | 1257 | 1123 | 1406 | 1254 | 1029 | 1239 | | 1046 | 1001 | | 1014 |
| Temperature | deg C | 15.02 | 18.8 | 18.15 | 12.1 | 9.72 | 10.6 | 15.41 | 18 | 17.8 | 8.71 | 9.2 | | 17.81 | 10 5 | | 17.52 |
| Turb dity | NTU | 3.89 | 2.16 | 1.93 | 3.16 | 4.14 | 3.25 | 4.33 | 2.45 | 4.95 | 4.62 | 12.81 | | 3.64 | 4.65 | | 3.98 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW16B | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | | 2017-01-11 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-15 | 2018-04-24 | 2018-09-07 | 2018-10-29 | 2019-05-06 | 2019-11-08 | |
| Samp e Type | | N | N | FD | N | N | N | N | N | N | N | N | N | N | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.8 | 1.6 | 1.4 | 1.4 | 1.4 | 1.4 | 1.1 | 3.4 | 6.5 | 2.9 | | 4.1 | 7.6 | 9.7 | 12 | 11 | 10 |
| Ca cium | mg/L | 230 | 190 | 180 | 180 | 210 | 210 | 270 | 220 | 260 | 100 | | 250 | 310 | 350 | 350 | 300 | 280 |
| Ch oride | mg/L | 63 | 56 | 57 | 55 | 57 | 47 | 71 | 71 | 120 | 78 | | 140 | 160 | 150 | 190 | 220 | 210 |
| Fluoride | mg/L | 1.1 J | 1 1 J | 0.84 J | 0.73 J | 0.99 J | 0.87 J | 0.83 J | 0.76 J | 0.78 J | 1 J | 0.8 J | 0.76 J | 0 73 J | 0.64 | 0.76 | 1 | 1 |
| pH | SU | 7.76 | 7.47 | | 7.41 | 7.57 | 7.55 | 7.3 | 7.51 | 7.28 | 7.54 | 7.6 | 7.65 | 7.97 | 7.02 | 7.49 | | 7.85 |
| Su fate | mg/L | 580 J- | 480 | 500 | 440 | 50 | 470 | 730 | 720 | 640 | 580 | | 690 | 760 | 890 | 940 | 1500 | 1500 |
| Total Dissolved Solids | mg/L | 1100 | 1000 | 1000 | 1000 | 1000 | 1000 | 1300 | 1200 | 1400 | 1200 | | 1400 | 20 U | 1600 | 1800 | 2400 | 2400 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.00057 J | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0.00095 J | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0 0068 | 0.0064 | 0.011 | 0.011 | 0.012 | 0.0095 | 0.012 | 0 0096 | 0.0081 | | 0.0099 | 0.0097 | 0.011 | 0.0088 | 0.0071 | 0.0079 | 0.0076 |
| Barium | mg/L | 0.072 | 0 04 | 0.036 | 0.035 | 0.038 | 0.039 | 0.055 | 0.043 | 0.046 | | 0.053 | 0.058 | 0.068 | 0.071 | 0.079 | 0.055 | 0.054 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.00022 J | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.00029 J | 0.002 U | 0.00026 J | 0 002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00016 J | 0.00019 J | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.0003 J | | 0.00054 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 1.1 J | 1 1 J | 0.84 J | 0.73 J | 0.99 J | 0.87 J | 0.83 J | 0.76 J | 0.78 J | 1 J | 0.8 J | 0.76 J | 0 73 J | 0.64 | 0.76 | 1 | 1 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0055 J | 0.008 U | 0.0032 J | 0.0022 J | 0 0058 J | 0.0035 J | 0.0072 J | 0 006 J | 0.0061 J | | 0.007 J | | 0 0059 J | 0.0059 J | 0.007 J | 0.0054 J | 0.0055 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 UJ | | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.013 | 0.012 | 0.012 | 0.012 | 0.012 | 0.013 | 0.023 | 0.016 | 0.013 | | 0 016 | 0.015 | 0.012 | 0.011 | 0.014 | 0 02 | 0.019 |
| Radium Total | pci/L | 1 31 | 1 05 | 0.866 | 0.794 | 0.998 J | 0.577 | 1 23 | 0.795 | 1.21 | | 1.11 J | 0.99 | 1.17 J | 1.64 J | 0.984 | | |
| Radium-226 | pci/L | 0.651 J | 0.458 | 0.427 | 0.412 U | 0.507 | 0.348 | 0.635 | 0.54 J | 0.559 | | 0.443 | 0.535 | 0.724 J | 0.719 J | 0.753 | | |
| Radium-228 | pci/L | 0 66 | 0 59 | 0.467 U | 0.435 U | 0.491 J | 0 399 U | 0.597 | 0.287 U | 0.647 | | 0.671 J | 0.455 | 0 522 U | 0.919 J | 0.459 U | | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.00061 J | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | 0.005 U | | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | 200 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | 200 | 210 | 190 | | 200 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | 6 J | 5.1 | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | 0.1 R | 1.8 J | | | |
| Iron | mg/L | | | | | | | | | | | | | | | 9.2 | | 7.5 |
| Magnesium | mg/L | | | | | | | | | | | | | 46 | 53 | 58 | | 49 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.49 | | 0.39 |
| Nitrate as N | mg/L | | | | | | | | | | | | | 0.05 R | | 0.018 J | | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | 0.05 R | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 0.063 | | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | 0.19 | 0 28 J | 0.22 J | | 0.17 J |
| Potassium | mg/L | | | | | | | | | | | | | 4.9 J | 5.2 | 5.5 | | 6.3 |
| Sodium | mg/L | | | | | | | | | | | | | 84 | 84 | 97 | | 380 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 1.23 | 1.63 | | 0.39 | 0.3 | 0.21 | 0.12 | 0.32 | 0.16 | 0.15 | 0.28 | 0.25 | 1.02 | 4.23 | 0 33 | | 3.41 |
| Oxidation Reduction Potential | mV | -122.6 | -89 | | -126.3 | -148.5 | -132.2 | -130.2 | -123.1 | -32.7 | -135.8 | -75.5 | -117.8 | -101.5 | -166.8 | 21.2 | | -99.5 |
| Eh | mV | 77.4 | 111.0 | 200.0 | 73.7 | 51.5 | 67.8 | 69 8 | 76.9 | 167.3 | 64.2 | 124.5 | 82.2 | 98.5 | 33.2 | 221.2 | | 100.5 |
| pH | SU | 7.76 | 7.47 | | 7.41 | 7.57 | 7.55 | 7.3 | 7.51 | 7.28 | 7.54 | 7.6 | 7.65 | 7.97 | 7.02 | 7.49 | | 7.85 |
| Spec f c Conductance | uS/cm | 1147 | 1297 | | 1158 | 1230 | 1192 | 1645 | 1333 | 1665 | 1461 | 1142 | 1653 | 3104 | 2098 | 1692 | | 2340 |
| Temperature | deg C | 13.04 | 14.44 | | 15 27 | 14.3 | 13.37 | 12 3 | 13.48 | 14.3 | 15 | 12.6 | 12.3 | 15 | 17.7 | 11.2 | | 14.65 |
| Turb dity | NTU | 4.1 | 3.99 | | 1 8 | 2.76 | 4.21 | 4.58 | 3.27 | 2.48 | 3.9 | 4.08 | 4 2 | 4.99 | 3.49 | 3.72 | | 2.81 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW17 | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-14 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-24 | 2017-10-04 | 2018-03-14 | | 2018-04-23 | | 2018-10-29 | 2019-05-09 | 2019-11-08 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | FD | N | FD | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 12 | 12 | 11 | 11 | 11 | 8.9 | 7.6 | 12 | 12 | | | 5.8 | 5.8 | 16 | 7.7 | 4.9 |
| Ca cium | mg/L | 150 | 160 | 170 | 180 | 200 | 180 | 120 | 150 | 64 | | | 110 | 110 | 200 | 130 | 120 |
| Ch oride | mg/L | 110 | 100 | 130 | 150 | 140 | 81 | 170 | 130 | 160 | | | 40 | 38 | 150 | 90 | 92 |
| Fluoride | mg/L | 1.8 J | 2 2 J | 2 J | 1.9 J | 1.6 J | 1.6 J | 0.79 J | 1.9 J | 2.4 J | 5 U | 1.7 J | 1.9 J | 1.9 J- | 1.7 | 1.6 | 1.7 |
| pH | SU | 7.56 | 7.27 | 7.21 | 7.33 | 7.54 | 7.23 | 7.4 | 7 16 | 7 22 | | 7.62 | | 7 82 | 6.85 | 7.53 | 7.75 |
| Su fate | mg/L | 330 J- | 330 | 360 | 390 | 390 | 390 | 520 | 250 | 350 | | | 240 | 220 | 430 | 300 | 290 |
| Total Dissolved Solids | mg/L | 940 | 920 | 940 | 1000 | 1100 | 950 | 1400 | 890 | 1000 | | | 630 | 620 | 1100 | 800 | 860 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 00034 J | 0.00032 J | 0.00032 J | 0.002 U | 0.00028 J | 0 002 U | 0 002 U | 0.002 U | | 0.002 U | 0.002 U | | | 0.002 U | 0.002 U | 0 002 U |
| Arsenic | mg/L | 0 0054 | 0.0056 | 0.0042 J | 0.0069 | 0.0055 | 0.0054 | 0 0035 J | 0.0028 J | | 0.005 U | 0.0027 J | | | 0.004 J | 0 0021 J | 0.0028 J |
| Barium | mg/L | 0.047 | 0.056 | 0.054 | 0.05 | 0 054 | 0.048 | 0.044 | 0.06 | | 0.041 | 0.058 | | 0.029 | 0.073 | 0.041 | 0.052 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.00076 J | 0 001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0 001 U |
| Chromium | mg/L | 0.0015 J | 0.002 U | 0.0011 J | 0.0011 J | 0.0012 J | 0.0012 J | 0 002 U | 0.002 U | | 0.0017 J | 0.0014 J | | | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 6 3E-05 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 1.8 J | 2 2 J | 2 J | 1.9 J | 1.6 J | 1.6 J | 0.79 J | 1.9 J | 2.4 J | 5 U | 1.7 J | 1.9 J | 1.9 J- | 1.7 | 1.6 | 1.7 |
| Lead | mg/L | 0 00018 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.001 U | 0 001 U |
| L thium | mg/L | 0.0047 J | 0.008 U | 0.0036 J | 0.0047 J | 0.0024 J | 0.0045 J | 0 0058 J | 0.0076 J | | 0.008 U | 0.0035 J | | | 0.0066 J | 0 0035 J | 0.0052 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0.0002 U | 0.0002 U | | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.015 | 0.012 | 0.011 | 0.01 U | 0.01 | 0.011 | 0.018 | 0.024 | | 0.024 | 0.024 | | 0.02 | 0.017 | 0.017 | 0.012 |
| Radium Total | pci/L | 0.569 | 0.451 U | 0.447 U | 0.553 U | 0.428 | 0.477 | 0.403 U | 0.71 | | 0.816 J | 0.384 U | | 0.205 | 1.1 J | 0.518 U | |
| Radium-226 | pci/L | 1 U | 0.331 | 0.415 U | 0.246 U | 0 222 | 0.23 | 0 191 J | 0.215 | | 0.202 | 0.112 | | 0.0399 | 0.315 J | 0.26 U | |
| Radium-228 | pci/L | 1 U | 0.451 U | 0.447 U | 0.553 U | 0.402 U | 0.406 U | 0.403 U | 0.495 | | 0.614 J | 0.384 U | | 0.166 | 0.783 J | 0.518 U | |
| Selenium | mg/L | 0.019 | 0 03 | 0.018 | 0.023 | 0 028 | 0.026 | 0.0081 | 0.0032 J | | 0.0074 | 0.021 | | 0.015 | 0.022 | 0.004 J | 0.011 |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | 0.001 U | | | 0.001 U | 0.00063 J | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | 190 | 160 | 160 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | 0.1 U | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | 0.05 UJ | | |
| Iron | mg/L | | | | | | | | | | | | | | | 0.2 U | 0 2 U |
| Magnesium | mg/L | | | | | | | | | | | | | | 67 | 49 | 40 |
| Manganese | mg/L | | | | | | | | | | | | | | | 0.015 U | 0 015 U |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | 0.97 | 2 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | 2.8 | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | 0.47 | 0 28 J | 0.3 J |
| Potassium | mg/L | | | | | | | | | | | | | | 5.3 | 3.5 J | 5 |
| Sodium | mg/L | | | | | | | | | | | | | | 34 | 31 | 28 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 5.78 | 1.7 | 1.8 | 1.01 | 2.35 | 7.33 | 3.18 | 4 33 | 3.3 | | 4.99 | | 9 | 1.78 | 5.75 | 6.47 |
| Oxidation Reduction Potential | mV | 45 8 | 825.9 | 6.1 | 82.3 | 6.6 | 67.9 | 23.3 | 8 | 57.9 | | -90.2 | | -90.2 | -237 | 53.1 | 35 |
| Eh | mV | 245.8 | 1025.9 | 206.1 | 282.3 | 206.6 | 267.9 | 223.3 | 208.0 | 257.9 | 200.0 | 109.8 | | 109.8 | -37.0 | 253.1 | 235.0 |
| pH | SU | 7.56 | 7.27 | 7.21 | 7.33 | 7.54 | 7.23 | 7.4 | 7.16 | 7.22 | | 7.62 | | 7 82 | 6.85 | 7.53 | 7.75 |
| Spec f c Conductance | uS/cm | 1059 | 1287 | 1141 | 1272 | 1541 | 1290 | 902 | 1151 | 1357 | | 832 | | 675 | 1513 | 894 | 798 |
| Temperature | deg C | 17.23 | 20.6 | 18.63 | 13.6 | 10.95 | 11.8 | 17.71 | 24.4 | 22.3 | | 10.9 | | 11.4 | 20 | 12.1 | 17.23 |
| Turb dity | NTU | 1.56 | 1.09 | 0.58 | 2.58 | 0.44 | 2.21 | 1.02 | 1.5 | 2 51 | | 0.54 | | 1.19 | 0.45 | 0.44 | 0.86 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW17B | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | 2017-01-10 | 2017-03-02 | 2017-04-27 | 2017-06-29 | 2017-08-23 | 2017-10-04 | 2018-03-14 | 2018-04-23 | 2018-09-06 | 2018-10-29 | 2019-05-09 | 2019-11-08 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | |
| Boron | mg/L | 18 | 19 | 19 | 21 | 22 | 20 | 16 | 13 | 11 | | 13 | 10 | 12 | 12 | 9.4 |
| Ca cium | mg/L | 230 | 250 | 240 | 250 | 270 | 250 | 240 | 160 | 57 | | 180 | 150 | 150 | 180 | 150 |
| Ch oride | mg/L | 180 | 170 | 180 | 190 | 200 | 200 | 71 | 99 | 130 | | 140 | 120 | 110 | 130 | 110 |
| Fluoride | mg/L | 0.9 J | 0.98 J | 0.68 J | 0.58 J | 0.6 J | 0.6 J | 2.1 J | 1.3 J | 1.1 J | 0.55 J | 0.58 J | 0.84 J | 0.71 | 0.62 | 0.67 |
| pH | SU | 7.43 | 7.37 | 7.1 | 7.24 | 7.44 | 7.02 | 7.25 | 7 19 | 7 38 | 7.48 | 7.39 | 7.63 | 7.4 | 7.15 | 7.66 |
| Su fate | mg/L | 710 J- | 680 | 710 | 740 | 710 | 680 | 300 | 380 | 420 | | 520 | 350 | 350 | 270 | 350 |
| Total Dissolved Solids | mg/L | 1500 | 1400 | 1400 | 1500 | 1700 | 1500 | 660 | 1000 | 960 | | 1100 | 940 | 950 | 980 | 990 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Arsenic | mg/L | 0.0024 J | 0.0021 J | 0.0024 J | 0.0035 J | 0.0023 J | 0.0022 J | 0 0023 J | 0.0026 J | | 0.0011 J | | 0.0017 J | 0.0023 J | 0.0022 J | 0.0019 J |
| Barium | mg/L | 0.078 | 0.079 | 0.086 | 0.092 | 0 1 | 0.089 | 0.065 | 0.06 | | 0.085 | 0.069 | 0.066 | 0.073 | 0.11 | 0.074 |
| Beryllium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.00033 J | 0 001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0 002 U |
| Cobalt | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.0003 J | 0.001 U | 0.001 U | 0 001 U |
| Fluoride | mg/L | 0.9 J | 0.98 J | 0.68 J | 0.58 J | 0.6 J | 0.6 J | 2.1 J | 1.3 J | 1.1 J | 0.55 J | 0.58 J | 0.84 J | 0.71 | 0.62 | 0.67 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0 001 U |
| L thium | mg/L | 0.0017 J | 0.008 U | 0.008 U | 0.0019 J | 0.00046 J | 0.0021 J | 0 0019 J | 0.008 U | | 0.008 U | | 0.008 U | 0.008 U | 0.008 U | 0 008 U |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 UJ | | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.024 | 0.021 | 0.013 | 0.011 | 0 012 | 0.011 | 0.017 | 0.021 | | 0.017 | 0.016 | 0.01 | 0.011 | 0.0073 J | 0.01 |
| Radium Total | pci/L | 1 79 | 1 84 | 2.53 | 2.58 | 1.25 | 1.94 | 1.03 | 2.4 | | | 1.21 | 1.47 | 2.48 J | 1.71 | |
| Radium-226 | pci/L | 0.882 J | 0.864 | 1.28 | 1.4 | 1.01 | 1.09 | 0 639 J | 0.867 | | | 0.518 | 0.945 | 1.15 J | 0.964 | |
| Radium-228 | pci/L | 0.913 | 0.98 | 1.25 | 1.17 | 0.423 U | 0.846 | 0.395 | 1.53 | | | 0.696 | 0.524 | 1.33 J | 0.748 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.005 U | 0.00053 J | 0.00051 J | 0 005 U | 0 005 U | 0.005 U | | 0.005 U | | 0.0011 J | 0.005 U | 0.005 U | 0 005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | | 0.001 U | | 0.001 U | 0.001 U | 0.00022 J | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | 210 | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | 5 U | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | 5 U | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | 210 | 230 | 300 | 190 |
| Ferr c Iron | mg/L | | | | | | | | | | | | 4.1 J | 3 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | 0.1 R | 1.5 J | | |
| Iron | mg/L | | | | | | | | | | | | | | 6.8 | 5.1 |
| Magnesium | mg/L | | | | | | | | | | | | 32 | 33 | 53 | 44 |
| Manganese | mg/L | | | | | | | | | | | | | | 1 | 0.76 |
| Nitrate as N | mg/L | | | | | | | | | | | | 0.05 R | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | 0.05 R | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | 0.23 | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | 0.46 | 0.17 J | 0.31 U | 0.31 U |
| Potassium | mg/L | | | | | | | | | | | | 5.7 | 6 2 | 9.5 | 6.1 |
| Sodium | mg/L | | | | | | | | | | | | 83 | 110 | 39 | 42 |
| **Sample Parameters** | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.33 | 0.24 | 0.67 | 0.36 | 0.13 | 0.13 | 0.18 | 0 14 | 0 09 | 0.16 | 0.11 | 0.2 | 0.88 | 0.23 | 4.2 |
| Oxidation Reduction Potential | mV | -115 | 654 | -100 8 | -119.6 | -91 8 | 102 3 | -98.6 | -51.1 | -129.4 | -95.2 | -131.9 | -91.9 | -244.5 | 11.8 | -3.6 |
| Eh | mV | 85 0 | 854.0 | 99.2 | 80.4 | 108.2 | 302 3 | 101.4 | 148.9 | 70.6 | 104.8 | 68.1 | 108.1 | -44.5 | 211 8 | 196.4 |
| pH | SU | 7.43 | 7.37 | 7.1 | 7.24 | 7.44 | 7.02 | 7.25 | 7 19 | 7 38 | 7.48 | 7.39 | 7.63 | 7.4 | 7.15 | 7.66 |
| Spec f c Conductance | uS/cm | 1525 | 1734 | 1568 | 171.9 | 2251 | 1950 | 1488 | 1244 | 1337 | 1235 | 1463 | 2077 | 1380 | 1060 | 890 |
| Temperature | deg C | 15.29 | 16.16 | 15.77 | 15 | 14.8 | 14.4 | 15.62 | 16.5 | 16.6 | 15.2 | 15.2 | 16.55 | 16.1 | 13.6 | 15.05 |
| Turb dity | NTU | 4.09 | 2.48 | 0.62 | 0.92 | 0.58 | 2.11 | 2.35 | 1 86 | 3.45 | 3.76 | 3.88 | 3.55 | 4.86 | 3.61 | 2.68 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW18 | | | | | | | | | | | | | | | | | GAMW18B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2016-07-13 | 2016-09-08 | 2016-11-09 | | 2017-01-10 | 2017-03-01 | 2017-04-26 | 2017-07-12 | | 2017-08-23 | 2017-10-03 | | 2018-03-14 | 2018-04-23 | 2018-10-25 | 2019-04-29 | 2019-11-07 | 2018-09-10 | 2018-10-25 | | 2019-04-29 | 2019-11-07 |
| Samp e Type | | N | N | FD | N | N | N | N | FD | N | N | FD | N | N | N | N | N | N | N | FD | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1 8 | 3.5 | 1 9 | 1 8 | 1 3 | 1 | 0 77 | 1 2 | 1 2 | 1 5 | 1 9 | 1 9 | | 1 2 | 1 7 | 0 95 | 1 7 | 13 | 12 | 13 | 14 | 11 |
| Ca cium | mg/L | 320 | 610 | 370 | 360 | 330 | 280 | 210 | 280 | 290 | 300 | 380 J | 64 J | | 320 | 230 | 320 | 360 | 260 | 200 | 220 | 240 | 180 |
| Ch oride | mg/L | 17 | 39 | 17 | 17 | 9 3 | 5 | 4 3 | 10 | 10 | 11 | 23 | 23 | | 7 3 | 22 | 12 | 27 | 150 | 140 | 140 | 170 | 140 |
| Fluoride | mg/L | 0 047 J | 0 036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0 057 | 0 074 | 0 15 | 0 77 J | 0 74 | 0 73 | 0 88 | 0 99 |
| pH | SU | 6 95 | 6 83 | | 6 7 | 6 88 | 7 11 | 6 6 | | 6 96 | 7 02 | | 6 91 | 7 2 | 7 21 | 6 54 | 6 71 | 7 18 | 7 73 | | 6 86 | 7 15 | 7 68 |
| Su fate | mg/L | 760 J- | 1400 | 850 | 830 | 640 | 540 | 370 | 600 | 610 | 690 | 960 | 950 | | 670 | 550 | 780 | 920 | 1100 | 1000 | 1100 | 1100 | 840 |
| Total Dissolved Solids | mg/L | 1300 | 2200 | 1500 | 1500 | 1200 | 1000 | 730 | 1100 | 1100 | 1300 | 1600 | 1500 | | 2400 | 1100 | 1400 | 1500 | 2100 | 2000 | 2000 | 2100 | 1500 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 002 U | 0 002 U | 0 00096 J | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | | | 0 002 U | | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U |
| Arsenic | mg/L | 0 0014 J | 0 0023 J | 0 0014 J | 0 00091 J | 0 0014 J | 0 005 U | 0 0015 J | 0 0021 J | 0 0021 J | 0 0011 J | | | 0 005 U | | 0 005 U | 0 00079 J | 0 005 U | 0 0018 J | 0 0026 J | 0 0028 J | 0 0037 J | 0 0041 J |
| Barium | mg/L | 0 038 | 0 047 | 0 041 | 0 039 | 0 037 | 0 024 | 0 021 | 0 051 | 0 052 | 0 055 | | | 0 048 | 0 035 | 0 037 | 0 039 | 0 05 | 0 048 | 0 035 | 0 039 | 0 039 | 0 024 |
| Beryllium | mg/L | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 00094 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 00053 U | 0 001 U |
| Cadmium | mg/L | 8 1E-05 J | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U |
| Chromium | mg/L | 0 002 U | 0 002 U | 0 00067 J | 0 00046 J | 0 0005 J | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | | | 0 002 U | | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U | 0 002 U |
| Cobalt | mg/L | 0 001 U | 0 00023 J | 0 00047 J | 0 0002 J | 0 00024 J | 0 001 U | 0 00023 J | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 00028 J | 0 001 U | 0 00027 J | 0 00026 J | 0 00028 J | 0 00024 J | 0 00024 J |
| Fluoride | mg/L | 0 047 J | 0 036 J | 10 U | 10 U | 5 U | 5 U | 2 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 5 U | 0 057 | 0 074 | 0 15 | 0 77 J | 0 74 | 0 73 | 0 88 | 0 99 |
| Lead | mg/L | 0 001 U | 0 001 U | 0 00051 J | 0 00025 J | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 00067 J | | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U |
| L thium | mg/L | 0 00096 J | 0 008 U | 0 008 U | 0 008 U | 0 00042 J | 0 008 U | 0 008 U | 0 008 U | 0 008 U | 0 008 U | | | 0 008 U | | 0 008 U | 0 008 U | 0 008 U | 0 025 | 0 015 | 0 016 | 0 023 | 0 015 |
| Mercury | mg/L | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 UJ | | | 0 0002 U | | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U | 0 0002 U |
| Molybdenum | mg/L | 0 11 | 0 18 | 0 14 | 0 13 | 0 094 | 0 1 | 0 1 | 0 1 | 0 11 | 0 1 | | | 0 097 | 0 085 | 0 057 | 0 062 | 0 076 | 0 024 | 0 014 | 0 015 | 0 026 | 0 011 |
| Radium Total | pci/L | 5 U | 0 803 | 0 474 | 0 449 | 0 581 U | 0 398 U | 0 384 U | 0 493 | 0 337 U | 0 629 | | | 0 373 U | 0 259 | 0 477 | 0 365 U | | 1 7 | 1 28 | 1 46 | | |
| Radium-226 | pci/L | 1 U | 0 348 | 0 334 U | 0 33 U | 0 325 | 0 13 | 0 131 U | 0 166 J | 0 179 J | 0 332 | | | 0 111 | 0 0715 | 0 291 | 0 325 U | | 0 773 J | 0 717 | 0 748 | 0 41 | |
| Radium-228 | pci/L | 1 U | 0 49 U | 0 455 U | 0 413 U | 0 581 U | 0 398 U | 0 384 U | 0 381 U | 0 337 U | 0 369 U | | | 0 373 U | 0 187 | 0 357 U | 0 365 U | | 0 928 | 0 562 | 0 708 | 0 941 | |
| Selenium | mg/L | 0 01 | 0 018 | 0 0065 | 0 0052 | 0 0099 | 0 011 | 0 0053 | 0 012 | 0 012 | 0 006 | | | 0 009 | 0 0084 | 0 015 | 0 015 | 0 012 | 0 005 U | 0 005 U | 0 005 U | 0 005 U | 0 005 U |
| Thallium | mg/L | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | | | 0 001 U | | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | | 230 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | | 5 U | | | | |
| Alkal nity Total | mg/L | | | | | | | | | | | | | | | 240 | 190 | 250 | 230 | | 230 | 210 | 200 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | | 0 032 J | | | 6 8 J | | 2 9 | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | | 0 05 UJ | | | 0 1 R | | 1 3 J | | |
| Iron | mg/L | | | | | | | | | | | | | | | | 0 16 J | 0 083 J | | | | 3 6 | 3 |
| Magnesium | mg/L | | | | | | | | | | | | | | | 16 | 17 | 23 | 66 | | 58 | 67 | 51 |
| Manganese | mg/L | | | | | | | | | | | | | | | | 0 0047 J | 0 014 J | | | | 0 69 | 0 66 |
| Nitrate as N | mg/L | | | | | | | | | | | | | | | | 0 19 | 0 51 | 0 05 UJ | | | 0 1 U | 0 1 U |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | | 0 05 UJ | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | 0 55 | | | | | 0 05 U | | |
| Phosphorus (as phosphate) | mg/L | | | | | | | | | | | | | | | 0 31 U | 0 14 J | 0 31 UJ | 0 031 U | | 0 31 U | 0 31 U | 0 31 UJ |
| Potassium | mg/L | | | | | | | | | | | | | | | 3 4 J | 2 J | 3 7 J | 7 3 | | 5 7 | 7 8 | 4 4 J |
| Sodium | mg/L | | | | | | | | | | | | | | | 28 | 24 | 39 | 260 | | 240 | 260 | 180 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 4.83 | 4.77 | | 5.93 | 7.52 | 8 86 | 7.79 | | 6.04 | 4.52 | | 5 32 | 6.5 | 8.49 | 3.78 | 7.01 | 2.95 | 0.24 | | 0.29 | 0.92 | 0.36 |
| Oxidation Reduction Potential | mV | 98.9 | 76.8 | | 28.7 | 106.8 | 97.9 | 209.2 | | 203.2 | 24.7 | | 121.9 | -129 6 | -51.6 | -36.6 | 129.2 | -41.1 | -140.7 | | -103.4 | 109.2 | -144.8 |
| Eh | mV | 298.9 | 276.8 | | 228.7 | 306.8 | 297.9 | 409.2 | 200.0 | 403.2 | 224.7 | | 321.9 | 70.4 | 148.4 | 163.4 | 329.2 | 158.9 | 59.3 | | 96.6 | 309.2 | 55.2 |
| pH | SU | 6.95 | 6.83 | | 6.7 | 6.88 | 7 11 | 6.6 | | 6.96 | 7.02 | | 6.91 | 7.2 | 7.21 | 6.54 | 6.71 | 7.18 | 7.73 | | 6.86 | 7.15 | 7.68 |
| Spec f c Conductance | uS/cm | 1474 | 2362 | | 1740 | 1255 | 986 | 970 | | 1299 | 1414 | | 1760 | 905 | 1170 | 1230 | 1060 | 1338 | 3311 | | 2147 | 1902 | 1475 |
| Temperature | deg C | 16 3 | 20.1 | | 16 6 | 9.65 | 8.47 | 11.2 | | 17.9 | 19.8 | | 19.3 | 8.1 | 8.9 | 17.4 | 8 8 | 14.2 | 15.39 | | 14.9 | 11.8 | 13.7 |
| Turb dity | NTU | 3.32 | 1.63 | | 2.38 | 3.05 | 4.44 | 2.48 | | 1.71 | 1.03 | | 4 16 | 4.59 | 0.71 | 1.29 | 4.55 | 2.04 | 2.78 | | 3.58 | 3 21 | 3.14 |

Notes:
CCR = coal combustion res dual
mg/L = m ligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW46 | | | | | | | | GAMW46B | | | | | | | | GAMW52 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2018-06-13 | 2019-03-01 | 2019-04-17 | 2019-06-06 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2018-06-13 | 2019-03-04 | 2019-04-17 | 2019-06-07 | 2019-07-18 | 2019-08-26 | 2019-10-04 | 2019-11-19 | 2018-09-10 | 2018-10-31 | | 2019-05-09 | 2019-11-14 | |
| Samp e Type | | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | N | FD | N | N | FD | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0.055 J | 0.1 U | 0.033 J | 0.1 U | 0.032 J | 0.053 J | 0.043 J | 0.049 J | 0.05 J | 0.05 J | 0.037 J | 0.047 J | 0.03 J | 0.05 J | 0.047 J | 0.046 J | 0.34 | | 0.17 | 0.077 J | | 0.13 |
| Ca cium | mg/L | 56 | 14 | 28 | 25 J- | 25 | 25 | 23 | 27 | 25 | 58 | 58 | 56 | 52 | 58 | 49 | 56 | 75 | | 59 | 52 | | 72 |
| Ch oride | mg/L | 8.4 | 2.4 | 1.9 | | 1 8 | 1.6 | 1.6 | 1.6 | 3 | 7.9 | 7.9 | | 7 2 | 8 | 7.1 | 6.9 | 34 | | 9.1 | 5.5 | | 37 |
| Fluoride | mg/L | 0.052 J | 0.068 | 0.063 | | 0 065 | 0.06 | 0 079 J | 0.062 | 0 048 J | 0.066 | 0.076 | | 0.072 | 0.069 | 0.073 J | 0.072 | 0.36 J | | 0.3 | 0.25 J | | 0.3 |
| pH | SU | 7.93 | 8.17 | 8.23 | 7.52 | 8.15 | 7.9 | 7.81 | 7.77 | 8.2 | 7.11 | 7.99 | 7.58 | 8.18 | 7.62 | 7.44 | 7.47 | 7.5 | | 7.06 | 7.17 | | 7.59 |
| Su fate | mg/L | 55 | 34 | 30 | | 28 | 29 | 30 | 27 | 29 | 64 | 64 | | 64 | 68 | 65 | 64 | 86 | | 39 | 24 | | 67 |
| Total Dissolved Solids | mg/L | 260 | 160 | 150 | | 130 | 150 | 140 J | 140 | 150 | 260 | 290 | | 240 | 220 J | 250 | 240 | 400 | | 250 | 240 | | 350 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0 002 U | 0.002 U | | 0.002 U |
| Arsenic | mg/L | 0.0014 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.00086 J | 0.005 U | 0.0015 J | 0.0012 J | 0.00076 J | 0.005 U | 0.00091 J | 0.00095 J | 0.0013 J | 0.001 J | 0.005 U | | 0 005 U | 0.005 U | | 0 005 U |
| Barium | mg/L | 0.027 | 0.0028 J | 0.0059 | 0.0065 | 0.0054 | 0.0054 | 0 0049 J | 0.0059 | 0.0086 | 0.027 | 0.026 | 0.025 | 0.023 | 0.024 | 0.021 | 0.025 | 0.039 | | 0.019 | 0.015 | | 0.02 |
| Beryllium | mg/L | 0.001 U | 0.005 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00054 J | 0.001 U | 0.001 U | 0 0011 | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.0011 | 0.001 U | | 0 001 U | 0.001 U | | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0.00024 J | 0.001 U | | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0014 J | 0 002 U | 0.002 U | 0.0021 | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0 002 U | 0.002 U | | 0 002 U | 0.002 U | | 0.002 U |
| Cobalt | mg/L | 0.0002 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0 00034 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.00058 J | | 0.00031 J | 0.001 U | | 0.001 U |
| Fluoride | mg/L | 0.052 J | 0.068 | 0.063 | | 0 065 | 0.06 | 0 079 J | 0.062 | 0 048 J | 0.066 | 0.076 | | 0.072 | 0.069 | 0.073 J | 0.072 | 0.36 J | | 0.3 | 0.25 J | | 0.3 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | | 0 001 U | 0.001 U | | 0.001 U |
| L thium | mg/L | 0.008 U | 0 04 U | 0.008 U | 0.008 U | 0.008 U | 0 008 U | 0 008 U | 0.008 U | 0.008 U | 0.0017 J | 0.008 U | 0.008 U | 0.002 J | 0.008 U | 0 008 U | 0 003 J | 0.0017 J | | 0 008 U | 0.008 U | | 0.0025 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | | 0.0002 U |
| Molybdenum | mg/L | 0.0031 J | 0 01 | 0.01 U | 0.01 U | 0.01 U | 0.01 U | 0 0015 J | 0.01 U | 0.0018 J | 0.0024 J | 0.0022 J | 0.0025 J | 0.0028 J | 0.0028 J | 0.0025 J | 0.003 J | 0.005 J | | 0.0035 J | 0.0016 J | | 0.0017 J |
| Radium Total | pci/L | 0.384 U | 0.486 U | 0.33 U | | 0.427 U | 0.505 U | 0.566 | | 0.392 U | 0.402 U | 0.308 U | | 0.427 U | 0.609 U | 0.408 U | | 0.796 | | 1 J | 0.53 U | | |
| Radium-226 | pci/L | 0.244 U | 0.103 U | 0.0708 U | | 0.214 U | 0.0925 UJ | 0 179 J | | 0.223 U | 0.286 | 0.108 | | 0.232 U | 0.105 UJ | 0.192 J | | 0.46 J | | 0 299 J | 0.436 | | |
| Radium-228 | pci/L | 0.384 U | 0.486 U | 0.33 U | | 0.427 U | 0.505 UJ | 0.481 U | | 0.392 U | 0.402 U | 0.308 U | | 0.427 U | 0.609 UJ | 0.408 U | | 0.392 U | | 0 706 J | 0.53 U | | |
| Selenium | mg/L | 0.001 J | 0.025 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.0017 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0 005 U | 0.0014 J | | 0.0017 J | 0.0014 J | | 0.0011 J |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00059 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.00068 J | 0.001 U | | 0 001 U | 0.001 U | | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | | | | | | | | | | | | | | | | 210 | | | | | |
| Alkal nity Carbonate (CO3) | mg/L | | | | | | | | | | | | | | | | | 5 U | | | | | |
| Alkal nity Hydrox de (OH) | mg/L | | | | | | | | | | | | | | | | | 5 U | | | | | |
| Alkal nity Total | mg/L | | | 82 | | | | | 73 | | | 140 | | | | | 130 | 210 | 180 | 190 | 170 | 190 | 190 |
| Ferr c Iron | mg/L | | | | | | | | | | | | | | | | | 0.2 J | 0.1 U | 0.1 U | | | |
| Ferrous Iron | mg/L | | | | | | | | | | | | | | | | | 0.1 R | 0 05 J | 0.05 UJ | | | |
| Iron | mg/L | | | 0.054 J | | | | | 0 2 U | | | 1.5 | | | | | 1.6 | | | | 0.2 U | 0.2 U | 0.2 U |
| Magnesium | mg/L | | | 9.7 | | | | | 7.8 | | | 15 | | | | | 14 | 20 | 16 | 15 | 16 | 20 | 21 |
| Manganese | mg/L | | | 0.0066 J | | | | | 0.015 U | | | 0.26 | | | | | 0.23 | | | | 0.0022 J | 0.017 | 0.02 |
| Nitrate as N | mg/L | | | 0.58 | | | | | 0.48 | | | 0.1 U | | | | | 0.1 U | 1 J | | | 1.9 | 1.1 | 1.1 |
| Nitrite as N | mg/L | | | | | | | | | | | | | | | | | 0.089 J | | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | | | | | | | | | | | | | | | 1.3 | 1.3 | | | |
| Phosphorus (as phosphate) | mg/L | | | 0.16 J | | | | | 0.31 U | | | 0.15 J | | | | | 0.31 U | 0.031 U | 0.31 U | 0.31 U | 0.31 U | 0.31 U | 0.31 U |
| Potassium | mg/L | | | 0.97 J | | | | | 1 J | | | 0.83 J | | | | | 0.82 J | 4.7 | 3 J | 2.9 J | 2.1 J | 3.1 J | 3.3 J |
| Sodium | mg/L | | | 4.6 J | | | | | 2.4 J | | | 5.4 | | | | | 4.6 J | 25 | 13 | 13 | 9 8 | 18 | 21 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.12 | 1.85 | 4.18 | 6.44 | 6.58 | 4.03 | 2.44 | 3 36 | 3 59 | 0.08 | 1.9 | 0.3 | 1.4 | 1.25 | 0.31 | 0.3 | 0.48 | | 0.21 | 6.42 | | 2 2 |
| Oxidation Reduction Potential | mV | -171.4 | 1.9 | 7.7 | 157.6 | 25.5 | 40.6 | 9.16 | -141.1 | -29.4 | 111.9 | -111.1 | -133.1 | -93.9 | -119.9 | 33.7 | -229.6 | -30.3 | | 85.1 | 108.2 | | -43 2 |
| Eh | mV | 28 6 | 201.9 | 207.7 | 357.6 | 225.5 | 240.6 | 209.2 | 58.9 | 170.6 | 311.9 | 88.9 | 66.9 | 106.1 | 80.1 | 233.7 | -29.6 | 169.7 | | 285.1 | 308.2 | 200.0 | 156.8 |
| pH | SU | 7.93 | 8.17 | 8.23 | 7.52 | 8.15 | 7.9 | 7.81 | 7.77 | 8.2 | 7.11 | 7.99 | 7.58 | 8.18 | 7.62 | 7.44 | 7.47 | 7.5 | | 7.06 | 7.17 | | 7.59 |
| Spec f c Conductance | uS/cm | 367 | 155 | 161 | 179 | 153 | 153 | 152 | 132 | 211 | 268 | 294 | 282 | 274 | 284 | 260 | 242 | 0.896 | | 448 | 308 | | 320 |
| Temperature | deg C | 11.4 | 8 | 9.1 | 11.1 | 13.2 | 14.2 | 14.8 | 11.7 | 11.3 | 9.6 | 10.8 | 11 | 11.9 | 12.3 | 12.3 | 11 3 | 19.97 | | 17.6 | 14.2 | | 15.3 |
| Turb dity | NTU | 3.96 | 1.91 | 1.33 | 0.51 | 0.82 | 0.69 | 0.89 | 0 66 | 3.45 | 3.26 | 4.3 | 3.25 | 3.11 | 1.15 | 4.16 | 2.84 | 0.45 | | 0.83 | 0.42 | | 0.74 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW52B | | | | GAMW53 | | | | GAMW53B | | | | | GAMW54 | | | | GAMW54B | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2018-09-11 | 2018-10-31 | 2019-05-09 | 2019-11-14 | 2018-09-11 | 2018-10-30 | 2019-04-30 | 2019-11-14 | 2018-09-11 | 2018-10-30 | | 2019-04-30 | 2019-11-14 | 2018-09-10 | 2018-10-31 | 2019-04-30 | 2019-11-14 | 2018-09-10 | 2018-10-31 | | 2019-05-01 | 2019-11-15 |
| Samp e Type | | N | N | N | N | N | N | N | N | N | FD | N | N | N | N | N | N | N | N | FD | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 0 75 | 0.8 | 1 | 1.3 | 0.19 | 0.25 | 0.056 J | 0.13 | 2.5 | | 3.1 | 2 2 | 0.73 | 0.84 | 0.77 | 0.39 | 0 37 | 5.6 | | 6.5 | 5.9 | 6 |
| Ca cium | mg/L | 160 | 160 | 110 | 130 | 45 | 53 | 17 | 25 | 180 | | 190 | 150 | 140 | 93 | 88 | 93 | 81 | 210 | | 220 | 200 | 240 |
| Ch oride | mg/L | 530 | 470 | 380 | 370 | 4.9 | 4.6 | 1.9 | 3.6 | 90 | | 85 | 81 | 74 | 15 | 10 | 10 | 4 | 100 | | 95 | 110 | 120 |
| Fluoride | mg/L | 10 U | 0.18 | 0 21 J | 0.23 | 0.17 J | 0.17 | 0.05 U | 0.05 U | 0.52 J | | 0.46 | 0.51 | 0.7 | 0 18 J | 0.17 | 0.14 | 0 28 | 0.41 J | | 0.52 | 0.59 | 0.58 |
| pH | SU | 8.3 | 7.1 | 7.42 | 7.34 | 6 | 6.47 | 5.93 | 6 21 | 7.3 | | 7.35 | 7.41 | 7.52 | 6.24 | 7.92 | 6 82 | 7.08 | 6.95 | | 8.71 | 7.27 | 7.2 |
| Su fate | mg/L | 210 | 190 | 220 | 290 | 51 | 56 | 37 | 36 | 430 | | 510 | 340 | 320 | 190 | 150 | 190 | 76 | 750 | | 730 | 710 | 720 |
| Total Dissolved Solids | mg/L | 1500 | 1300 | 1100 | 1100 | 240 | 250 | 130 | 160 | 1100 | | 1100 | 900 | 770 | 500 | 400 | 470 | 350 | 1600 | | 1400 | 1500 | 1400 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.00061 J | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0 0011 J | 0.00074 J | 0 00078 J | 0.001 J | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.0013 J | 0.0016 J | 0.00083 J | 0.0012 J | 0.013 | 0.015 | 0.00097 J | 0.0018 J | 0 00079 J | | 0.00083 J | 0.001 J | 0.0016 J | 0 0024 J | 0.0028 J | 0.0022 J | 0.0045 J | 0.0025 J | | 0.0032 J | 0.0045 J | 0.005 |
| Barium | mg/L | 0 32 | 0 31 | 0.25 | 0.28 | 0 027 | 0.028 | 0.019 | 0.026 | 0.052 | | 0.054 | 0 044 | 0.072 | 0.043 | 0.039 | 0.031 | 0.031 | 0.098 | | 0.093 | 0.08 | 0.084 |
| Beryllium | mg/L | 0.001 U | 0.00042 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0.00059 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Cadmium | mg/L | 0.001 U | 0.00029 J | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.0019 J | 0.0018 J | 0 0012 J | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | | 0.002 U | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.001 U | 0.00032 J | 0.001 U | 0.001 U | 0.00084 J | 0.00099 J | 0 0005 J | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.00053 J | 0.00052 J | 0 00062 J | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| Fluoride | mg/L | 10 U | 0.18 | 0 21 J | 0.23 | 0.17 J | 0.17 | 0.05 U | 0.05 U | 0.52 J | | 0.46 | 0.51 | 0.7 | 0 18 J | 0.17 | 0.14 | 0 28 | 0.41 J | | 0.52 | 0.59 | 0.58 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.0014 | 0.00089 J | 0.00057 J | 0.00063 J | 0.001 U | | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| L thium | mg/L | 0.0041 J | 0.0031 J | 0.0033 J | 0.0071 J | 0.008 U | 0.008 U | 0 008 U | 0.0021 J | 0.0042 J | | 0.0052 J | 0.005 J | 0.0066 J | 0.008 U | 0.008 U | 0.008 U | 0.0023 J | 0.0048 J | | 0.0036 J | 0.0048 J | 0.0074 J |
| Mercury | mg/L | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.014 | 0.015 | 0.0095 J | 0.0086 J | 0 012 | 0.015 | 0 0051 J | 0.011 | 0.0083 J | | 0.0075 J | 0.0098 J | 0.02 | 0.043 | 0.044 | 0.023 | 0 03 | 0.018 | | 0.019 | 0 0085 J | 0.012 |
| Radium Total | pci/L | 3 52 | 5.55 J | 2.63 | | 0.547 U | 1.45 J | 0 344 U | | 1.69 | | 0.48 J | 1.26 | | 0.5 | 1.08 J | 0.393 U | | 2 03 | | 2.7 J | 1.82 | |
| Radium-226 | pci/L | 2 11 | 2.76 J | 1.2 | | 0.257 | 0.795 J | 0 316 U | | 0.789 | | 0 238 J | 0.544 | | 0.385 J | 0 237 J | 0.337 U | | 1 18 J | | 1.35 J | 0.956 | |
| Radium-228 | pci/L | 1.41 | 2.79 J | 1.44 | | 0.547 U | 0.658 J | 0 344 U | | 0.897 | | 0.347 U | 0.719 | | 0.385 U | 0 843 J | 0.393 U | | 0.849 | | 1.35 J | 0.865 | |
| Selenium | mg/L | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 005 U | 0.005 U | 0.005 U | | 0.005 U | 0.005 U | 0.005 U | 0 0017 J | 0.0012 J | 0.0043 J | 0.0035 J | 0.005 U | | 0.005 U | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0 001 U | 0.001 U | 0.001 U | | 0.001 U | 0.00049 J | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | 220 | | | | 120 | | | | 250 | | | | | 150 | | | | 240 | | | | |
| Alkal nity Carbonate (CO3) | mg/L | 5 U | | | | 5 U | | | | 5 U | | | | | 5 U | | | | 5 U | | | | |
| Alkal nity Hydrox de (OH) | mg/L | 5 U | | | | 5 U | | | | 5 U | | | | | 5 U | | | | 5 U | | | | |
| Alkal nity Total | mg/L | 220 | 230 | 220 | 200 | 120 | 140 | 53 | 73 | 250 | 240 | 250 | 260 | 190 | 150 | 160 | 160 | 230 | 240 | 230 | 230 | 250 | 260 |
| Ferr c Iron | mg/L | 5 J | 3.4 | | | 2 J | 1 | | | 3.2 J | 2 3 | 2.7 | | | 0 13 J | 0.14 | | | 5.9 J | 4.5 | 3.4 | | |
| Ferrous Iron | mg/L | 0.1 R | 0.32 J | | | 0 1 R | 0.5 J | | | 0.1 R | 0 56 J | 1 J | | | 0.1 R | 0 029 J | | | 0.1 R | 0.94 J | 1.6 J | | |
| Iron | mg/L | | | 2.7 | 2.5 | | | 0.25 | 0.28 | | | | 3 1 | 2.4 | | | 0.14 J | 0 31 | | | | 5.4 | 5.4 |
| Magnesium | mg/L | 37 | 38 | 30 | 28 | 15 | 15 | 8.9 | 11 | 23 | 24 | 25 | 23 | 19 | 19 | 18 | 21 | 17 | 38 | 38 | 36 | 42 | 46 |
| Manganese | mg/L | | | 0.21 | 0.25 | | | 0 0079 J | 0.015 U | | | | 0.4 | 0.32 | | | 0.0097 J | 0.015 U | | | | 0.48 | 0.51 |
| Nitrate as N | mg/L | 0.05 UJ | | 0.1 U | 0.1 U | 1.3 J | | 1.4 | 0.4 | 0.05 UJ | | | 0.1 U | 0.1 U | 0.028 J | | 0.49 | 0 15 | 0.05 UJ | | | 0.1 U | 0 1 U |
| Nitrite as N | mg/L | 0.05 UJ | | | | 0.03 J | | | | 0.05 UJ | | | | | 0 05 UJ | | | | 0.05 UJ | | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | 0.052 | | | | 0.05 U | | | | 0.099 | 0.74 J- | | | | 0.21 | | | | 0.15 | 0.091 | | |
| Phosphorus (as phosphate) | mg/L | 0.056 | 0.21 J | 0.31 U | 0.11 J | 0.32 | 0.31 U | 0.31 U | 0.31 U | 0.031 U | 0.14 J | 0.52 | 0.31 U | 0.31 U | 0.031 U | 0.31 U | 0.11 J | 0.31 U | 0.079 | 0.31 U | 0.39 | 0.38 | 0.3 J |
| Potassium | mg/L | 6 | 6.4 | 7 | 6.5 | 2 2 | 5 U | 1.3 J | 1.6 J | 4.6 | 5 2 | 5.4 | 4.9 J | 4.5 J | 1.9 | 1.8 J | 1.2 J | 1.6 J | 6.8 | 6.8 | 6.2 | 6 3 | 5.6 |
| Sodium | mg/L | 220 | 250 | 250 | 210 | 6 5 | 7.8 | 4.9 J | 3.9 J | 120 | 130 | 130 | 99 | 75 | 21 | 21 | 15 | 11 | 200 | 200 | 180 | 160 | 140 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | 0.44 | 0.1 | 0.15 | 0.19 | 0.53 | 0.86 | 3.11 | 0 84 | 0 26 | | 0.8 | 0.36 | 0.09 | 0.61 | 1.41 | 0.72 | 0.26 | 0.42 | | 2.12 | 0.42 | 0.31 |
| Oxidation Reduction Potential | mV | -214.9 | -103.5 | 6.31 | -102.9 | -24 6 | -199.5 | 43.7 | -54.8 | -183.2 | | -168 | 27.7 | -75 3 | 107 8 | -294.7 | 48.4 | -69.5 | -123.4 | | -315.7 | -23.1 | -43.3 |
| Eh | mV | -14.9 | 96.5 | 206.3 | 97.1 | 175.4 | 0.5 | 243.7 | 145.2 | 16.8 | | 32.0 | 227.7 | 124 7 | 307 8 | -94.7 | 248.4 | 130.5 | 76.6 | 200.0 | -115.7 | 176.9 | 156.7 |
| pH | SU | 8.3 | 7.1 | 7.42 | 7.34 | 6 | 6.47 | 5.93 | 6.21 | 7.3 | | 7.35 | 7.41 | 7.52 | 6.24 | 7.92 | 6 82 | 7.08 | 6.95 | | 8.71 | 7.27 | 7.2 |
| Spec f c Conductance | uS/cm | 1934 | 2005 | 1652 | 1353 | 307 | 400 | 125 | 155 | 1354 | | 1620 | 1160 | 870 | 675 | 630 | 493 | 374 | 1816 | | 1983 | 1636 | 1310 |
| Temperature | deg C | 17.26 | 16.6 | 15.3 | 16.1 | 21.3 | 20.1 | 11.4 | 17.5 | 20.89 | | 20.4 | 18.7 | 19.7 | 21.2 | 18.53 | 10.5 | 15 3 | 17.6 | | 17.29 | 15.5 | 15.8 |
| Turb dity | NTU | 1.6 | 0.88 | 2.35 | 1.01 | 9.93 | 5.17 | 4.76 | 4.8 | 2.43 | | 3 | 3.45 | 2 5 | 2.03 | 1 | 3 24 | 2.31 | 4.2 | | 1.64 | 4.49 | 1.67 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.

UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

**Appendix A 1 Groundwater Analytical Data**
**CCR Unit Schahfer MSRB MCWB and Drying Area**
**NIPSCO LLC R M Schahfer Generat ng Station**
**Wheatfield ndiana**

| Location | | GAMW55 | | | | GAMW55R | GAMW55B | | | | | GAMW56 | | | | GAMW56B | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample Date | | 2018-09-10 | | 2018-10-29 | | 2019-11-15 | 2018-09-11 | | 2018-10-29 | 2019-05-01 | 2019-11-15 | 2018-09-11 | 2018-10-26 | 2019-04-29 | 2019-11-15 | 2018-09-11 | 2018-10-29 | 2019-04-29 | 2019-11-15 |
| Samp e Type | | FD | N | FD | N | N | FD | N | N | N | N | N | N | N | N | N | N | N | N |
| Chemical Name | Un t | | | | | | | | | | | | | | | | | | |
| **CCR Appendix I I I** | | | | | | | | | | | | | | | | | | | |
| Boron | mg/L | 1.9 | 1.9 | 1.8 | 1.8 | 1.1 | 7.1 | 7.4 | 8 2 | 9.1 | 11 | 0.26 | 0 28 | 0 21 | 0.2 | 1.2 | 1 2 | 2.3 | 3.2 |
| Ca cium | mg/L | 260 | 250 | 270 | 260 | 180 | 250 | 250 | 260 | 210 | 210 | 130 | 110 | 91 | 120 | 140 | 140 | 150 | 150 |
| Ch oride | mg/L | 58 | 59 | 69 | 70 | 61 | 220 | 220 | 190 | 170 | 150 | 3.1 | 2.4 | 3.2 | 2.1 | 50 | 36 | 55 | 64 |
| Fluoride | mg/L | 0 51 J | 0.52 J | 0.47 | 0.47 | 0 62 | 0 29 J | 10 U | 0.25 | 0.31 | 0.31 | 1.2 J | 0.99 | 0 53 | 0.71 | 0.41 J | 0.33 | 0.4 | 0.44 |
| pH | SU | | 6.77 | | 7.04 | 7.46 | 7.31 | | 7.07 | 7.19 | 7.31 | 6 82 | 7.17 | 6.83 | 7.06 | 6.95 | 6.91 | 7.08 | 7.21 |
| Su fate | mg/L | 590 | 600 | 630 | 620 | 480 | 820 | 820 | 910 | 790 | 750 | 57 | 63 | 54 | 56 | 170 | 130 | 260 | 360 |
| Total Dissolved Solids | mg/L | 1200 | 1300 | 1300 | 1300 | 950 | 1800 | 1900 | 1800 | 1700 | 1400 | 470 | 480 | 420 | 440 | 740 | 690 | 830 | 860 |
| **CCR Appendix IV** | | | | | | | | | | | | | | | | | | | |
| Ant mony | mg/L | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 | 0 002 U |
| Arsenic | mg/L | 0.00083 J | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0 0014 J | 0.0011 J | 0.005 U | 0.005 U | 0.005 U | 0.019 | 0.022 | 0.011 | 0.0097 | 0.005 U | 0.005 U | 0.005 | 0 005 U |
| Barium | mg/L | 0 099 | 0.097 | 0.068 | 0.069 | 0.035 | 0.14 | 0.14 | 0.12 | 0.074 | 0.067 | 0.068 | 0.049 | 0.044 | 0.04 | 0.076 | 0 072 | 0.082 | 0.076 |
| Beryllium | mg/L | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| Cadmium | mg/L | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| Chromium | mg/L | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0 002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 U | 0.002 | 0 002 U |
| Cobalt | mg/L | 0.0065 | 0.0058 | 0.0044 | 0.0044 | 0.001 U | 0.00034 J | 0.00028 J | 0.001 U | 0.001 U | 0.001 U | 0.0017 | 0 0053 | 0.0084 | 0.0081 | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| Fluoride | mg/L | 0 51 J | 0.52 J | 0.47 | 0.47 | 0 62 | 0 29 J | 10 U | 0.25 | 0.31 | 0.31 | 1.2 J | 0.99 | 0 53 | 0.71 | 0.41 J | 0.33 | 0.4 | 0.44 |
| Lead | mg/L | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| L thium | mg/L | 0.0021 J | 0.0017 J | 0.008 U | 0.008 U | 0.0035 J | 0 0064 J | 0.0064 J | 0.0054 J | 0 0055 J | 0.0078 J | 0.0034 J | 0.0039 J | 0.0023 J | 0.0053 J | 0.0051 J | 0.0035 J | 0.0044 | 0 0062 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0 0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 | 0.0002 U |
| Molybdenum | mg/L | 0.03 | 0.028 | 0.026 | 0.026 | 0.024 | 0 0057 J | 0.0055 J | 0.0055 J | 0 0046 J | 0.005 J | 0.013 | 0.0094 J | 0.0072 J | 0.0079 J | 0.004 J | 0.003 J | 0.0031 | 0 0064 J |
| Radium Total | pci/L | 1.4 | 0.802 | 0.922 J | 1.24 J | | 3.35 | 3.18 | 3.66 J | 2.08 | | 0.728 | 0.698 J | | | 1.26 | 1.28 J | | |
| Radium-226 | pci/L | 0.574 J | 0.474 J | 0.363 J | 0.447 J | | 1.72 | 1.75 | 1.86 J | 1.15 | | 0.504 | 0.357 J | 0.334 U | | 0.763 | 0.578 J | 0.506 | |
| Radium-228 | pci/L | 0 824 | 0.403 U | 0.559 J | 0.796 J | | 1.63 | 1.43 | 1.79 J | 0.926 | | 0.371 U | 0.429 U | 0.373 U | | 0.493 | 0.698 J | 0.571 | |
| Selenium | mg/L | 0.0037 J | 0.0031 J | 0.0027 J | 0.0027 J | 0.0046 J | 0 005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 U | 0.005 | 0 005 U |
| Thallium | mg/L | 0.00021 J | 0.001 U | 0.00023 J | 0.00022 J | 0.00022 J | 0 001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 | 0 001 U |
| **Supplemental Parameters** | | | | | | | | | | | | | | | | | | | |
| Alkal nity Bicarbonate (HCO3) | mg/L | | 240 | | | | | 230 | | | | 370 | | | | 370 | | | |
| Alkal nity Carbonate (CO3) | mg/L | | 5 U | | | | | 5 U | | | | 5 U | | | | 5 U | | | |
| Alkal nity Hydrox de (OH) | mg/L | | 5 U | | | | | 5 U | | | | 5 U | | | | 5 U | | | |
| Alkal nity Total | mg/L | | 240 | | 240 | 230 | | 230 | 220 | 230 | 230 | 370 | 370 | 300 | 330 | 370 | 410 | 330 | 270 |
| Ferr c Iron | mg/L | | 0.65 J | | 0.19 | | | 5.2 J | 2 5 | | | 13 J | 5.5 | | | 6.4 J | 3.5 | | |
| Ferrous Iron | mg/L | | 0.1 R | | 0 058 J | | | 0.1 R | 2.8 J | | | 0.1 R | 6.5 J | | | 0.1 R | 1.7 J | | |
| Iron | mg/L | | | | | 0.044 J | | | | 4.2 | 4.1 | | | 10 | 3.9 | | | 5.7 | 4.3 |
| Magnesium | mg/L | | 32 | | 39 | 28 | | 46 | 51 | 50 | 42 | 24 | 25 | 27 | 24 | 37 | 38 | 40 | 38 |
| Manganese | mg/L | | | | | 0.22 | | | | 0.58 | 0.46 | | | 0.25 | 0.45 | | | 0 33 | 0.29 |
| Nitrate as N | mg/L | | 0.68 J | | | 1.4 | | 0.05 UJ | | 0.1 U | 0.1 U | 0.05 UJ | | 1.5 | 0.13 | 0.05 UJ | | 0.1 U | 0.1 U |
| Nitrite as N | mg/L | | 0.058 J | | | | | 0.05 UJ | | | | 0.05 UJ | | | | 0.05 UJ | | | |
| Nitrogen Nitrate-Nitrite | mg/L | | | | 0.44 | | | | 0.05 U | | | | 0.062 | | | | 0.05 U | | |
| Phosphorus (as phosphate) | mg/L | | 0.031 U | | 0 31 U | 0.31 U | | 2.1 | 0.7 | 0.31 U | 0.16 J | 0.031 U | 0.31 U | 0.12 J | 0.31 U | 0.045 | 0.15 J | 0.14 J | 0.31 U |
| Potassium | mg/L | | 8.3 | | 9.5 | 7.2 | | 6 | 6 6 | 6.2 | 4.8 J | 2.6 | 2.4 J | 1.6 J | 1.9 J | 3.3 | 3.6 J | 3 7 J | 3.6 J |
| Sodium | mg/L | | 58 | | 72 | 79 | | 200 | 230 | 200 | 180 | 11 | 12 | 6.3 | 5.5 | 50 | 49 | 58 | 62 |
| **Sample Parameters** | | | | | | | | | | | | | | | | | | | |
| Dissolved Oxygen | mg/L | | 1.73 | | 0.33 | 0.17 | 0.72 | | 0.37 | 0.17 | 0.11 | 0.99 | 0.28 | 1.3 | 0.34 | 0.29 | 0.26 | 0.79 | 0.18 |
| Oxidation Reduction Potential | mV | | 21.6 | | -69.4 | -137.9 | -28.9 | | -129.5 | -115.9 | -57.5 | -97.4 | -95.4 | 64 | -86.6 | -102.8 | -44.4 | 31.8 | -105.7 |
| Eh | mV | | 221.6 | 200.0 | 130.6 | 62.1 | 171.1 | | 70.5 | 84.1 | 142.5 | 102.6 | 104.6 | 264.0 | 113.4 | 97.2 | 155.6 | 231.8 | 94 3 |
| pH | SU | | 6.77 | | 7.04 | 7.46 | 7.31 | | 7.07 | 7.19 | 7.31 | 6 82 | 7.17 | 6.83 | 7.06 | 6.95 | 6.91 | 7.08 | 7.21 |
| Spec f c Conductance | uS/cm | | 1493 | | 1574 | 1491 | 1017 | | 2109 | 2201 | 1967 | 749 | 835 | 460 | 466 | 928 | 1036 | 856 | 741 |
| Temperature | deg C | | 21.1 | | 19.4 | 17.9 | 16.7 | | 19.2 | 18.5 | 18.1 | 17 | 15.7 | 8.7 | 14 | 13.9 | 13.8 | 11.6 | 12.9 |
| Turb dity | NTU | | 1.74 | | 0.66 | 3.92 | 2.26 | | 4.38 | 1.74 | 4.77 | 2.91 | 2.99 | 2.31 | 2.01 | 2.96 | 1.45 | 4.77 | 1.4 |

Notes:
CCR = coal combustion res dual
mg/L = m lligrams per liter
mV= millivolts
pci/L= picoCuries per iter
uS/cm = m cro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Un ts
SU = Standard Units

U = Indicates the result was not detected above the method de ection limit (MDL) for the samp e; the quan itation limit (RL) is provided.
J = Indicates the result s estima ed.
J = Indicates the result s estimated and may be biased high.
UJ = Indica es the result was not de ected above the MDL, the estima ed RL is prov ded.
R = Result was rejected dur ng data validation.

Prepared by: DFSC
Checked by: KMC
Rev ewed by MAH

**Appendix A-2: Porewater Analytical Data**
**CCR Unit Schahfer MSRB, MCWB, and Drying Area**
**NIPSCO LLC R. M. Schahfer Generating Station**
**Wheatfield, Indiana**

| SYS_LOC_CODE | | DAPZ-02A | DAPZ-02B | GAPIEZ06 | GAPIEZ06 | GAPIEZ06 |
|---|---|---|---|---|---|---|
| SAMPLE_DATE_yyyy-MM-dd | | 2020-03-03 | 2020-03-03 | 2018-08-09 | 2018-09-13 | 2018-10-31 |
| FRACTION | | T | T | D | T | T |
| Chemical Name | Unit | | | | | |
| **CCR Appendix III** | | | | | | |
| Boron | mg/L | 7.4 | 13.8 | 9.6 | 8.6 | 8.3 |
| Calcium | mg/L | 489 | 175 | 210 | 210 | 210 |
| Chloride | mg/L | 21.9 | 119 | 56 | 58 | 55 |
| Fluoride | mg/L | 0.16 | 0.72 | 0.91 | 1.1 J | 0.92 |
| pH | SU | 7.33 | 7.62 | 7.51 | 7.43 | 9.37 |
| Sulfate | mg/L | 1760 | 2420 | 750 | 720 | 740 |
| Total Dissolved Solids | mg/L | 2810 | 3830 | | 1300 | 1300 |
| **CCR Appendix IV** | | | | | | |
| Antimony | mg/L | 0.001 U | 0.001 U | 0.0014 J | 0.002 U | 0.002 U |
| Arsenic | mg/L | 0.001 U | 0.0018 | 0.011 | 0.011 | 0.012 |
| Barium | mg/L | 0.028 | 0.033 | 0.03 | 0.029 | 0.03 |
| Beryllium | mg/L | 0.0002 U | 0.0002 U | 0.001 U | 0.00052 J | 0.001 U |
| Cadmium | mg/L | 0.00052 | 0.0002 U | 0.001 U | 0.001 U | 0.001 U |
| Chromium | mg/L | 0.002 U | 0.0038 | 0.0023 J+ | 0.002 U | 0.002 U |
| Cobalt | mg/L | 0.0022 | 0.001 U | 0.0004 J | 0.00029 J | 0.001 U |
| Fluoride | mg/L | 0.16 | 0.72 | 0.91 | 1.1 J | 0.92 |
| Lead | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| Lithium | mg/L | 0.008 U | 0.016 | 0.0041 J | 0.0038 J | 0.0033 J |
| Mercury | mg/L | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U | 0.0002 U |
| Molybdenum | mg/L | 0.81 | 0.063 | 0.079 | 0.094 | 0.11 |
| Selenium | mg/L | 0.011 | 0.001 U | 0.001 J | 0.005 U | 0.005 U |
| Thallium | mg/L | 0.001 U | 0.001 U | 0.001 U | 0.001 U | 0.001 U |
| **Supplemental Parameters** | | | | | | |
| Alkalinity, Bicarbonate (HCO3) | mg/L | | | | 170 | |
| Alkalinity, Carbonate (CO3) | mg/L | | | | 5 U | |
| Alkalinity, Hydroxide (OH) | mg/L | | | | 5 U | |
| Alkalinity, Total | mg/L | 99.6 | 224 | 170 | 170 | 160 |
| Ferric Iron | mg/L | | | 2.8 J | 2.7 J | 0.19 |
| Ferrous Iron | mg/L | | | 0.1 U | 0.1 R | 0.088 J |
| Iron | mg/L | 0.61 | 14.2 | | | |
| Magnesium | mg/L | 48.9 | 18.4 | 53 | 51 | 45 |
| Manganese | mg/L | 0.12 | 0.7 | | | |
| Nitrate | mg/L | | | 0.031 J | | |
| Nitrate as N | mg/L | 0.75 J+ | 0.1 U | | 0.05 U | |
| Nitrite as N | mg/L | | | | 0.05 U | |
| Nitrogen, Nitrate-Nitrite | mg/L | | | | | 0.038 J |
| Phosphorus (as phosphate) | mg/L | | | 0.031 U | 0.028 J | 0.12 J |
| Potassium | mg/L | 59.1 | 17.5 | 3.9 J | 4.1 | 5 U |
| Sodium | mg/L | 286 | 1050 | 100 | 110 | 99 |
| **Field Parameters** | | | | | | |
| Dissolved Oxygen | mg/L | 0.61 | 0.00 | 1.33 | 0.7 | 0.80 |
| Oxidation-Reduction Potential | mV | 66.9 | -197.4 | -130 8 | -118 2 | -261 |
| Eh | mV | 266.9 | 2.6 | 69.2 | 81.8 | -61 |
| pH | SU | 7.33 | 7.62 | 7.51 | 7.43 | 9.37 |
| Specific Conductance | uS/cm | 3025 | 4772 | 1518 | 1371 | 1672 |
| Temperature | deg C | 9.4 | 11.7 | 15.91 | 16.1 | 15.1 |
| Turbidity | NTU | 28.9 | 2.74 | 3.73 | 4.29 | 3.4 |

Notes:
CCR= coal combustion residual
mg/L = milligrams per liter
mV= millivolts
uS/cm = micro Siemens per centimeter
deg C = degrees Celsius
NTU = Nephelometric Turbidity Units
SU = Standard Units
"U" = Indicates he result was not detected above the method detection limit (MDL) for the sample; he quantitation limit (RL) is provided.
"J" = Indicates the result is estimated.
"J+" = Indicates the result is estimated and may be biased high.
"R"= Indicates the result was rejected during data validation.

Prepared by: DFSC
Checked by: KMC
Reviewed by: MAH

**APPENDIX B**

# Groundwater Flow Model Technical Memorandum

# TECHNICAL MEMORANDUM

**DATE** November 12, 2020

**TO** Danielle Sylvia Cofelice, PE and PJ Nolan, Ph.D.

**CC** Mark Haney, Joe Gormley, and Rens Verburg

**FROM:** Ross Bennett, PE(NH) and Brandon Poiencot, PE

**GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM**

**R.M. SCHAHFER GENERATING STATION**

## 1.0 GROUNDWATER MODELING

This Memorandum presents Golder's summary of groundwater modeling activities associated with the evaluation of hydrogeologic conditions and potential remedial designs at the R.M. Schahfer Generating Station in Wheatfield, Indiana (the Site).

A steady state groundwater flow model was developed and calibrated. This memorandum includes the following to document development of the groundwater flow model and includes:

1) Objectives;
2) Groundwater Flow Model Development
3) Model selection (numerical);
4) Model Geometry
5) Boundary Conditions
6) Input Parameters
7) Model Calibration and Verification
8) Parameter Sensitivity analysis
9) Design Simulations
10) Summary

The conceptual model (including geology, hydrology, lithology and analytical data) used to support numerical model development is described Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019).

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## 1.1 Objectives

The primary objective of the modeling was to simulate the groundwater flow conditions in the area surrounding R.M. Schahfer Generating Station to support evaluation of the remedy design including the feasibility of Monitored Natural Attenuation (MNA) as part of the assessment of corrective measures process for the Coal Combustion Residuals (CCR) surface impoundments for the Site.

The general scope of the groundwater modeling is to:

- Simulate the groundwater flow regimes on Site;
- Predict the travel times and flow paths of unattenuated particles originating at areas impacted by metals contamination;
- Inform remedy design (e.g., groundwater pump and treat design);
- Inform the groundwater monitored natural attenuation study.

# 2.0 GROUNDWATER FLOW MODEL DEVELOPMENT

## 2.1 Numerical Implementation

Golder developed the groundwater flow model for the site using the USGS MODFLOW-2005 Modular Three-Dimensional Finite-Difference Groundwater Flow Model (Harbaugh, 2005). The pre- and post-processing software used for the modeling was Groundwater Vistas (Vistas) Version 7.24 (Environmental Simulations Inc.).

Development of a numerical groundwater flow model involved the following steps:

- Definition of the model geometry including lateral and vertical extent, number and thickness of model layers, and grid spacing
- Definition and placement of model boundary conditions
- Selection of input parameters such as hydraulic conductivity (horizontal and vertical) and precipitation recharge

The following sections describe the steps used to develop the model.

## 2.2 Model Geometry

The finite-difference model grid location is shown on Attachment A**.** The model area (excluding no-flow cells) is approximately 10,800 feet (along x-axis) by 12,300 feet (along y-axis) at the widest points. The southwest corner of the model grid (model coordinates 0, 0) corresponds with Site coordinates 2165530.5N and 2962863.0 W (Indiana State Plane West). The model grid is oriented parallel with cardinal directions. The model grid contains 504 rows and 432 columns. The grid cell size in the XY direction is uniform, at 25 feet by 25 feet across the entire model domain. Based on geologic and hydrogeologic conditions discussed in Section 2.0 of the CCR Assessment of Corrective Measures Report (Golder, 2019), the model utilizes three layers, with the lowermost layer representing the medium to coarse sand and the upper two layers representing the fine sands. Layers 1 and 2 have the same hydraulic properties, but they were divided to focus boundary condition cells in the upper portion of the aquifer using Layer 1. The base of Layer 3 is the top of the shale bedrock surface and ranges from 597 to 624

feet mean sea level (MSL). The surface topography is based on publicly available lidar data and ranges from 646 to 723 feet MSL. A cross section of model geometry along model column 200 is shown on Attachment B.

## 2.3 Model Boundary Conditions

Boundary conditions in groundwater models consist of physical and hydraulic boundaries within the model area. Physical boundary conditions are well-defined geologic and hydrologic features that influence groundwater flow patterns. The following sections describe the boundary conditions used in the model.

### 2.3.1 Constant Head Boundaries

Constant head boundaries (CHB) were assigned along an unnamed stream in Layer 1 in the southwestern corner of the model to recreate the approximate constant hydraulic heads where long-term average stream water levels are expected to remain relatively constant. Constant heads were also used within the basins that are surrounded slurry walls to simulate the average surface water elevations in the basins. The modeled CHBs are shown on Attachment C and summarized on Table B-1.

### 2.3.2 River Boundary Conditions

River boundary conditions are a head-dependent boundary condition, where the model computes the difference in head between the boundary and the model cell where the boundary is defined. River Boundary condition cells were used for the Kankakee River, as shown in Attachment A. River heads were defined by two USGS gauging stations that fell within the model grid, downstream at USGS station 05517530 in Kouts and upstream at USGS 05517500 at Dunns Bridge. The river width was estimated from satellite imagery, the river bottom elevation was assumed to be three feet lower than the stage, and the bed thickness was assumed to be 10 feet. The hydraulic conductivity of the river was set through calibration at 64.5 feet/day which is slightly lower than aquifer hydraulic conductivities discussed in Section 1.1.2.4.1.

### 2.3.3 Stream Boundary Conditions

Stream boundary conditions are a simplified version of river boundary conditions where surface water flow is monitored by MODFLOW and water is added or removed from the model based on the stream stage. Stream boundary conditions were used in the Model for Davis Ditch and Stalbaum Ditch, as shown in Attachment C. The stream width was estimated from satellite imagery, the stream bottom elevation was assumed to be 0.5 to 2 feet lower than the stage depending on size of the stream, and the bed thickness was assumed to be 5 feet. The hydraulic conductivity of the river was set at 100 feet/day for Davis Ditch where loosing stream conditions were expected, and at 0.5 feet per day in Stalbaum ditch where perched conditions where assumed to exist. Stream stage was set off two gauging stations in Stalbaum, SW-04 and SW-10. Elsewhere stream stage was estimated from surface elevations and then refined through model calibration.

### 2.3.4 Drain Boundary Conditions

Drain boundary conditions are a version of river/stream boundary conditions that can only remove water from the model. Drain boundary conditions were used in the Model for intermittent streams and drainage ditches, as shown in Attachment C. The drain width was estimated from satellite imagery, the drain bottom elevation was assumed to be 1 to 2 feet lower than the stage depending on size of the drain, and the bed thickness was assumed to be 1 foot. The hydraulic conductivity of the drains was set at 100 feet/day. Drain stage was estimated from surface elevations and then refined through model calibration.

### 2.3.5 No Flow Boundaries

No flow boundaries were assigned to the northeast side of the Kankakee River, as shown in Attachment C.

### 2.3.6 Horizontal Flow Barriers

A hydraulic flow barrier (HFB) or wall is a condition that limits flow between adjacent cells based on an assigned thickness and hydrologic conductivity. To model the slurry walls that are present around ponds, Golder used the HFB boundary condition with an assigned thickness of 1 foot and a horizontal hydraulic conductivity (K) value of 0.0000001 to model slurry walls that surround the basins. The location of HFB boundaries are presented in Attachment C

## 2.4 Model Input Parameters

The following paragraphs describe the input parameter data used for the model. Golder simulated steady state conditions in the model. Transient dependent parameters such as porosity and storage/storativity were not included in the model calibration process.

### 2.4.1 Hydraulic Conductivity

Golder based hydraulic conductivity values for the Site model on pumping test analysis results as discussed in Section 6.0 of the AT-01 Aquifer Test Report (Golder, 2020) and summarized in Table B-2. Golder used these results to assign initial hydraulic conductivity values to the groundwater flow model, and to check that the hydraulic conductivity values resulting from model calibration were within the range of values observed. Golder assigned a uniform Kx/Ky hydraulic conductivity value of 215 feet/day and a Kz of 21.5 feet/day across the entire model area for Layers 1 and 2. Layer 3 had a slightly lower hydraulic conductivity of 200 feet/day and a Kz of 20.0 feet/day across the entire model area. These hydraulic conductivities are based on a best fit from model calibration, and are within range of measured conductivities.

### 2.4.2 Precipitation Recharge

Precipitation recharge is the amount of precipitation that recharges the aquifer, which is generally the precipitation rate minus losses due to runoff and evapotranspiration. Recharge rates calculated for the area were presented in Letsinger (2015) and used in the model. After model calibration a best fit recharge value of 7.1 inches per year (0.00162 feet/day) was established, which was similar to the published rates. A recharge rate of 0.04 inches/year (0.00001 ft/day) was used for the capped landfill areas. Precipitation recharge rates are shown in Attachment D.

### 2.4.3 Groundwater Extraction and Recharge Wells

Groundwater extraction or recharge wells are present on and adjacent to the Site and were modeled in all versions of the model, as shown in Attachment D. The well field located on the northeast corner of the model contains eight wells that remove a total of 55,343 cubic feet/day. In the central portion of the Site the 5 cooling tower wells and two Miox wells remove a total of 7,701 cubic feet/day, and just west of the Site on well on the adjacent property removes 9,625 cubic feet/day.

# 3.0 MODEL CALIBRATION AND VERIFICATION

Model calibration consists of successive refinement of the model property assignments and input data from initial assumptions/estimates to improve the fit between observed and model-predicted results. A solution of a groundwater flow model problem requires information including aquifer parameters such as hydraulic conductivity, spatial boundary conditions, and the location and magnitude of applied stresses, such as recharge and drainage.

A solution is attained only when the proper combination of the above parameters and inputs are selected such that the physical problem is accurately represented by the model. The calibrated model described below should be considered a limited hydrologic effort founded on the available information within the context of necessary simplifying assumptions.

The purpose of the calibration effort was to simulate "steady-state" groundwater flow conditions that approximate the general flow patterns inferred from September 2019 groundwater level measurements. The model was calibrated through trial-and-error adjustment of model parameter values and through use of Model-Independent PEST, developed by Watermark Computing, to refine aquifer parameters. PEST allows model input parameters to be adjusted automatically over a given range until the model predicted head matches the observed head with the lowest possible numerical difference, referred to as the calibration residual (Doherty, 2016). Golder set the allowable range of parameter adjustment in PEST to represent realistic values as determined by previously published literature for the region and aquifer tests at the Site.

At each well location, the head residuals were calculated in Groundwater Vistas as the difference between the measured and simulated head values. Positive residual values indicate simulated head values were lower than measured elevations, while negative residual values indicate simulated head values were higher than measured elevations.

As a measure of the accuracy of the model, Groundwater Vistas calculates summary statistics using calculated residuals, which are used as measures of error in the calibrated model. The residual mean (RM) is the arithmetic mean of all calculated residual values. The absolute residual mean (ARM) is the arithmetic mean of the absolute value of the residuals (i.e., all negative residuals are considered positive). The root mean square error (RMSE) is the square root of the mean of the squared value of target residuals. Other statistics such as the residual standard deviation (RSD) (i.e., the square root of the variance [the average of the squared deviations from the mean]), and the sum of squared residuals (SSR) (computed by squaring each residual and adding them together) can also be useful in evaluation of the calibration process. While calibrating the model, Golder selected parameters estimated by PEST that were within a valid range from published literature or Site-specific data that resulted in improved calibration summary statistics.

## 3.1 Simulated Heads Calibrated to September 2019 Conditions

Measured groundwater elevations for 112 monitoring points from September 2019 were used for calibration, as presented in Table B-3. The model files for September 2019 calibration simulation use the root file name *V12_2019.* The simulated heads and residuals for targets screened in Layer 1 are presented in Attachment F. Based on the simulated contours of groundwater elevation, groundwater flows from the south/southwest toward the Site before it travels to the Kankakee River in the north/northeast.

A comparison of model-predicted versus observed September 2019 potentiometric heads for the 112 selected calibration points resulted in a RM of -0.36 feet and a RMSE of 0.72 feet. The calibration statistics for the model are presented in Table B-4. The RM of -0.36 feet, represents 4.9 percent of the total measured head difference for the model area (approximately 7.41 feet). The absolute residual mean for the model run is 0.57 feet, which is 7.7 percent of the total hydraulic head difference for the entire modeling area. The residual mean and the absolute residual mean are within the generally accepted standard of 10 percent of the total hydraulic head difference for the modeling area.

### 3.1.1 Water Balance

An effective measure of model calibration is the analysis of the water budget calculated by MODFLOW. The model provides flows across boundaries, flows to and from all sources and sinks, and flows generated by storage. Inflows into the model include:

- Constant head boundaries: 16,716 $ft^3/d$,
- Rivers: 165,339 $ft^3/d$,
- Streams: 182,984 $ft^3/d$ and
- Recharge: 545,949 $ft^3/d$.

Outflows in the model include

- Constant head boundaries: 5,640 $ft^3/d$,
- Wells: 70,469 $ft^3/d$,
- Rivers: 474,633 $ft^3/d$,
- Streams: 400,512 $ft^3/d$, and
- Drains: 45,574 $ft^3/d$.

The outflow deficit is 85,842 cubic feet per day ($ft^3/d$), which is equivalent to error between outflow and inflow estimates of approximately 8.9 percent.

### 3.1.2 Numerical Model Verification

Model verification was performed using a second water level calibration data set from October 2018. The model input parameter values defined in the September 2019 simulation were maintained. The verification data is presented in Table B-5. The model files for the October 2018 conditions use the root file name *V12.1_2019*. The verification results indicate a RM of 0.33 feet, which represents 4.1 percent of the total hydraulic head difference for the model area. The absolute residual mean for this simulation was 0.52 feet, which is 6.5 percent of the total hydraulic head difference for the entire model area. The verification statistics suggests that the model is calibrated and verified.

## 4.0 DESIGN SIMULATIONS

Using the calibrated model, Golder used MODPATH (Pollack, 1989) to simulate travel times for particles released from the metals cleaning basin. Particles were started in Layer 3 of the model to simulate the release of contaminants in the deeper part of the aquifer where Boron concentrations exceeded 10 micrograms/liter. Effective porosity of the aquifer was varied between 0.16, 0.3, and 0.46 to represent values within the expected range for medium to fine sand. The length of the particle traces produced by MODPATH along with travel time estimates were used to calculate average groundwater velocities. These travel time calculations are presented in Table B-6.

## 5.0 GROUNDWATER MODELING SUMMARY

Through standard numerical groundwater modeling procedures, Golder developed a steady state groundwater flow model for the Site that is considered calibrated and verified. This model was utilized to inform the groundwater monitored natural attenuation study by simulating travel times for particles released from the metals cleaning basin.

# 6.0 REFERENCES

Doherty, 2016. PEST, Model-Independent Parameter Estimation. User Manual 6th Edition.

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Letsinger, S. L., 2015, Map of Indiana showing near-surface aquifer recharge: Indiana Geological Survey Miscellaneous Map 92, scale 1:500,000.

Pollock, D.W., 1989 Documentation of computer programs to compute and display pathlines using results from the U.S. Geological Survey modular three-dimensional finite-difference groundwater flow model. U.S. Geological Survey, Open File Report 89-381.

## List of Attachments:

Attachment A Model Grid

Attachment B Cross Section of Model Grid

Attachment C Boundary Conditions

Attachment D Precipitation Recharge Zones

Attachment E Active Pumping Wells

Attachment F Model Calibration – September 2019

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Table B-2 Site Pumping Test Results

Table B-3 Measured Groundwater Elevations - September 2019

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Table B-5 Verification Residuals and Summary Statistics – October 2018

Table B-6 Travel Time Simulations

**Table B-1 Boundary Conditions**
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**Constant Head Boundaries**

| Name | Layer | Reach | Starting Head (ft) | Ending Head (ft) |
|---|---|---|---|---|
| Intake Settling Basin | 1 | 104 | 675 0 | 675.0 |
| Final Settling Basin | 1 | 101 | 675 0 | 675.0 |
| Drying Area | 1 | 100 | 672 0 | 672.0 |
| Unnamed SW. Stream | 1 | 1 | 663.17 | 661.20 |

**Rivers**

| Name | Layer | Starting Stage (ft) | Starting Bed Elevation (ft) | Ending Stage (ft) | Ending Bed Elevation (ft) | Starting Width (ft) | Ending Width (ft) | Length (ft) | Thickness of Bed (ft) | Hydraulic Conductivity (ft/d) |
|---|---|---|---|---|---|---|---|---|---|---|
| Kakakanee River | 1 | 651.82 | 649.10 | 646.72 | 644.01 | 135 28 | 159.88 | 24.0 | 10.0 | 64.41 |

**Streams**

| Name | Layer | Starting Stage (ft) | Starting Bed Elevation (ft) | Ending Stage (ft) | Ending Bed Elevation (ft) | Starting Width (ft) | Ending Width (ft) | Length (ft) | Thickness of Bed (ft) | Hydraulic Conductivity (ft/d) | Slope of Channel (ft/ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Davis Ditch | 1 | 661.99 | 659.99 | 650.29 | 646.31 | 20.05 | 74.80 | 50 | 10.0 | 63.41 | 0.001 |
| Stalbaum Ditch | 1 | 660.74 | 659.74 | 654.5 | 652.0 | 10.07 | 50 | 28 | 1.0 | 50 | 0.001 |
| Fisher Ditch | 1 | 661.49 | 659.49 | 660.88 | 658.88 | 30.04 | 32.08 | 51 | 5.0 | 100 | 0.001 |
| Stalbaum South Ancillary Ditch | 1 | 661.50 | 660 0 | 659.21 | 657.76 | 2.06 | 29.93 | 31 | 1.0 | 10 | 0.001 |
| Stalbaum East Ancillary Ditch | 1 | 661 0 | 655.36 | 657.17 | 655.21 | 18.80 | 30.36 | 13 | 5.0 | 0.1 | 0.001 |
| Coal Yard Ditch | 1 | 660.7 | 659.00 | 660.7 | 659 | 5.0 | 5.0 | 50 | 1.0 | 50 | 0.001 |

**Drains**

| Name | Layer | Starting Stage (ft) | Ending Stage (ft) | Starting Width (ft) | Ending Width (ft) | Length (ft) | Thickness of Bed (ft) | Hydraulic Conductivity (ft/d) |
|---|---|---|---|---|---|---|---|---|
| Sands Ditch | 1 | 662 0 | 654.1 | 1 0 | 5 | 38 | 1 | 50 |
| W. Sands Drain | 1 | 660 0 | 655 6 | 2 | 2 | 27 | 1 | 50 |
| Hilliard St Ditch | 1 | 659 | 659 | 2 | 2 | 24 | 1 | 10 |
| N. LF Drain | 1 | 661 | 661 | 8 8 | 8 8 | 50 0 | 1.0 | 62.0 |
| S. LF Drain | 1 | 661 | 661 | 8 8 | 8 8 | 50 0 | 1.0 | 62.0 |
| W. LF Drain | 1 | 661 | 661 | 5 | 5 | 50 | 2 | 100 |

**Hydraulic Flow Barriers (Slurry Walls)**

| Name | First Layer | Last Layer | Thickness (ft) | Hydraulic Conductivity (ft/d) |
|---|---|---|---|---|
| Intake Settling Basin Slurry Wall | 1 | 3 | 1 | 1.00E-07 |
| Final Settling Basin Slurry Wall | 1 | 3 | 1 | 1.00E-07 |
| Drying Area Slurry Wall | 1 | 3 | 1 | 1.00E-06 |

**Table B-2: Site Pumping Test Results**
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**NIPSCO LLC R. M. Schahfer Generating Station**

| Pumping Test Results | | Estimated Hydraulic Conductivity (ft/d) |
|---|---|---|
| SHALLOW WELLS | *Minimum:* | 192 |
| | *Maximum:* | 363 |
| | *Arithmetic Mean:* | 266 |
| DEEP WELLS | *Minimum:* | 234 |
| | *Maximum:* | 320 |
| | *Arithmetic Mean:* | 268 |

**Table B-3: Measured Groundwater Elevations - September 2019**
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**NIPSCO LLC R. M. Schahfer Generating Station**

| Well ID | Layer | Groundwater Elevation (ft msl) |
|---|---|---|
| GAMW01 | 1 | 658.89 |
| GAMW01B | 3 | 658.72 |
| GAMW03 | 1 | 659.84 |
| GAMW03B | 3 | 659.26 |
| GAMW07 | 1 | 660.74 |
| GAMW07B | 3 | 660.79 |
| GAMW08 | 1 | 658.87 |
| GAMW08B | 3 | 658.98 |
| GAMW09 | 1 | 659.27 |
| GAMW09B | 3 | 658.87 |
| GAMW12 | 1 | 658.64 |
| GAMW12B | 3 | 658.66 |
| GAMW13 | 1 | 658.35 |
| GAMW13B | 3 | 658.37 |
| GAMW14 | 1 | 658.14 |
| GAMW14B | 3 | 658.12 |
| GAMW15 | 1 | 660.35 |
| GAMW15B | 3 | 660.33 |
| GAMW16 | 1 | 659.31 |
| GAMW16B | 3 | 659.46 |
| GAMW17B | 3 | 658.92 |
| GAMW18 | 1 | 658.92 |
| GAMW18B | 3 | 659.17 |
| GAMW20 | 1 | 658.21 |
| GAMW24 | 1 | 658.66 |
| GAMW24B | 2 | 658.73 |
| GAMW25 | 1 | 658.41 |
| GAMW25B | 2 | 658.41 |
| GAMW26 | 1 | 658.33 |
| GAMW26B | 3 | 658.26 |
| GAMW27 | 1 | 658.29 |
| GAMW27B | 3 | 658.32 |
| GAMW29 | 1 | 657.48 |
| GAMW29B | 3 | 657.48 |
| GAMW30 | 1 | 657.42 |
| GAMW30B | 3 | 657.51 |
| GAMW31 | 1 | 657.24 |
| GAMW31B | 2 | 657.25 |
| GAMW32 | 1 | 657.19 |
| GAMW32B | 3 | 657.15 |
| GAMW33 | 1 | 657.04 |
| GAMW33B | 3 | 657.13 |
| GAMW34 | 1 | 657.58 |

**Table B-3: Measured Groundwater Elevations - September 2019**
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| Well ID | Layer | Groundwater Elevation (ft msl) |
|---|---|---|
| GAMW34B | 3 | 657.59 |
| GAMW35B | 2 | 658.16 |
| GAMW36 | 1 | 656.67 |
| GAMW36B | 3 | 656.69 |
| GAMW37B | 2 | 657.26 |
| GAMW38 | 1 | 657.91 |
| GAMW38B | 3 | 657.91 |
| GAMW39 | 2 | 657.88 |
| GAMW39B | 3 | 657.84 |
| GAMW40 | 1 | 657.66 |
| GAMW40B | 3 | 657.65 |
| GAMW42 | 1 | 658.12 |
| GAMW42B | 3 | 658.13 |
| GAMW43 | 1 | 657.83 |
| GAMW43B | 3 | 657.83 |
| GAMW44 | 1 | 657.71 |
| GAMW44B | 3 | 657.69 |
| GAMW45B | 3 | 654.52 |
| GAMW46 | 1 | 655.22 |
| GAMW46B | 3 | 655.21 |
| GAMW48 | 1 | 654.5 |
| GAMW48B | 3 | 654.51 |
| GAMW49 | 1 | 656.26 |
| GAMW49B | 3 | 656.34 |
| GAMW50 | 1 | 656.37 |
| GAMW50B | 3 | 656.35 |
| GAMW51 | 1 | 658.07 |
| GAMW51B | 3 | 658.19 |
| GAMW52 | 1 | 657.81 |
| GAMW52B | 3 | 657.82 |
| GAMW53 | 1 | 658.04 |
| GAMW53B | 3 | 658.21 |
| GAMW54 | 1 | 657.87 |
| GAMW54B | 3 | 657.82 |
| GAMW55B | 3 | 657.78 |
| GAMW56 | 1 | 657.81 |
| GAMW56B | 3 | 657.77 |
| GAMW02 | 1 | 660.14 |
| GAMW05 | 1 | 658.17 |
| GAMW06 | 1 | 659.65 |
| GAMW10 | 1 | 657.63 |
| GAMW11 | 1 | 657.37 |
| GAMW20B | 3 | 658.25 |

**Table B-3: Measured Groundwater Elevations - September 2019**
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| Well ID | Layer | Groundwater Elevation (ft msl) |
|---|---|---|
| MW-1D | 3 | 659.11 |
| MW-1S | 2 | 659.09 |
| MW-2S | 2 | 657.7 |
| MW-3D | 3 | 656.68 |
| MW-4S | 2 | 657.08 |
| MW-5D | 3 | 658.17 |
| MW-5S | 2 | 658.14 |
| MW-6D | 3 | 654.1 |
| MW-6S | 2 | 654.07 |
| MW-7D | 3 | 656.12 |
| MW-7S | 2 | 656.1 |
| MW-8S | 3 | 654.65 |
| MW-9D | 3 | 655.18 |
| MW-9S | 3 | 655.14 |
| MW-10D | 3 | 658.66 |
| MW-10S | 1 | 658.61 |
| MW-11D | 3 | 656.75 |
| MW-11S | 2 | 656.73 |
| MW-12D | 3 | 656.97 |
| MW-12S | 2 | 656.95 |
| MW-13D | 3 | 657.2 |
| MW-13S | 2 | 657.17 |
| MW-14D | 2 | 656.51 |
| MW-14S | 2 | 656.54 |
| SW-4 | 1 | 661.48 |
| SW-10 | 1 | 660 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
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| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Layer 1 | | | |
| GAMW01 | 658.89 | 658.87 | 0.02 |
| GAMW03 | 659.84 | 660.22 | -0.38 |
| GAMW07 | 660.74 | 662.14 | -1.40 |
| GAMW08 | 658.87 | 658.87 | 0.00 |
| GAMW09 | 659.27 | 659.05 | 0.22 |
| GAMW12 | 658.64 | 658.58 | 0.06 |
| GAMW13 | 658.35 | 658.50 | -0.15 |
| GAMW14 | 658.14 | 658.57 | -0.43 |
| GAMW15 | 660.35 | 662.08 | -1.73 |
| GAMW16 | 659.31 | 659.11 | 0.20 |
| GAMW18 | 658.92 | 659.30 | -0.38 |
| GAMW20 | 658.21 | 658.72 | -0.51 |
| GAMW24 | 658.66 | 659.16 | -0.50 |
| GAMW25 | 658.41 | 658.67 | -0.26 |
| GAMW26 | 658.33 | 658.34 | -0.01 |
| GAMW27 | 658.29 | 658.09 | 0.20 |
| GAMW29 | 657.48 | 658.19 | -0.71 |
| GAMW30 | 657.42 | 658.20 | -0.78 |
| GAMW31 | 657.24 | 658.12 | -0.88 |
| GAMW32 | 657.19 | 657.99 | -0.80 |
| GAMW33 | 657.04 | 657.92 | -0.88 |
| GAMW34 | 657.58 | 658.44 | -0.86 |
| GAMW36 | 656.67 | 657.59 | -0.92 |
| GAMW38 | 657.91 | 658.24 | -0.33 |
| GAMW40 | 657.66 | 658.27 | -0.61 |
| GAMW42 | 658.12 | 658.62 | -0.50 |
| GAMW43 | 657.83 | 658.54 | -0.71 |
| GAMW44 | 657.71 | 658.56 | -0.85 |
| GAMW46 | 655.22 | 654.39 | 0.83 |
| GAMW48 | 654.5 | 654.25 | 0.25 |
| GAMW49 | 656.26 | 656.37 | -0.11 |
| GAMW50 | 656.37 | 656.86 | -0.49 |
| GAMW51 | 658.07 | 658.84 | -0.77 |
| GAMW52 | 657.81 | 657.89 | -0.08 |
| GAMW53 | 658.04 | 658.21 | -0.17 |
| GAMW54 | 657.87 | 658.36 | -0.49 |
| GAMW56 | 657.81 | 658.51 | -0.70 |
| GAMW02 | 660.14 | 659.81 | 0.33 |
| GAMW05 | 658.17 | 658.77 | -0.60 |
| GAMW06 | 659.65 | 660.42 | -0.77 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
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**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW10 | 657.63 | 658.34 | -0.71 |
| GAMW11 | 657.37 | 658.19 | -0.82 |
| MW-10S | 658.61 | 659.16 | -0.55 |
| SW-4 | 661.48 | 657.77 | 3.71 |
| SW-10 | 660 | 659.21 | 0.79 |
| **Layer 2** | | | |
| GAMW24B | 658.73 | 659.16 | -0.43 |
| GAMW25B | 658.41 | 658.67 | -0.26 |
| GAMW31B | 657.25 | 658.12 | -0.87 |
| GAMW35B | 658.16 | 659.00 | -0.84 |
| GAMW37B | 657.26 | 658.24 | -0.98 |
| GAMW39 | 657.88 | 658.29 | -0.41 |
| MW-1S | 659.09 | 659.72 | -0.63 |
| MW-2S | 657.7 | 658.54 | -0.84 |
| MW-4S | 657.08 | 657.79 | -0.71 |
| MW-5S | 658.14 | 658.13 | 0.01 |
| MW-6S | 654.07 | 654.60 | -0.53 |
| MW-7S | 656.1 | 656.26 | -0.16 |
| MW-11S | 656.73 | 657.28 | -0.55 |
| MW-12S | 656.95 | 657.48 | -0.53 |
| MW-13S | 657.17 | 657.95 | -0.78 |
| MW-14S | 656.54 | 657.27 | -0.73 |
| **Layer 3** | | | |
| GAMW01B | 658.72 | 658.87 | -0.15 |
| GAMW03B | 659.26 | 660.22 | -0.96 |
| GAMW07B | 660.79 | 660.99 | -0.20 |
| GAMW08B | 658.98 | 658.87 | 0.11 |
| GAMW09B | 658.87 | 659.05 | -0.18 |
| GAMW12B | 658.66 | 658.58 | 0.08 |
| GAMW13B | 658.37 | 658.50 | -0.13 |
| GAMW14B | 658.12 | 658.57 | -0.45 |
| GAMW15B | 660.33 | 662.22 | -1.89 |
| GAMW16B | 659.46 | 659.11 | 0.35 |
| GAMW17B | 658.92 | 659.55 | -0.63 |
| GAMW18B | 659.17 | 659.30 | -0.13 |
| GAMW26B | 658.26 | 658.34 | -0.08 |
| GAMW27B | 658.32 | 658.13 | 0.19 |
| GAMW29B | 657.48 | 658.19 | -0.71 |
| GAMW30B | 657.51 | 658.20 | -0.69 |
| GAMW32B | 657.15 | 657.98 | -0.83 |
| GAMW33B | 657.13 | 657.92 | -0.79 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW34B | 657.59 | 658.44 | -0.85 |
| GAMW36B | 656.69 | 657.59 | -0.90 |
| GAMW38B | 657.91 | 658.24 | -0.33 |
| GAMW39B | 657.84 | 658.29 | -0.45 |
| GAMW40B | 657.65 | 658.27 | -0.62 |
| GAMW42B | 658.13 | 658.62 | -0.49 |
| GAMW43B | 657.83 | 658.54 | -0.71 |
| GAMW44B | 657.69 | 658.56 | -0.87 |
| GAMW45B | 654.52 | 653.66 | 0.86 |
| GAMW46B | 655.21 | 654.39 | 0.82 |
| GAMW48B | 654.51 | 654.24 | 0.27 |
| GAMW49B | 656.34 | 656.36 | -0.02 |
| GAMW50B | 656.35 | 656.86 | -0.51 |
| GAMW51B | 658.19 | 658.84 | -0.65 |
| GAMW52B | 657.82 | 657.88 | -0.06 |
| GAMW53B | 658.21 | 658.21 | 0.00 |
| GAMW54B | 657.82 | 658.36 | -0.54 |
| GAMW55B | 657.78 | 658.47 | -0.69 |
| GAMW56B | 657.77 | 658.51 | -0.74 |
| GAMW20B | 658.25 | 658.72 | -0.47 |
| MW-1D | 659.11 | 659.72 | -0.61 |
| MW-3D | 656.68 | 657.50 | -0.82 |
| MW-5D | 658.17 | 658.13 | 0.04 |
| MW-6D | 654.1 | 654.61 | -0.51 |
| MW-7D | 656.12 | 656.26 | -0.14 |
| MW-8S | 654.65 | 654.32 | 0.33 |
| MW-9D | 655.18 | 654.27 | 0.91 |
| MW-9S | 655.14 | 654.28 | 0.86 |
| MW-10D | 658.66 | 659.16 | -0.50 |
| MW-11D | 656.75 | 657.27 | -0.52 |
| MW-12D | 656.97 | 657.48 | -0.51 |
| MW-13D | 657.2 | 657.95 | -0.75 |
| MW-14D | 656.51 | 657.27 | -0.76 |

| Calibration Parameter | Value |
|---|---|
| Residual Mean (ft) | -0.36 |
| Redsidual Standard Deviation (ft) | 0.63 |
| Absolute Residual Mean (ft) | 0.57 |
| Residual Sum of Squares | 59 |
| RMS Error | 0.72 |
| Minimum Residual (ft) | -1.89 |
| Maximum Residual (ft) | 3.71 |

**Table B-4: Calibration Residuals and Summary Statistics - September 2019**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Range of Observations (ft) | | | 7.41 |
| Scaled Residual Standard Deviation | | | 0.085 |
| Scaled Absolute Mean | | | 0.076 |
| Scaled RMS (%) | | | 9.8 |
| Number of Observations | | | 112 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Layer 1 | | | |
| GAMW01 | 659.19 | 658.87 | 0.32 |
| GAMW03 | 660.82 | 660.22 | 0.60 |
| GAMW07 | 659.27 | 660.62 | -1.35 |
| GAMW08 | 659.06 | 658.87 | 0.19 |
| GAMW09 | 660.34 | 659.05 | 1.29 |
| GAMW12 | 658.84 | 658.58 | 0.26 |
| GAMW13 | 658.72 | 658.50 | 0.22 |
| GAMW14 | 659.55 | 658.57 | 0.98 |
| GAMW15 | 659.10 | 660.00 | -0.90 |
| GAMW16 | 659.07 | 659.11 | -0.04 |
| GAMW18 | 659.57 | 659.30 | 0.27 |
| GAMW20 | 659.81 | 658.72 | 1.09 |
| GAMW24 | 659.90 | 659.16 | 0.74 |
| GAMW25 | 659.67 | 658.67 | 1.00 |
| GAMW26 | 659.73 | 658.34 | 1.39 |
| GAMW27 | 659.67 | 658.09 | 1.58 |
| GAMW29 | 658.28 | 658.19 | 0.09 |
| GAMW30 | 658.62 | 658.20 | 0.42 |
| GAMW31 | 658.13 | 658.12 | 0.01 |
| GAMW32 | 657.99 | 657.99 | 0.00 |
| GAMW33 | 657.84 | 657.92 | -0.08 |
| GAMW34 | 658.47 | 658.44 | 0.03 |
| GAMW36 | 657.71 | 657.59 | 0.12 |
| GAMW38 | 659.19 | 658.24 | 0.95 |
| GAMW40 | 658.76 | 658.27 | 0.49 |
| GAMW42 | 658.40 | 658.62 | -0.22 |
| GAMW43 | 658.16 | 658.54 | -0.38 |
| GAMW44 | 657.95 | 658.56 | -0.61 |
| GAMW46 | 655.25 | 654.39 | 0.86 |
| GAMW48 | 654.68 | 654.25 | 0.43 |
| GAMW49 | 656.86 | 656.37 | 0.49 |
| GAMW50 | 657.22 | 656.86 | 0.36 |
| GAMW51 | 658.42 | 658.84 | -0.42 |
| GAMW52 | 657.99 | 657.89 | 0.10 |
| GAMW53 | 658.14 | 658.21 | -0.07 |
| GAMW54 | 658.47 | 658.36 | 0.11 |
| GAMW56 | 658.86 | 658.51 | 0.35 |
| GAMW02 | 660.52 | 659.81 | 0.71 |
| GAMW05 | 658.53 | 658.77 | -0.24 |
| GAMW06 | 658.63 | 660.42 | -1.79 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW10 | 658.61 | 658.34 | 0.27 |
| GAMW11 | 657.97 | 658.19 | -0.22 |
| MW-10S | 659.83 | 659.16 | 0.67 |
| SW-4 | 662.48 | 657.77 | 4.71 |
| SW-10 | 660.45 | 659.21 | 1.24 |
| **Layer 2** | | | |
| GAMW24B | 659.95 | 659.16 | 0.79 |
| GAMW25B | 659.69 | 658.67 | 1.02 |
| GAMW31B | 658.14 | 658.12 | 0.02 |
| GAMW35B | 659.16 | 659.00 | 0.16 |
| GAMW37B | 658.42 | 658.24 | 0.18 |
| GAMW39 | 659.08 | 658.29 | 0.79 |
| MW-1S | 659.76 | 659.72 | 0.04 |
| MW-2S | 658.58 | 658.54 | 0.04 |
| MW-4S | 657.62 | 657.79 | -0.17 |
| MW-5S | 659.47 | 658.13 | 1.34 |
| MW-6S | 654.83 | 654.60 | 0.23 |
| MW-7S | 656.72 | 656.26 | 0.46 |
| MW-11S | 657.55 | 657.28 | 0.27 |
| MW-12S | 657.68 | 657.48 | 0.20 |
| MW-13S | 657.97 | 657.95 | 0.02 |
| MW-14S | 657.49 | 657.27 | 0.22 |
| **Layer 3** | | | |
| GAMW01B | 659.23 | 658.87 | 0.36 |
| GAMW03B | 660.31 | 660.22 | 0.09 |
| GAMW07B | 659.29 | 660.56 | -1.27 |
| GAMW08B | 659.12 | 658.87 | 0.25 |
| GAMW09B | 659.94 | 659.05 | 0.89 |
| GAMW12B | 657.90 | 658.58 | -0.68 |
| GAMW13B | 658.70 | 658.50 | 0.20 |
| GAMW14B | 658.50 | 658.57 | -0.07 |
| GAMW15B | 659.13 | 660.03 | -0.90 |
| GAMW16B | 659.14 | 659.11 | 0.03 |
| GAMW17B | 659.18 | 658.84 | 0.34 |
| GAMW18B | 660.15 | 659.30 | 0.85 |
| GAMW26B | 659.66 | 658.34 | 1.32 |
| GAMW27B | 659.70 | 658.13 | 1.57 |
| GAMW29B | 658.43 | 658.19 | 0.24 |
| GAMW30B | 658.71 | 658.20 | 0.51 |
| GAMW32B | 657.95 | 657.98 | -0.03 |
| GAMW33B | 657.89 | 657.92 | -0.03 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| GAMW34B | 658.46 | 658.44 | 0.02 |
| GAMW36B | 657.72 | 657.59 | 0.13 |
| GAMW38B | 659.21 | 658.24 | 0.97 |
| GAMW39B | 659.04 | 658.29 | 0.75 |
| GAMW40B | 658.68 | 658.27 | 0.41 |
| GAMW42B | 658.41 | 658.62 | -0.21 |
| GAMW43B | 658.10 | 658.54 | -0.44 |
| GAMW44B | 657.91 | 658.56 | -0.65 |
| GAMW45B | 654.52 | 653.66 | 0.86 |
| GAMW46B | 655.24 | 654.39 | 0.85 |
| GAMW48B | 654.67 | 654.24 | 0.43 |
| GAMW49B | 656.94 | 656.36 | 0.58 |
| GAMW50B | 657.25 | 656.86 | 0.39 |
| GAMW51B | 658.58 | 658.84 | -0.26 |
| GAMW52B | 658.00 | 657.88 | 0.12 |
| GAMW53B | 658.24 | 658.21 | 0.03 |
| GAMW54B | 658.42 | 658.36 | 0.06 |
| GAMW55B | 658.68 | 658.47 | 0.21 |
| GAMW56B | 658.87 | 658.51 | 0.36 |
| GAMW20B | 659.85 | 658.72 | 1.13 |
| MW-1D | 659.76 | 659.72 | 0.04 |
| MW-3D | 657.50 | 657.50 | 0.00 |
| MW-5D | 659.47 | 658.13 | 1.34 |
| MW-6D | 654.86 | 654.61 | 0.25 |
| MW-7D | 656.70 | 656.26 | 0.44 |
| MW-8S | 654.80 | 654.32 | 0.48 |
| MW-9D | 655.15 | 654.27 | 0.88 |
| MW-9S | 655.14 | 654.28 | 0.86 |
| MW-10D | 659.83 | 659.16 | 0.67 |
| MW-11D | 657.52 | 657.27 | 0.25 |
| MW-12D | 657.64 | 657.48 | 0.16 |
| MW-13D | 657.96 | 657.95 | 0.01 |
| MW-14D | 657.46 | 657.27 | 0.19 |

| Calibration Parameter | Value |
|---|---|
| Residual Mean (ft) | 0.33 |
| Redsidual Standard Deviation (ft) | 0.71 |
| Absolute Residual Mean (ft) | 0.52 |
| Residual Sum of Squares | 69 |
| RMS Error | 0.78 |
| Minimum Residual (ft) | -1.79 |
| Maximum Residual (ft) | 4.71 |

**Table B-5: Verification Residuals and Summary Statistics – October 2018**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| Name | Observed Groundwater Elevation (ft msl) | Computed Groundwater Elevation (ft msl) | Residual (ft) |
|---|---|---|---|
| Range of Observations (ft) | | | 7.96 |
| Scaled Residual Standard Deviation | | | 0.09 |
| Scaled Absolute Mean | | | 0.066 |
| Scaled RMS (%) | | | 9.9 |
| Number of Observations | | | 112 |

**Table B-6: Travel Time Simulations**
**Groundwater Flow Model Technical Memorandum**
**NIPSCO LLC R. M. Schahfer Generating Station**

| | Shallow Flow Paths | | | | Deep Flow Paths | | | |
|---|---|---|---|---|---|---|---|---|
| **Starting Well** | **GAMW-16** | **GAMW-18** | **GAMW-17B** | **GAMW-09B** | **GAMW-16B** | **GAMW-18B** | **GAMW-17B** | **GAMW-09B** |
| **Ending Well** | **GAMW-53** | **GAMW-55** | **GAMW-54B** | **GAMW-54B** | **GAMW-53B** | **GAMW-55B** | **GAMW-54B** | **GAMW-54B** |
| **Distance (ft)** | **1521** | **1964** | **1200** | **1714** | **1521** | **1964** | **1200** | **1714** |
| **Effective Porosity = 16%** | | | | | | | | |
| Travel Time (years) | 4.8 | 11.0 | 4.5 | 8.9 | 5.0 | 11.0 | 5.5 | 9.0 |
| Velocity (ft/year) | 317 | 179 | 267 | 193 | 304 | 179 | 218 | 190 |
| Time to Davis Ditch (years) | 5.5 | - | - | - | 6 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 27 | 49 | 41 | - | 28.5 | 45 | 41 |
| **Effective Porosity = 30%** | | | | | | | | |
| Travel Time (years) | 8.5 | 19.8 | 8.0 | 16.0 | 8.9 | 20.0 | 10.0 | 16.5 |
| Velocity (ft/year) | 179 | 99 | 150 | 107 | 171 | 98 | 120 | 104 |
| Time to Davis Ditch (years) | 10 | - | - | - | 9.9 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 49.8 | 79 | 75 | - | 51.5 | 80 | 76 |
| **Effective Porosity = 46%** | | | | | | | | |
| Travel Time (years) | 13.0 | 31.0 | 12.0 | 25.0 | 13.5 | 29.0 | 15.0 | 25.0 |
| Velocity (ft/year) | 117 | 63 | 100 | 69 | 113 | 68 | 80 | 69 |
| Time to Davis Ditch (years) | 15 | - | - | - | 15 | - | - | - |
| Time to property boundry near GAMW46B (years) | - | 76.8 | 122 | 117 | - | 77 | 130 | 120 |

**Notes:**
ft = feet



NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHIGAN CITY GENERATING STATION

MODEL GRID

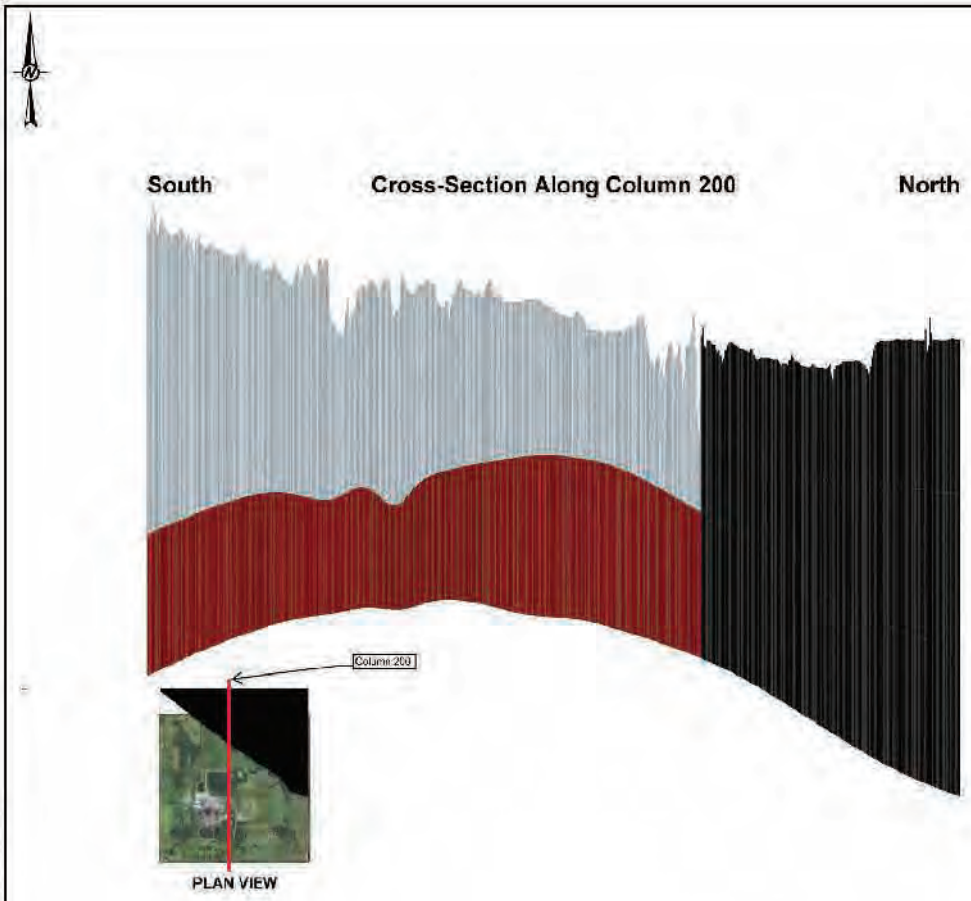
GOLDER

DESIGNED RWB

APPROVED RWB

19121587

A




NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

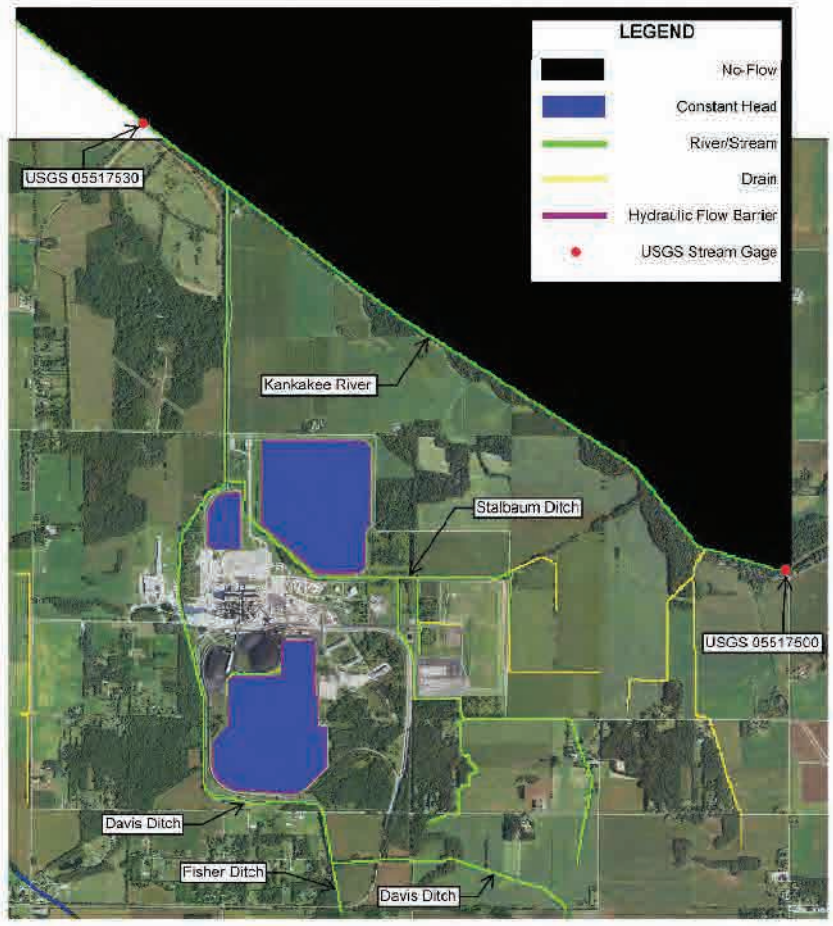
CROSS SECTION OF MODEL GRID

GOLDER

DESIGNED RWB
APPROVED MWD

19121587

B




NORTH [N]
1. BASED ON NAD83 (2011) 2010

REFERENCE(S)
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

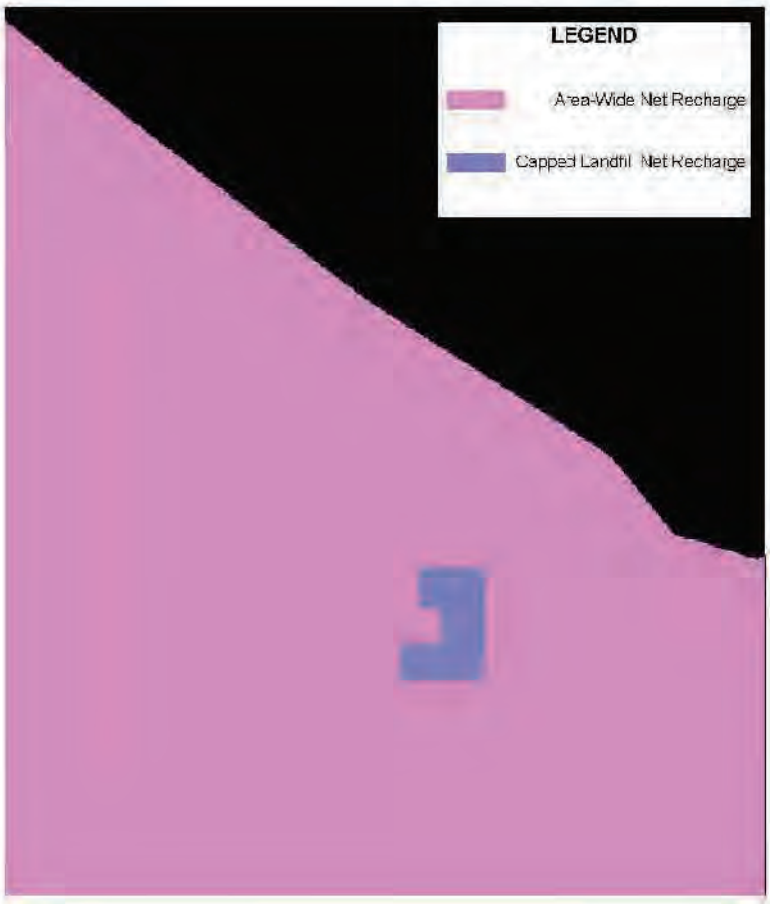
PROJECT
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE
**BOUNDARY CONDITIONS**

CONSULTANT
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2023-12-22 |
| DESIGNED | RWB |
| PREPARED | SR |
| REVIEWED | RP |
| APPROVED | RWB |

PROJECT NO.: 19431587 | CONTROL: - | REV: - | REVISION: C




NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRD, MCWD, AND DRYING AREA
MICHAEL G GIBSON GENERATING STATION

**PRECIPITATION RECHARGE ZONES**

GOLDER

DESIGNED RWS

19121587

D



LEGEND

Well Location

0 700 1,400

Feet

1:1 - 1,667 (at)

NOTE(S)

1. DIGITIZATION MODEL VER. 2019.

REFERENCE(S)

1. COORDINATE SYSTEM: NAD 1983 STATE PLANE INDIANA WEST FIPS 1302 FEET
2. 2019 NAIP IMAGERY RETRIEVED FROM ESRI ARCGIS ONLINE IMAGERY SERVICE LAYER

CLIENT

NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT

GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE

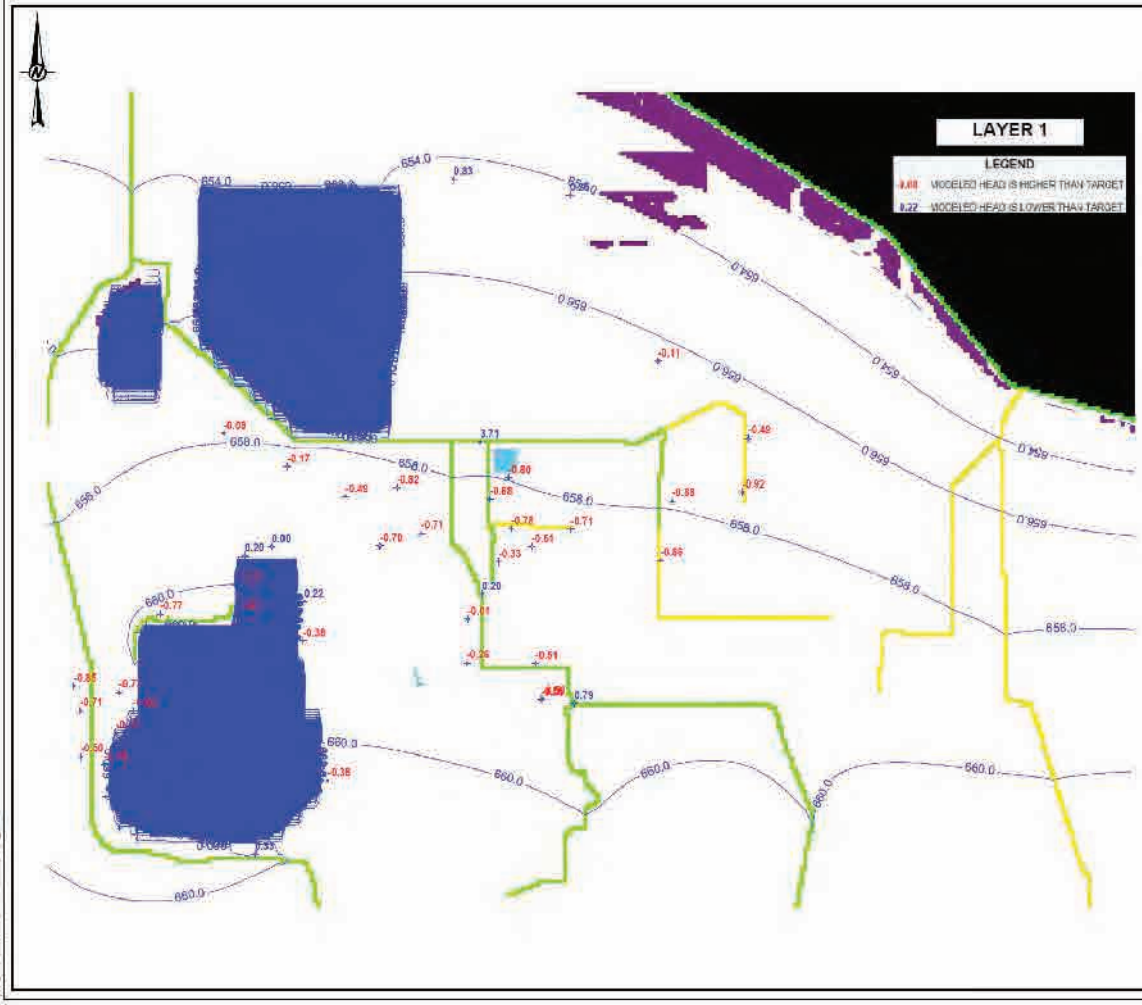
ACTIVE PUMPING WELLS

CONSULTANT

GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2022-12-09 |
| DESIGNED | RWS |
| PREPARED | SR |
| REVIEWED | RP |
| APPROVED | DAH |

PROJECT NO. 19101567 | CONTROL - | REV. - | FIGURE NO. E




NOTE(S):
1. BASED ON MODEL V12_2019

REFERENCE(S):
1. COORDINATE SYSTEM: WGS 1984 WEB MERCATOR AUXILIARY SPHERE

CLIENT:
NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC

PROJECT:
GROUNDWATER FLOW MODEL TECHNICAL MEMORANDUM
MSRB, MCWD, AND DRYING AREA
NIPSCO R.M. SCHAHFER GENERATING STATION

TITLE:
MODEL CALIBRATION - SEPTEMBER 2019

CONSULTANT:
GOLDER

| | |
|---|---|
| YYYY-MM-DD | 2020-12-22 |
| DESIGNED | RWS |
| PREPARED | SR |
| REVIEWED | RP |
| APPROVED | RWS |

PROJECT NO.: 19121567 | CONTROL: - | REV.: - | FIG. NO.: F




golder.com

**APPENDIX P**

# Corrective Measures Selection of Remedy, Semi-Annual Progress Reports #21-01, #21-02, and #22-01

# TECHNICAL MEMORANDUM

**DATE** April 9, 2021 **Project No.** 19121567

**TO** Joe Kutch, Team Leader Environmental Compliance
Northern Indiana Public Service Company LLC (NIPSCO LLC)

**CC** Jeff Loewe (NIPSCO LLC), Joe Gormley, Danielle Sylvia Cofelice, Jim Peace, Krysta Cione

**FROM** Mark Haney **EMAIL mhane @golder.com**

**RE: NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC
R.M. SCHAHFER GENERATING STATION, CCR UNIT CONSISTING OF MSRB, MCWB AND DA
CORRECTIVE MEASURES SELECTION OF REMEDY, SEMI-ANNUAL PROGRESS REPORT 21-01**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC) and in conformance with 40 Code of Federal Regulations (CFR) §257.97(a), Golder Associates Inc. (Golder) has prepared this semi-annual progress report for the NIPSCO LLC R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. This report summarizes progress toward selection of a Corrective Measures remedy for three Coal Combustion Residuals (CCR) impoundments (the Material Storage Runoff Basin MSRB , Metal Cleaning Waste Basin MCWB , and Drying Area DA ), collectively referred to as the Multi-Cell Unit (MCU). Specifically, this semi-annual progress report summarizes actions completed since the submittal of the third semi-annual progress report on October 9, 2020.

In April 2019, Golder prepared an Assessment of Corrective Measures (ACM) to address detections of Appendix IV parameters in groundwater downgradient of the MCU above the groundwater protection standards (GWPS). Specifically, the ACM addressed cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. In addition, the ACM addressed boron because of detections above the Indiana Department of Environmental Management (IDEM) 4 milligrams per liter (mg/l) groundwater screening level and based on information suggesting the United States Environmental Protection Agency (USEPA) is considering adding it to the Appendix IV list. The ACM was prepared in conformance with applicable requirements of 40 CFR §257.96 and was certified by a qualified Indiana-licensed professional engineer on April 19, 2019. Following certification, the ACM was placed in the facility operating record and NIPSCO LLC posted it to their publicly-accessible CCR website.

As discussed in the ACM, NIPSCO LLC plans to close the MCU by removal in accordance with 40 CFR §257.102(c). NIPSCO LLC initially submitted a Closure Application to IDEM in April 2019 and has since provided supplemental information in response to IDEM review comments. NIPSCO LLC continues to refine the Closure Application, which is currently under additional review by IDEM. Modifications to the closure approach and Closure Application will impact the ACM and selection of a groundwater corrective measure(s).

The ACM initially identified eight potential Corrective Measure alternatives to be considered for implementation following excavation and closure of the CCR Unit. However, Golder determined that additional data and further evaluation were required to select a remedy from among these options. Concurrent with IDEM review of the Closure Application and further development by NIPSCO LLC of the closure detailed design, Golder performed

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additional field investigations to collect Site-specific data and conducted analyses of recent and historical information. The following remedy selection-related activities have been performed in the past six months:

- In October 2020, Golder collected groundwater data from three piezometers installed in April 2020, northwest of the CCR Unit. Golder used these data along with data from May, July, August, and September 2020 to refine groundwater flow maps in the near vicinity of the CCR Unit. Golder will continue to collect groundwater surface elevation and groundwater quality data during succeeding monitoring events.
- In November 2020, Golder completed a monitored natural attenuation (MNA) Tier I-III evaluation report[1] that summarized its evaluations of the feasibility, mechanisms, rates, and stability of MNA as a potential remedy for groundwater impacts at the Site.
- In November 2020, Golder prepared a summary of the results of groundwater modeling activities associated with the evaluation of hydrogeologic conditions and potential remedial designs.[2]
- In November 2020, Golder prepared an ACM Addendum[3] (ACM Addendum 1) to supplement the findings of the 2019 ACM and provide further details of Golder s evaluation of the potential corrective measures for RMSGS. ACM Addendum 1 specifically focused on the following requirements under 40 CFR §257.96(c):

  *"The assessment under paragraph (a) of this section must include an analysis of the effectiveness of potential corrective measures in meeting all of the requirements and objectives of the remedy as described under §257.97 addressing at least the following:*
  1) *The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies including safety impacts, cross-media impacts, and control of exposure to any residual contamination;*
  2) *The time required to begin and complete the remedy;*
  3) *The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s)."*

  In addition, ACM Addendum 1 included copies of the MNA Tier I-III evaluation report and the summary of groundwater modeling activities.
- From October 2020 through April 2021, NIPSCO LLC continued to refine the Closure Application/Design of the MCU in response to IDEM comments.

Following final closure design for the MCU and IDEM acceptance of the Closure Application as complete, which is expected in summer 2021, Golder will prepare another Addendum to the ACM (ACM Addendum 2) to reevaluate the list of potential corrective measures identified in the ACM based on their compatibility with the final closure design.

Throughout the spring-fall 2021 timeframe, Golder will continue to collect and evaluate additional information and perform an engineering review of the potential Corrective Measures, consistent with timing and implications of the Closure Application IDEM review, NIPSCO LLC public meeting, and IDEM approval processes. For these reviews, Golder will place emphases on identifying critical data gaps, understanding and reacting to impacts of

[1] Golder, November 2020. Monitored Natural Attenuation Evaluation for the R.M. Schahfer Generating Station

[2] Golder, November 12, 2020. Groundwater Flow Model Technical Memorandum for the R M. Schahfer Generating Station

[3] Golder, November 30, 2020. CCR Assessment of Corrective Measures Report Addendum for the R.M. Schahfer Generating Station

newly gathered information on previous assumptions and/or conclusions, identifying and researching applicability of emerging technologies, and monitoring changing conditions and future plans for the Site and their impacts on the remedy process. Golder will summarize these additional evaluations along with a summary NIPSCO LLC's progress toward selection of remedy for groundwater Corrective Measures at the MCU in the next semi-annual progress report.

# TECHNICAL MEMORANDUM

**DATE** October 11, 2021 **Project No.** 19121567

**TO** Joe Kutch, Team Leader - Environmental Compliance
Northern Indiana Public Service Company LLC

**CC** Jeff Loewe (NIPSCO LLC), Joe Gormley, Danielle Sylvia Cofelice, Jim Peace, Krysta Cione

**FROM** Mark Haney **EMAIL mhane @golder.com**

**RE: NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC**
**R.M. SCHAHFER GENERATING STATION, CCR UNIT CONSISTING OF MSRB, MCWB AND DA**
**CORRECTIVE MEASURES SELECTION OF REMEDY, SEMI-ANNUAL PROGRESS REPORT 21-02**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO) and in conformance with 40 Code of Federal Regulations (CFR) §257.97(a), Golder Associates Inc. (Golder), *a member of WSP,* has prepared this semi-annual progress report for the NIPSCO R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. This report summarizes progress toward selection of a Corrective Measures remedy for three Coal Combustion Residuals (CCR) impoundments (the Material Storage Runoff Basin MSRB , Metal Cleaning Waste Basin MCWB , and Drying Area DA ), collectively referred to as the Multi-Cell Unit (MCU). Specifically, this semi-annual progress report summarizes actions completed since the submittal of the fourth semi-annual progress report on April 9, 2021.

In April 2019, Golder prepared an Assessment of Corrective Measures (ACM) to address detections of Appendix IV parameters in groundwater downgradient of the MCU above the groundwater protection standards (GWPS). Specifically, the ACM addressed cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. In addition, the ACM addressed boron because of detections above the Indiana Department of Environmental Management (IDEM) 4 milligrams per liter (mg/l) groundwater screening level and based on information suggesting the United States Environmental Protection Agency (USEPA) is considering adding it to the Appendix IV list. The ACM was prepared in conformance with applicable requirements of 40 CFR §257.96 and was certified by a qualified Indiana-licensed professional engineer on April 19, 2019. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website.

In November 2020, based upon informal feedback from USEPA officials regarding their interpretation of ACM content, Golder prepared an Addendum (hereinafter Addendum 1) to the 2019 ACM in accordance with the requirements of 40 CFR §257.96. Addendum 1 was certified by a qualified Indiana-licensed professional engineer on November 30, 2020. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In July 2021, consistent with changes to the MCU closure design and resultant impacts on remedy alternatives, Golder prepared a second Addendum (hereinafter Addendum 2) to the 2020 ACM in accordance with the requirements of 40 CFR §257.96. Addendum 2 was certified by a qualified Indiana-licensed professional engineer on July 29, 2021. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. For the purposes of this progress report the initial ACM and all Addenda are collectively referred to simply as the ACM.

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As discussed in the ACM, NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c). NIPSCO initially submitted a Closure Application to IDEM in April 2019. On May 13, 2021, NIPSCO submitted a final Closure Application to IDEM that modified the closure design and provided supplemental information in response to IDEM review comments. The final Closure Application, which included a low permeability cap design, is currently under review by IDEM. The final Closure Application includes modifications to the closure approach and low permeability cap design that impacts the ACM findings and final selection of a groundwater corrective measure(s).

The ACM initially identified eight potential Corrective Measure alternatives to be considered for implementation following excavation and closure of the MCU. However, Golder determined that additional data and further evaluation were required to select a remedy from among these options. Concurrent with IDEM review of the Closure Application and further development by NIPSCO of the closure detailed design, Golder performed additional field investigations to collect Site-specific data and conducted analyses of recent and historical information. The following remedy selection-related activities have been performed in the past six months:

- From April 2021 through May 2021, NIPSCO LLC continued to refine the Closure Application/Design of the MCU in response to IDEM comments and submitted the final Closure Application on May 13, 2021.
- Following submittal of the final Closure Application and confirmation that IDEM was in general agreement with the modified cap design, Golder prepared the MCU Assessment of Corrective Measures - Addendum 2 to reevaluate the list of potential corrective measures identified in the ACM based on their compatibility with the modified cap design. ACM Addendum 2 revised and updated information provided in the predecessor documents and incorporated the low permeability cap design in all corrective measures alternatives identified in the ACM and Addendum 1, effectively eliminating four of the ACM alternatives from further consideration.
- From August through October 2021, Golder performed additional engineering evaluations of the four remaining alternatives taking into consideration the low permeability cap design and its impact on the selection of remedy for groundwater Corrective Measures.
- During the spring 2021, Golder collected groundwater samples from the monitoring well network and evaluated the resulting analytical data to confirm plume extent and stability. Golder sampled groundwater monitoring wells for CCR and monitored natural attenuation (MNA) parameters from April 14 to April 27, 2021.

Throughout the fall 2021 - spring 2022 timeframe, Golder will continue to collect and evaluate additional information and perform an engineering review of the potential Corrective Measures, consistent with timing and implications of the Closure Application IDEM review, NIPSCO LLC public meeting, and IDEM approval processes. For these reviews, Golder will place emphases on identifying critical data gaps, understanding and reacting to impacts of newly gathered information on previous assumptions and/or conclusions, identifying and researching applicability of emerging technologies, and monitoring changing conditions and future plans for the Site and their impacts on the remedy process. Golder will summarize these additional evaluations along with a summary NIPSCO LLC s progress toward selection of remedy for groundwater Corrective Measures at the MCU in the next semi-annual progress report.

# TECHNICAL MEMORANDUM

**DATE** April 10, 2022 **Project No.** 21508844

**TO** Joe Kutch, Team Leader - Environmental Compliance
Northern Indiana Public Service Company LLC

**CC** Jeff Loewe (NIPSCO), Joe Gormley, Danielle Sylvia Cofelice, Jim Peace, Cody Johnson

**FROM** Mark Haney **EMAIL mark.haney@wsp.com**

**RE: NORTHERN INDIANA PUBLIC SERVICE COMPANY LLC**
**R.M. SCHAHFER GENERATING STATION, CCR UNIT CONSISTING OF MSRB, MCWB AND DA**
**CORRECTIVE MEASURES SELECTION OF REMEDY, SEMI-ANNUAL PROGRESS REPORT #22-01**

On behalf of Northern Indiana Public Service Company LLC (NIPSCO) and in conformance with 40 Code of Federal Regulations (CFR) §257.97(a), Golder Associates USA Inc., *a member of WSP,* (Golder) has prepared this semi-annual progress report for the NIPSCO R.M. Schahfer Generating Station (RMSGS or Site), 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana. This report summarizes progress toward selection of a Corrective Measures remedy for three Coal Combustion Residuals (CCR) impoundments (the Material Storage Runoff Basin [MSRB], Metal Cleaning Waste Basin [MCWB], and Drying Area [DA]), collectively referred to as the Multi-Cell Unit (MCU). Specifically, this semi-annual progress report summarizes actions completed since the submittal of the fifth semi-annual progress report on October 11, 2021.

In April 2019, Golder prepared an Assessment of Corrective Measures (ACM) to address detections of Appendix IV parameters in groundwater downgradient of the MCU above the groundwater protection standards (GWPS). Specifically, the ACM addressed cobalt due to a detection at a Statistically Significant Level (SSL) in groundwater. In addition, the ACM addressed boron because of detections above the Indiana Department of Environmental Management (IDEM) 4 milligrams per liter (mg/l) groundwater screening level and based on information suggesting the United States Environmental Protection Agency (USEPA) was considering adding it to the Appendix IV list. The ACM was prepared in conformance with applicable requirements of 40 CFR §257.96 and was certified by a qualified Indiana-licensed professional engineer on April 19, 2019. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website.

In November 2020, based upon informal feedback from USEPA officials regarding their interpretation of ACM content, Golder prepared an Addendum (hereinafter Addendum #1) to the 2019 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #1 was certified by a qualified Indiana-licensed professional engineer on November 30, 2020. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In July 2021, consistent with changes to the MCU closure design and resultant impacts on remedy alternatives, Golder prepared a second Addendum (hereinafter Addendum #2) to the 2020 ACM in accordance with the requirements of 40 CFR §257.96. Addendum #2 was certified by a qualified Indiana-licensed professional engineer on July 29, 2021. Following certification, the ACM was placed in the facility operating record and NIPSCO posted it to their publicly accessible CCR website. In March 2022, based on 1) feedback provided from USEPA to other utilities regarding Part A Demonstrations and

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interpretations about the applicability of certain proposed groundwater remedies, and 2) USEPA's lack of movement in regard to adding boron to the Appendix IV list, Golder began preparation of a third Addendum (hereinafter Addendum #3) to the previous ACM Addenda. ACM Addendum #3 was prepared in accordance with the requirements of 40 CFR §257.96. Although Addendum #3 refers to and, in part, relies on information used in the preparation of previous Addenda, it is a standalone document upon which the Selection of Remedy (SOR) process will be conducted. For the purposes of this progress report the initial ACM and all Addenda are collectively referred to simply as the ACM.

As discussed in the ACM, NIPSCO plans to close the MCU by removal in accordance with 40 CFR §257.102(c). NIPSCO initially submitted a Closure Application to IDEM in April 2019. On May 13, 2021, NIPSCO submitted what was intended to be a final Closure Application to IDEM that modified the closure design and provided supplemental information in response to IDEM review comments. This latest version of the Closure Application that included a low permeability cap design, was reviewed by IDEM, which in turn issued a request for additional information in March 2022. The previous and current versions of the Closure Application include modifications to the closure approach and low permeability cap design that impact the ACM findings and final selection of a groundwater corrective measure(s).

Earlier versions of the ACM initially identified eight potential Corrective Measure alternatives to be considered for implementation following excavation and closure of the MCU. However, Golder determined that additional data and further evaluation were required to refine and select one or more potential remedies from among these options. Concurrent with IDEM's prior review of the earlier and latest version of the Closure Application and further development by NIPSCO of the closure detailed design, Golder performed additional evaluations of potential corrective measures alternatives. As noted, USEPA's stated interpretations to other utilities regarding the appropriateness of certain potential groundwater remedies was the impetus for preparation of ACM Addendum #3. The following remedy selection-related activities have been performed in the past six months:

- Upon receipt of an additional request from IDEM for further information regarding the most recent (i.e., May 2021) Closure Application, NIPSCO LLC is continuing to refine the Closure Application/Design of the MCU in response to IDEM comments. In addition, NIPSCO will be meeting with IDEM in April 2022 in an attempt to 1) better understand IDEM's request for additional information about the Closure Application, and 2) gain its expedited approval.
- Following further evaluation of remedy alternatives in response to USEPA actions at other CCR sites, Golder began and completed preparation of ACM Addendum #3. This addendum focuses the scope of the corrective action response to cobalt in groundwater, which is the only Appendix IV constituent found at an SSL outside the MCU. Boron, which is not an Appendix IV constituent, but had been considered in Addenda #1 and #2 as discussed above, was removed from the list of constituents of concern.
- During the Fall 2021 Golder collected groundwater samples from the monitoring well network and evaluated the resulting analytical data to confirm plume extent and stability. Golder sampled groundwater monitoring wells for CCR Appendix III and IV parameters from September 15 to October 1, 2021.
- Golder began preliminary work on the draft Selection of Remedy report based on the results of ACM Addendum #3.

Throughout the spring – summer 2022 timeframe, Golder will continue to collect and evaluate additional information and perform, additional engineering evaluations of the alternatives identified in ACM Addendum #3 consistent with timing and implications of IDEM's Closure Application review and approval processes. Golder will summarize these additional evaluations along with a summary NIPSCO LLC's progress toward selection of remedy for groundwater Corrective Measures at the MCU in the next semi-annual progress report.

https://golderassociates.sharepoint.com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/selection of remedy progess updates/22-01/rmsgs selection of remedy semi annual progress report 6.docx

**APPENDIX Q**

# Annual RCRA CCR Unit Inspection Report Waste Disposal Area – December 2021

GOLDER
MEMBER OF WSP

**REPORT**

# Northern Indiana Public Service Company, LLC
# R.M. Schahfer Generating Station

*Annual RCRA CCR Unit Inspection Report*
*Waste Disposal Area – Surface Impoundment*

Submitted to:

**Northern Indiana Public Service Company, LLC**
2723 East 1500 North, Wheatfield, Indiana USA 46392

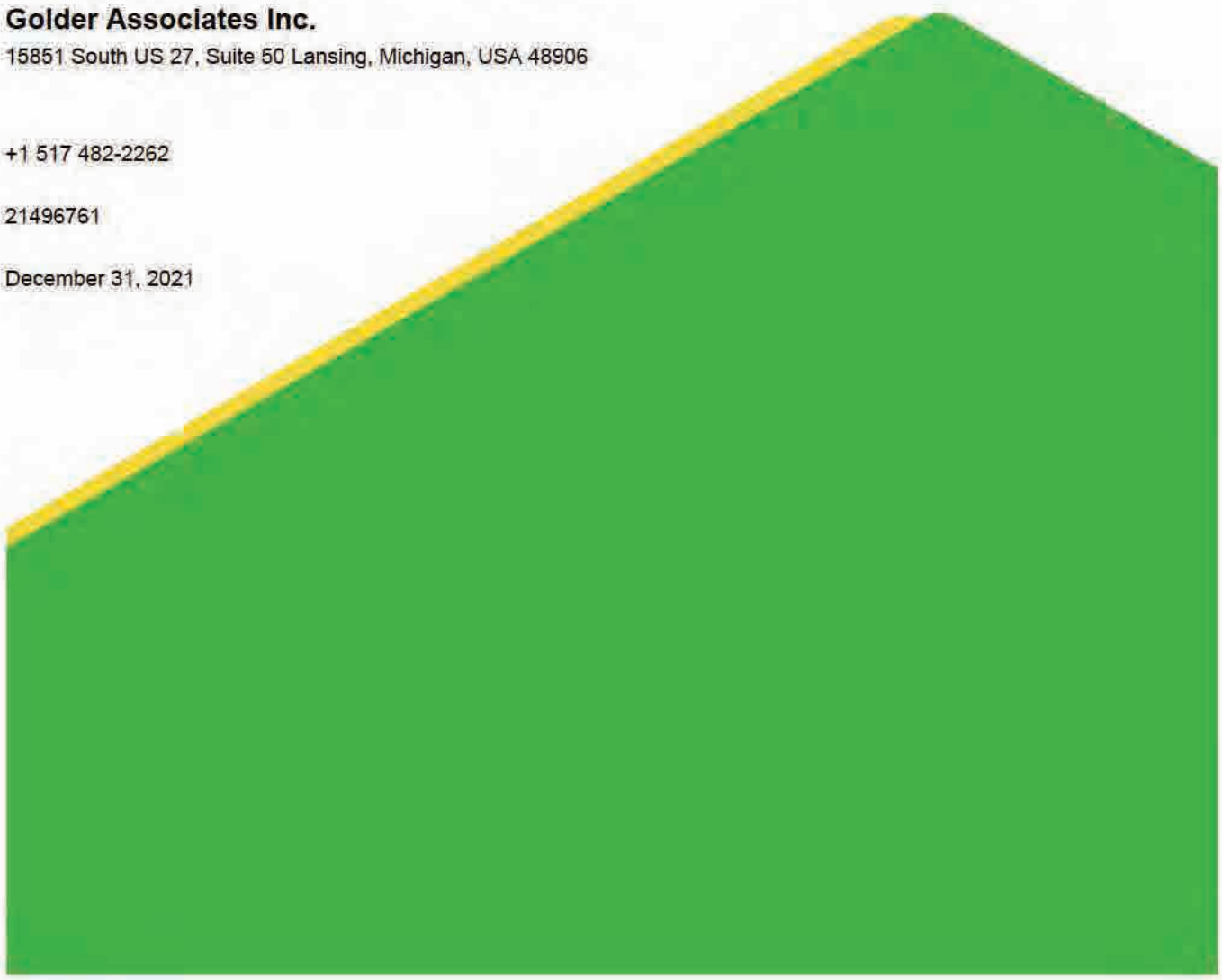
Submitted by:

**Golder Associates Inc.**
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21496761

December 31, 2021



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Table 1 Summary of Background Document Review

# 1.0 INTRODUCTION

The United States Environmental Protection Agency (EPA) promulgated the Resource Conservation and Recovery Act (RCRA) Coal Combustion Residuals (CCR) Rule (Rule) on April 17, 2015, with an effective date of October 19, 2015. The Rule requires owners or operators of existing CCR surface impoundments to have those units inspected on an annual basis by a qualified professional engineer in accordance with 40 CFR 257.83(b)(1). The annual qualified professional engineer inspections are required to be completed and the results documented in inspection reports (per 40 CFR 257.83(b)(2)) for CCR surface impoundments. Golder Associates USA Inc. (Golder) was retained by Northern Indiana Public Service Company, LLC (NIPSCO) to perform the annual inspection of the Waste Disposal Area (WDA), a CCR surface impoundment located at the R.M. Schahfer Generating Station (RMSGS, Site).

This report presents the results of the 2021 annual inspection of the WDA CCR surface impoundment unit at the RMSGS, located in Wheatfield, Jasper County, Indiana. The inspection was conducted to comply with §257.83 of the CCR Rule.

Per 40 CFR 257.83(b)(1), Golder reviewed available information regarding the status and condition of the CCR unit and performed an onsite visual inspection which was conducted on October 26, 2021. The objectives of the inspection included the following:

- Review of Operational Records (as applicable, see Section 3):
  - Design and construction information.
  - Results of previous structural stability assessments.
  - Results of previous annual inspections.
- A visual inspection of the CCR unit to identify signs of distress or malfunction of the CCR unit and appurtenant structures.
- A visual inspection of hydraulic structures underlying the base of the CCR unit or passing through the dike of the CCR unit for structural integrity and continued safe and reliable operation.

In accordance with §257.83(b)(2), this inspection report has been prepared by a qualified professional engineer documenting the operational records review, visual inspection, and identifying the following since the previous annual inspection:

- Any changes in geometry of the CCR surface impoundment since the previous annual inspection.
- The location and type of existing instrumentation and the maximum recorded readings for each instrument since the previous annual inspection.
- The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection.
- The storage capacity of the impounding structure at the time of inspection.
- The approximate volume of the impounded water and CCR at the time of inspection.
- Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures.

- Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.

## 2.0 FACILITY DESCRIPTION

The WDA was designed by Sargent & Lundy Engineers of Chicago, Illinois in 1982. The WDA, located in the southwest region of RMSGS, is unlined and formed by an approximately 17-foot-high perimeter earth-fill dike with slurry trench core that encloses an area of approximately 83 acres. The embankment crest has a nominal elevation of 681 feet above mean sea level (amsl), but surveyed crest elevations range from 680.0 to 682.3 feet amsl. The WDA receives primarily bottom ash/boiler slag from the generating station through pipes located at the northern end of the unit. Most of the deposited ash/slag is located in the northern half of the WDA. Due to size of the unit and settling/depositional properties of the materials, very little, if any, ash/slag is present in the southern half of the WDA. The east side of the WDA is common with the west side of the adjacent Recycle Settling Basin (RSB). Water exits the WDA via an overflow weir (standpipe), to the RSB, or through the auxiliary spillway located at the northwest side. The overflow weir is located at the southern end of the east side of the WDA. The WDA and the RSB are hydraulically connected and the water level within these impoundments will seek equilibrium when the water level is above the invert elevation of the standpipe connecting the impoundments. A survey of the WDA was performed by Marbach, Brady and Weaver, Inc. in December 2011 (Marbach, 2011).

The auxiliary spillway was modified in 2017 to allow for an increased invert elevation to account for the maximum flood levels. The modified spillway was operational in 2018. The modifications included removal of the former closed-conduit spillway and construction of a concrete open-channel spillway with a concrete down-chute and riprap armoring at the toe of the embankment. The completed spillway has an invert elevation of 677.5 feet amsl.

The revised analysis performed for the WDA's modified spillway and the actions by NIPSCO to operationally control the water surface elevation, satisfy the requirements of 40 CFR 257.82 (Golder, November 2017).

## 3.0 BACKGROUND AND DOCUMENT REVIEW SUMMARY

The existing reports reviewed for this assessment are summarized below.

**Table 1: Summary of Background Document Review**

| Document | Date | Author |
|---|---|---|
| Various construction drawings | 1982 | Sargent & Lundy Engineers |
| Assessment of Dam Safety of Coal Combustion Surface Impoundments, NIPSCO, RM Schahfer Generating Station | July 2010 | CDM for the EPA |
| Report on Inspection of The Waste Disposal Area | January 2011 | Golder Associates Inc. |
| Final Hazard Classification Review Report – NIPSCO Schahfer Generating Station | January 2011 | Golder Associates Inc. |
| Embankment Elevation Survey, Waste Disposal Area and Recycle Pond, NIPSCO Schahfer Generating Station | December 2011 | Marbach, Brady and Weaver, Inc. |

| Document | Date | Author |
|---|---|---|
| Schahfer Spillway Hydrologic and Hydraulic Evaluation | December 2011 | Golder Associates Inc. |
| Final Geotechnical Investigation and Embankment Stability Analyses | June 2012 | Golder Associates Inc. |
| Report on Inspection of The Waste Disposal Area | September 2012 | Golder Associates Inc. |
| Construction in a Floodway Permit Application, NIPSCO R.M. Schahfer Generating Station, | November 2012 | Golder Associates Inc. |
| Basin Operation, Maintenance, and Inspection Plan, NIPSCO R. M. Schahfer Generating Station, | February 2013 | Golder Associates Inc. |
| Emergency Action Plan, Final Settling Basin (FSB), Intake Settling Basin (ISB), Waste Disposal Area (WDA), Recycle Basin (RB), Northern Indiana Public Service Company (NIPSCO), R.M. Schahfer Generating Station | February 2013 | Golder Associates Inc. |
| State of Indiana Department of Natural Resources (DNR), Certificate of Approval, After-the-Fact, Construction in a Floodway | April 23, 2013 | State of Indiana DNR |
| Report on Inspection of The Waste Disposal Area | April 2014 | Golder Associates Inc. |
| Construction Observation Documentation Report, Surface Water Basin Erosion Repairs, NIPSCO R.M. Schahfer Generating Station | October 2014 | Golder Associates Inc. |
| Northern Indiana Public Service Company R.M. Schahfer Generating Station – First Annual RCRA CCR Unit Inspection Report – January 2016 – Waste Disposal Area – Surface Impoundment | January 2016 | Golder Associates Inc. |
| NIPSCO, R.M. Schahfer Generating Station, Hazard Potential Classification Assessment and Visual Inspection Report – RCRA CCR Units | September 2016 | Golder Associates Inc. |
| NIPSCO – R.M. Schahfer Generating Station, Waste Disposal Area, History of Construction | September 2016 | Golder Associates Inc. |
| Statement of Certification, NIPSCO RMSGS, Liner Design Criteria for Existing CCR Surface Impoundments | September 2016 | Golder Associates Inc. |

| Document | Date | Author |
|---|---|---|
| NIPSCO R.M. Schahfer Generating Station, CCR Surface Impoundment Inflow Design Flood Control System Plan | October 2016 | Golder Associates Inc. |
| NIPSCO, R.M. Schahfer Generating Station, Waste Disposal Area, Structural Stability and Safety Factor Assessment | October 2016 | Golder Associates Inc. |
| Waste Disposal Area Spillway Improvement Drawings – Bid Drawings, NIPSCO, RMSGS | August 2017 | Golder Associates Inc. |
| Northern Indiana Public Service Company, R.M. Schahfer Generating Station – Second Annual RCRA CCR Unit Inspection Report – January 2017 – Waste Disposal Area – Surface Impoundment | January 2017 | Golder Associates Inc. |
| Weekly Inspection Reports | 2017- October 2020 | NIPSCO |
| WDA Bathymetric Survey | 2017 | DLZ |
| Amendment to the R.M. Schahfer Generating Station Inflow Design Flood Control System Plan – Hydraulic Evaluation of the Waste Disposal Area Auxiliary Spillway | November 2017 | Golder Associates Inc. |
| Northern Indiana Public Service Company, R.M. Schahfer Generating Station – Third Annual RCRA CCR Unit Inspection Report – January 2018 – Waste Disposal Area – Surface Impoundment | January 2018 | Golder Associates Inc. |
| Northern Indiana Public Service Company, R.M. Schahfer Generating Station – Fourth Annual RCRA CCR Unit Inspection Report – January 2019 – Waste Disposal Area – Surface Impoundment | January 2019 | Golder Associates Inc. |
| Northern Indiana Public Service Company, R.M Schahfer Generating Station – Fifth Annual RCRA CCR Unit Inspection Report – January 2020 – Waste Disposal Area – Surface Impoundment | January 2020 | Golder Associates Inc. |
| Northern Indiana Public Service Company, R.M Schahfer Generating Station – Sixth Annual RCRA CCR Unit Inspection Report – Waste Disposal Area – Surface Impoundment | December 31, 2020 | Golder Associates Inc. |

# 4.0 2021 VISUAL INSPECTION

The 2021 onsite inspection of the WDA was performed by Ms. Tiffany Johnson, P.E. and Mr. Peter Joplin, P.E. of Golder on October 26, 2021. Both Ms. Johnson and Mr. Joplin are Professional Engineers, licensed in the State of Indiana. Golder's inspectors were directed by Mr. Joseph Kutch, Manager, Environmental Compliance with NiSource Corporate Services.

The inspection provides the following information as stipulated in 40 CFR 257.83(b)(2):

- Any changes in geometry of the CCR surface impoundment since the previous annual inspection.
  - None observed.
- The location and type of existing instrumentation and the maximum recorded readings for each instrument since the previous annual inspection.
  - There is currently no instrumentation in place designed to monitor structural stability of the WDA.
- The approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection.
  - Maximum: approximately 677.5 feet above mean sea level (based on invert elevation of the improved spillway (Golder, November 2017)
  - Minimum: approximately 676.5 feet above mean sea level (based on visual observation)
  - Present Depth: approximately 12.5 feet (based on visual observation at overflow weir staff gauge, approximate elevation of 676 ft amsl)
- The storage capacity of the impounding structure at the time of inspection.
  - 1,530 acre-feet (based on review of available information)
- The approximate volume of the impounded water and CCR at the time of inspection.
  - Impounded water = approximately 183,880,000 gallons (from NIPSCO based on 13-feet depth, no significant change from 2020)
  - CCR = approximately 640,000 cubic yards (from NIPSCO)
- Any appearances of an actual or potential structural weakness of the CCR unit, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR unit and appurtenant structures.
  - None were observed at the time of the inspection. However, in July 2021, NIPSCO informed Golder of a seep located on the northwest corner of the WDA downstream embankment slope. Golder inspected the location on July 30, 2021 and after visual inspection and interviews with workers on site it was determined that the likely cause of the seep was a leak in the Unit 14 Yard Sump Pit pipe which had broken at near the same spot in February of 2020. A subsequent investigation confirmed the leak in the pipe and the section was replaced in August of 2021 and backfilled. There were no issues observed in this area during the October 26, 2021 inspection.
- Any other change(s) which may have affected the stability or operation of the impounding structure since the previous annual inspection.
  - None were observed.

Based on visual observations made on October 26, 2021, the overall condition of the WDA is acceptable. No structural weaknesses or safety issues were observed within the upstream, downstream, crest, or hydraulic

structures of the WDA. Based on visual observations made on October 26, 2021, there were no visual conditions identified that would negatively impact the operation of the WDA.

## 5.0 CLOSING

This report has been prepared in general accordance with normally accepted civil engineering practices to fulfill the Resource Conservation and Recovery Act (RCRA) reporting requirements in accordance with 40 CFR 257.83(b). Based on our review of the information provided by NIPSCO and on Golder's on-site visual inspection, the overall condition of the WDA is acceptable. Golder's assessment is limited to the information provided to us by NIPSCO and to the features that could be inspected visually in a safe manner. Golder cannot attest to the condition of subsurface or submerged structures.

Sincerely,

**Golder Associates Inc.**




Peter Joplin, P.E.
*Senior Project Engineer*

Tiffany D. Johnson, P.E.
*Principal and Indiana P.E. #11500730*

https://golderassociates.sharepoint.com/sites/153481/project files/5 technical work/wda/2021_nipsco ccr wda rcra inspection report_final.docx

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

| | | |
|---|---|---|
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 26
Culley 2025 Air Permit Modification

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

**Mike Braun**
*Governor*

**Clint Woods**
*Commissioner*

| | |
|---|---|
| To: | Interested Parties |
| Date: | July 7, 2025 |
| From: | Jenny Acker, Chief<br>Permits Branch<br>Office of Air Quality |
| Source Name: | Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station |
| Permit Level: | TV Minor Permit Modification |
| Permit Number: | 173-48980-00001 |
| Source Location: | 3711 Darlington Rd, Newburgh, IN 47630 |
| Type of Action Taken: | Modification at an existing source |

# Notice of Decision: Approval - Effective Immediately

Please be advised that on behalf of the Commissioner of the Department of Environmental Management, I have issued a decision regarding the matter referenced above.

The final decision is available on the IDEM website at: https://www.in.gov/apps/idem/caats/
To view the document, choose Search Option **by Permit Number**, then enter permit 48980. This search will also provide the application received date, **draft permit** public notice start and end date, **proposed permit** EPA review period start and end date, and **final** permit issuance date.

The final decision is also available via IDEM's Virtual File Cabinet (VFC). Please go to: https://www.in.gov/idem and enter VFC in the search box. You will then have the option to search for permit documents using a variety of criteria.

*(continues on next page)*

If you would like to request a paper copy of the permit document, please contact IDEM's Office of Records Management:

IDEM - Office of Records Management
Indiana Government Center North
100 North Senate Avenue
Indianapolis, IN 46204-2251
Phone: (317) 232-8667
Fax: (317) 233-6647
Email: IDEMFILEROOM@idem.in.gov

Pursuant to IC 13-17-3-4 and 326 IAC 2, this permit modification is effective immediately, unless a petition for stay of effectiveness is filed and granted, and may be revoked or modified in accordance with the provisions of IC 13-15-7-1.

If you wish to challenge this decision, IC 4-21.5-3-7 and IC 13-15-7-3 require that you file a petition for administrative review. This petition may include a request for stay of effectiveness and must be submitted to Indiana Office of Administrative Law Proceedings, 100 N. Senate Avenue Suite N802, Indianapolis, IN 46204, **within eighteen (18) days of the mailing of this notice**. The filing of a petition for administrative review is complete on the earliest of the following dates that apply to the filing:

(1) the date the document is delivered to the Indiana Office of Administrative Law Proceedings (OALP); or
(2) the date of the postmark on the envelope containing the document, if the document is mailed to OALP by U.S. mail; or
(3) The date on which the document is deposited with a private carrier, as shown by receipt issued by the carrier, if the document is sent to the OALP by private carrier.

The petition must include facts demonstrating that you are either the applicant, a person aggrieved or adversely affected by the decision or otherwise entitled to review by law. Please identify the permit, decision, or other order for which you seek review by permit number, name of the applicant, location, date of this notice and all of the following:

(1) the name and address of the person making the request;
(2) the interest of the person making the request;
(3) identification of any persons represented by the person making the request;
(4) the reasons, with particularity, for the request;
(5) the issues, with particularity, proposed for considerations at any hearing; and
(6) identification of the terms and conditions which, in the judgment of the person making the request, would be appropriate in the case in question to satisfy the requirements of the law governing documents of the type issued by the Commissioner.

Pursuant to 326 IAC 2-7-18(d), any person may petition the U.S. EPA to object to the issuance of an initial Title V operating permit, permit renewal, or permit modification within sixty (60) days of the end of the forty-five (45) day EPA review period. Such an objection must be based only on issues that were raised with reasonable specificity during the public comment period, unless the petitioner demonstrates that it was impractible to raise such issues, or if the grounds for such objection arose after the comment period.

The EPA requests that you file Title V petitions electronically through the Central Data Exchange. To do so, please go to: https://cdx.epa.gov/ .

If you tried but you are unable to use the Central Data Exchange to file your petition, the EPA requests that you send your petition and associated attachments via email to: titleVpetitions@epa.gov.

If you have made every effort to electronically submit your petition but are simply unable to successfully do so, please submit a hardcopy of your petition to the following address:

US EPA
Office of Air Quality Planning and Standards
Air Quality Policy Division
Operating Permits Group Leader
109 T.W. Alexander Dr. (C-504-01)
Research Triangle Park, NC 27711

If you have technical questions regarding the enclosed documents, please contact the Office of Air Quality, Permits Branch at (317) 233-0178. Callers from within Indiana may call toll-free at 1-800-451-6027, ext. 3-0178.

Enclosures
Decision-Title V-Mod 1/13/25

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

**Mike Braun**
*Governor*

**Clint Woods**
*Commissioner*

July 7, 2025

Greg Dick
SIGECO - F.B. Culley Generating Station
P.O. Box 209
Evansville, IN 47702

Re: 173-48980-00001
Minor Permit Modification

Dear Mr. Dick:

SIGECO - F.B. Culley Generating Station was issued Part 70 Operating Permit Renewal No. T173-43264-00001 on August 17, 2021for a stationary electric utility generating station located at 3711 Darlington Road, Newburgh, Indiana 47630. An application requesting changes to this permit was received on April 3, 2025. Pursuant to the provisions of 326 IAC 2-7-12, a Minor Permit Modification to this permit is hereby approved as described in the attached Technical Support Document.

Please find attached the entire Part 70 Operating Permit as modified. The permit references the below listed attachment(s). Since these attachments have been provided in previously issued approvals for this source, IDEM OAQ has not included a copy of these attachments with this modification:

Attachment A: Fugitive Dust Control Plan
Attachment B: 40 CFR 60, Subpart OOO, Nonmetallic Mineral Processing Plants
Attachment C: 40 CFR 63, Subpart UUUUU, Coal and Oil Fired Electric Utility Steam Generating Units
Attachment D: 40 CFR 63, Subpart ZZZZ, Stationary Reciprocating Internal Combustion Engines
Attachment E: 40 CFR 60, Subpart Da, Electric Utility Steam Generating Units

Previously issued approvals for this source containing these attachments are available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/.

Previously issued approvals for this source are also available via IDEM's Virtual File Cabinet (VFC). To access VFC, please go to: https://www.in.gov/idem/legal/public-records/virtual-file-cabinet/. Once you have accessed VFC, you will then have the option to search for source related documents using a variety of criteria.

Federal rules under Title 40 of United States Code of Federal Regulations may also be found on the U.S. Government Printing Office's Electronic Code of Federal Regulations (eCFR) website, located on the Internet at: http://www.ecfr.gov/cgi-bin/text-idx?tpl=/ecfrbrowse/Title40/40tab_02.tpl.

A copy of the permit is available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/. A copy of the application and permit is also available via IDEM's Virtual File Cabinet (VFC) located at https://www.in.gov/idem/legal/public-records/virtual-file-cabinet/. Once you have accessed VFC, you will then have the option to search for source related documents using a variety of criteria. To find documents related to this air permit, click on "Advanced Search", specify "OAQ" in the Program search field, specify the five-digit permit number "48980" in the Permit # search field, then click the Search button at the top or bottom of the webpage.

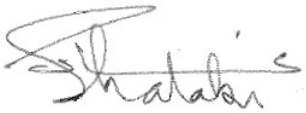
For additional information about air permits and how the public and interested parties can participate, refer to the IDEM Air Permits page on the Internet at: https://www.in.gov/idem/airpermit/public-participation/; and the Citizens' Guide to IDEM on the Internet at:

https://www.in.gov/idem/resources/citizens-guide-to-idem/.

This decision is subject to the Indiana Administrative Orders and Procedures Act - IC 4-21.5-3-5.

If you have any questions regarding this matter, please contact Hachem Ismaili Alaoui, Indiana Department Environmental Management, Office of Air Quality, Permits Branch, Indiana Government Center North, 100 North Senate Avenue, Room 13W, Indianapolis, Indiana 46204-2251, or by telephone at (317) 232-2827 or (800) 451-6027, and ask for Hachem Ismaili Alaoui or (317) 232-2827.

Sincerely,



Ghassan Shalabi, Section Chief
Permits Branch
Office of Air Quality

Attachments: Modified Permit and Technical Support Document
cc: File - Warrick County
Warrick County Health Department
U.S. EPA, Region 5
Compliance and Enforcement Branch
IDEM Northwest Regional Office

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

**Mike Braun**
*Governor*

**Clint Woods**
*Commissioner*

# Part 70 Operating Permit Renewal
# OFFICE OF AIR QUALITY

## Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
## 3711 Darlington Road
## Newburgh, Indiana 47630

(herein known as the Permittee) is hereby authorized to operate subject to the conditions contained herein, the source described in Section A (Source Summary) of this permit.

**The Permittee must comply with all conditions of this permit. Noncompliance with any provisions of this permit is grounds for enforcement action; permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Noncompliance with any provision of this permit, except any provision specifically designated as not federally enforceable, constitutes a violation of the Clean Air Act. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.**

This permit is issued in accordance with 326 IAC 2 and 40 CFR Part 70 Appendix A and contains the conditions and provisions specified in 326 IAC 2-7 as required by 42 U.S.C. 7401, et. seq. (Clean Air Act as amended by the 1990 Clean Air Act Amendments), 40 CFR Part 70.6, IC 13-15 and IC 13-17.

| Operation Permit No.: T173-43264-00001<br>Master Agency Interest ID.: 11786 | |
|---|---|
| Issued by: Original signed by:<br>Ghassan Shalabi, Section Chief<br>Permits Branch, Office of Air Quality | Issuance Date: August 17, 2021<br><br>Expiration Date: August 17, 2026 |

Significant Permit Modification No.: 173-44874-00001, issued on April 25, 2022

| Minor Permit Modification No.: 173-48980-00001 | |
|---|---|
| Issued by:<br><br>Ghassan Shalabi, Section Chief<br>Permits Branch<br>Office of Air Quality | Issuance Date: July 7, 2025<br><br>Expiration Date: August 17, 2026 |

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**Attachment C** National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coal and Oil-Fired Electric Utility Steam Generating Units [40 CFR 63, Subpart UUUUU]

**Attachment D** National Emission Standards for Hazardous Air Pollutants (NESHAP) for Stationary Reciprocating Internal Combustion Engines [40 CFR 63, Subpart ZZZZ]

**Attachment E** New Source Performance Standard (NSPS): Electric Utility Steam Generating Units [40 CFR 60, Subpart Da]

## SECTION A SOURCE SUMMARY

This permit is based on information requested by the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ). The information describing the source contained in conditions A.1 through A.4 is descriptive information and does not constitute enforceable conditions. However, the Permittee should be aware that a physical change or a change in the method of operation that may render this descriptive information obsolete or inaccurate may trigger requirements for the Permittee to obtain additional permits or seek modification of this permit pursuant to 326 IAC 2, or change other applicable requirements presented in the permit application.

### A.1 General Information [326 IAC 2-7-4(c)][326 IAC 2-7-5(14)][326 IAC 2-7-1(20)]

The Permittee owns and operates a stationary electric utility generating station.

| | |
|---|---|
| Source Address: | 3711 Darlington Road, Newburgh, Indiana 47630 |
| General Source Phone Number: | (812) 491-4769 |
| SIC Code: | 4911 and 4922 (Electric Services & Natural Gas Transmission) |
| County Location: | Warrick |
| Source Location Status: | Attainment for all criteria pollutants |
| Source Status: | Part 70 Operating Permit Program<br>Major Source, under PSD Rules<br>Major Source, Section 112 of the Clean Air Act<br>1 of 28 Source Categories |

### A.2 Emission Units and Pollution Control Equipment Summary [326 IAC 2-7-4(c)(3)][326 IAC 2-7-5(14)]

This stationary source consists of the following emission units and pollution control devices:

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide ($SO_2$), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide ($CO_2$), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(c) Coal storage and handling operations, identified as Unit 5F, constructed in 1954, expanded in 1963 and 1970, and modified in 1994, consisting of the following activities:

(1) Floating dock unloading clamshell serving both coal and limestone unloading operations (served by S/V 6).

(2) Truck load-out station serving both coal and limestone unloading operations (served by S/V 9).

(3) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 600 tons per hour.

(4) Unit No. 2 coal hopper conveyor (C1) with a maximum coal feed belt capacity of 600 tons per hour.

(5) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 600 tons per hour.

(6) Unit No. 2 coal transfer house conveyor (#4) with a maximum coal feed belt capacity of 1240 tons per hour.

(7) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 1240 tons per hour.

(8) Unit No. 2 coal transfer house conveyor with a maximum coal feed belt capacity of 1240 tons per hour.

(9) Unit No. 2 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(10) Unit No. 2 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(11) Unit No. 2 powerhouse coal bunkers with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(12) Units No. 2 and 3 coal pile of 645,000 tons.

(13) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(14) Unit No. 2 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(15) Unit No. 3 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(16) Unit No. 3 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(17) Unit No. 3 coal transfer house conveyor, with a maximum coal feed belt capacity of 640 tons per hour.

(18) Unit No. 3 coal transfer house conveyor drop with a maximum coal feed belt capacity of 640 tons per hour with an enclosed transfer house and fabric filter (served by S/V 8).

(19) Unit No. 3 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(20) Unit No. 3 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(21) Unit No. 3 powerhouse coal bunker with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(22) Miscellaneous enclosed coal bunker and weigh-scales with vents.

(d) A fly ash handling facility, identified as Unit 6, constructed in 1994, consisting of the following operations:

(1) One (1) fly ash storage silo receiving fly ash via a close-pipe vacuum handling system from the electrostatic precipitator and fabric filter hoppers of Units No. 2 and No. 3, respectively, with a maximum capacity of 1000 tons, and a maximum throughput of 179.9 tons per hour, with a fabric filter separator exhausting to stack 16 and a bin filter exhausting to stack 17. The filter/separator is designed for operation 50% of the time.

(2) One (1) fly ash silo truck loadout station, with a maximum capacity of 25 tons per hour (the coal trucks have a maximum capacity of 25 tons and haul ash at the rate of one truck per hour), with an enclosed telescoping discharged chute and emissions reduced by fly ash wetting and partial loading of the trucks.

(3) One (1) East Ash Pond receiving sluiced (closed-pipe) bottom ash from Units No. 2 and No. 3. The ash is discharged to the pond at a maximum annual rate of 4.65 tons per hour and stored in wet form, that is, a layer of water maintained above the ponded ash and dredging operations conducted periodically to maintain the ponded storage state.

(e) A limestone handling facility, identified as Unit 7, constructed in 1994, consisting of the following operations:

(1) One (1) limestone unloading floating clamshell dock with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 6. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(2) One (1) covered conveyor, identified as Conveyor 1 (CL-1), with a maximum throughput of 550 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(3) One (1) limestone truck loadout to conveyor with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 9. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(4) One (1) covered conveyor, identified as Conveyor 2 (L-1), with a maximum throughput of 800 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) limestone storage building with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 10.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(6) One (1) limestone reclaim system located inside a totally-enclosed building adjacent to the limestone storage building.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) limestone storage building loadout with a maximum capacity of 750 tons per hour, an enclosed building for dust control, and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(8) One (1) covered conveyor, identified as Conveyor 3 (L-2), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(9) One (1) limestone transfer house (No. 1) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 12.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(10) One (1) covered conveyor, identified as Conveyor 4 (L-3), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) coal and limestone transfer house (serving Unit No. 3) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 8. (This operation serves both coal and limestone transferring operations.)

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(12) One (1) covered conveyor, identified as Conveyor 5 (L-4), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(13) One (1) limestone transfer house (No. 2) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 14.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(14) One (1) covered conveyor, identified as Conveyor 6 (L-5), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(15) One (1) limestone day silo with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 15.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(16) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(17) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(18) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(f) A gypsum wet filter cake handling facility, identified as Unit 8, constructed in 1994, consisting of the following operations:

(1) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 11.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(2) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 13.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(3) One (1) covered conveyor, identified as G1A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(4) One (1) covered conveyor, identified as G1B (operates only when G1A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) gypsum filter cake transfer house conveyor drop with a maximum capacity of 35 tons per hour, a fabric filter for dust control, and exhausting to stack 4.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(6) One (1) covered conveyor, identified as G2A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) covered conveyor, identified as G2B (operates only when G2A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(8) One (1) gypsum storage building consisting of two (2) 1000-ton gypsum storage silos and one (1) storage pile designated for truck haul-away exhausting indoors.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(9) One (1) covered silo to barge loadout primary filter cake transfer conveyor, identified as Conveyor 4, with a maximum capacity of 400 tons per hour, with a fabric filter for dust control, exhausting to stack 7.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(10) One (1) covered silo to truck secondary transfer conveyor, identified as Conveyor 3, with a maximum capacity of 400 tons per hour and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) gypsum barge loadout conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control and exhausting to stack 5.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(12) One (1) gypsum barge loadout with two (2) telescoping transfer chutes delivering filter cake gypsum to river barges with a maximum capacity of 400 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(g) One (1) flue gas desulfurization (FGD) system for Units No. 2 and 3, constructed in 1994, consisting of the following limestone operations:

(1) Two (2) wet ball mills (one operational and one full capacity spare), receiving limestone from the day silo of the limestone handling facility (Unit 7). Each ball mill is a closed-device (hard-piped, enclosed design), wet mill capable of handling 20.5 tons per hour of dry limestone feed.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

(2) Two (2) limestone slurry storage tanks, receiving the ball mill product (fresh limestone slurry), which is then discharged into the scrubber system. The scrubbed gas stream exits the absorber tower through the scrubber stack.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

(h) One (1) diesel-fired Emergency Generator, constructed in March 2005, with a rated output capacity of 267 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

(i) One (1) emergency diesel-fired fire pump, constructed in 1994 with a rated output capacity of 500 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

A.3 Specifically Regulated Insignificant Activities [326 IAC 2-7-1(19)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities which are specifically regulated, as defined in 326 IAC 2-7-1(19):

(a) Vents from ash transport systems not operated at positive pressure.

(b) Coal bunker and coal scale exhausts and associated dust collector vents.

(c) Degreasing operations that do not exceed 145 gallons per 12 months, except if subject to 326 IAC 20-6.

(d) Two (2) Natural Gas-Fired water heaters located in the Maintenance Shop, each with heat input capacity of 0.04 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

A.4 Insignificant Activities [326 IAC 2-7-1(19)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities, as defined in 326 IAC 2-7-1(19):

(a) Small Natural Gas-Fired combustion units which are described as follows:

(1) Three (3) Natural Gas-Fired forced air unit heaters, each with a heat input capacity of 0.06 MMBtu/hr; each constructed prior to 2015 and exhausting to stacks.

(2) Four (4) Natural Gas-Fired furnaces located in the Planning Offices, each with a heat input capacity of 0.09 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

(3) Three (3) Natural Gas-Fired radiant heaters located in the Maintenance Shop, each with heat input capacity of 0.16 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

(b) Small Propane-Fired or Liquefied Petroleum Gas-Fired (LPG), combustion units described as follows:

(1) Five (5) Propane-Fired portable heaters, each with a heat input capacity of 0.05 MMBtu/hr (Assumed); each constructed prior to 2015 and exhausting to atmosphere.

(c) Small units which combust either Kerosene fuel or Distillate fuel oil and are described as follows:

(1) Ten (10) Kerosene-Fired portable heaters, each with a heat input capacity of 0.05 MMBtu/hr (Assumed); each constructed prior to 2015 and exhausting to atmosphere.

(d) Combustion source flame safety purging on startup.

(e) One (1) unleaded-gasoline fuel dispensing operation consisting of a 500 gallon above ground storage tank, dispensing a maximum of 1,300 gallons per day; constructed in 2006.

(f) One (1) diesel-fuel dispensing operation consisting of a 10,000 gallon above ground storage tank, dispensing a maximum of 230,000 gallons per month; constructed in 2006.

(g) Machining where an aqueous cutting coolant continuously floods the machining interface.

(h) Cleaners and solvents characterized as follows:

(1) having a vapor pressure equal to or less than 2 kPa; 15mm Hg; or 0.3 psi measured at 38 degrees C (100$^{o}$F) or;

(2) having a vapor pressure equal to or less than 0.7 kPa; 5 mm Hg; or 0.1 psi measured at 20oC (68$^{o}$F); the use of which for all cleaners and solvents combined does not exceed 145 gallons per 12 months.

(i) Closed loop heating and cooling systems.

(j) Solvent recycling systems with batch capacity less than or equal to 100 gallons.

(k) Activities associated with the treatment of wastewater streams with an oil and grease content less than or equal to 1% by volume.

(l) Water runoff ponds-.

(m) Any operation using aqueous solutions containing less than 1% by weight VOCs excluding HAPs.

(n) Replacement or repair of electrostatic precipitators, bags in baghouses and filters in other air filtration equipment.

(o) Heat exchanger cleaning and repair.

(p) Process vessel degassing and cleaning to prepare for internal repairs.

(q) Stockpiled soils from soil remediation activities that are covered and waiting transport for disposal.

(r) Underground conveyors.

(s) VOC and HAP storage containers all constructed prior to 1960: Storage tanks with capacity less than or equal to 1,000 gallons and annual throughputs less than 12,000 gallons; storage tanks which contain lubricating oils, hydraulic oils, and machining fluids.

(t) Asbestos abatement projects regulated by 326 IAC 14-10.

(u) Purging of gas lines and vessels that are related to routine maintenance and repair of buildings, structures, or vehicles at the source where air emissions from those activities would not be associated with any production process.

(v) Flue gas conditioning systems and associated chemicals such as the following: sodium sulfate; ammonia; and sulfur trioxide.

(w) Equipment used to collect any material that might be released during a malfunction, process upset, or spill cleanup, including catch tanks, temporary liquid separators, tanks, and fluid handling equipment.

(x) Blowdown for any of the following: sight glass; boiler; compressors; pumps; and cooling tower.

(y) On-site fire and emergency response training approved by the department.

(z) Filter or coalescer media changeout.

(aa) A laboratory as defined in 326 IAC 2-7-1(19)(D).

(bb) Farm operations (landscaping/brush clearing, grass/weed cutting, grounds maintenance).

(cc) Activities with emissions equal to or less than the following thresholds: 5 lb/hr or 25 lb/day PM; 5 lb/hr or 25 lb/day $SO_2$; 5 lb/hr or 25 lb/day NOx; 3 lb/hr or 15 lb/day VOC; 0.6 tons per year Pb; 1.0 ton/yr of a single HAP, or 2.5 ton/yr of any combination of HAPs:

(1) Boiler chemical cleaning waste evaporation, which involves the evaporation of boiler chemical cleaning wastes that may occur during episodic scheduled boiler outages.

(dd) One (1) diesel-fuel storage tank with a maximum capacity of 650 gallons.

(ee) Paved and unpaved roads and parking lots with public access.

A.5 Part 70 Permit Applicability [326 IAC 2-7-2]

This stationary source is required to have a Part 70 permit by 326 IAC 2-7-2 (Applicability) because:

(a) It is a major source, as defined in 326 IAC 2-7-1(20);

(b) It is a source in a source category designated by the United States Environmental Protection Agency (U.S. EPA) under 40 CFR 70.3 (Part 70 - Applicability).

(c) It is an affected source under Title IV (Acid Deposition Control) of the Clean Air Act, as defined in 326 IAC 2-7-1(3);

## SECTION B GENERAL CONDITIONS

### B.1 Definitions [326 IAC 2-7-1]

Terms in this permit shall have the definition assigned to such terms in the referenced regulation. In the absence of definitions in the referenced regulation, the applicable definitions found in the statutes or regulations (IC 13-11, 326 IAC 1-2 and 326 IAC 2-7) shall prevail.

### B.2 Permit Term [326 IAC 2-7-5(2)][326 IAC 2-1.1-9.5][326 IAC 2-7-4(a)(1)(D)][IC 13-15-3-6(a)]

(a) This permit, T173-43264-00001, is issued for a fixed term of five (5) years from the issuance date of this permit, as determined in accordance with IC 4-21.5-3-5(f) and IC 13-15-5-3. Subsequent revisions, modifications, or amendments of this permit do not affect the expiration date of this permit or of permits issued pursuant to Title IV of the Clean Air Act and 326 IAC 21 (Acid Deposition Control).

(b) If IDEM, OAQ, upon receiving a timely and complete renewal permit application, fails to issue or deny the permit renewal prior to the expiration date of this permit, this existing permit shall not expire and all terms and conditions shall continue in effect, including any permit shield provided in 326 IAC 2-7-15, until the renewal permit has been issued or denied.

### B.3 Term of Conditions [326 IAC 2-1.1-9.5]

Notwithstanding the permit term of a permit to construct, a permit to operate, or a permit modification, any condition established in a permit issued pursuant to a permitting program approved in the state implementation plan shall remain in effect until:

(a) the condition is modified in a subsequent permit action pursuant to Title I of the Clean Air Act; or

(b) the emission unit to which the condition pertains permanently ceases operation.

### B.4 Enforceability [326 IAC 2-7-7][IC 13-17-12]

Unless otherwise stated, all terms and conditions in this permit, including any provisions designed to limit the source's potential to emit, are enforceable by IDEM, the United States Environmental Protection Agency (U.S. EPA) and by citizens in accordance with the Clean Air Act.

### B.5 Severability [326 IAC 2-7-5(5)]

The provisions of this permit are severable; a determination that any portion of this permit is invalid shall not affect the validity of the remainder of the permit.

### B.6 Property Rights or Exclusive Privilege [326 IAC 2-7-5(6)(D)]

This permit does not convey any property rights of any sort or any exclusive privilege.

### B.7 Duty to Provide Information [326 IAC 2-7-5(6)(E)]

(a) The Permittee shall furnish to IDEM, OAQ, within a reasonable time, any information that IDEM, OAQ may request in writing to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit, or to determine compliance with this permit. Upon request, the Permittee shall also furnish to IDEM, OAQ copies of records required to be kept by this permit.

(b) For information furnished by the Permittee to IDEM, OAQ, the Permittee may include a claim of confidentiality in accordance with 326 IAC 17.1. When furnishing copies of requested records directly to U. S. EPA, the Permittee may assert a claim of confidentiality in accordance with 40 CFR 2, Subpart B.

B.8 Certification [326 IAC 2-7-4(f)][326 IAC 2-7-6(1)][326 IAC 2-7-5(3)(C)]

(a) A certification required by this permit meets the requirements of 326 IAC 2-7-6(1) if:

(1) it contains a certification by a "responsible official" as defined by 326 IAC 2-7-1(33), and

(2) the certification states that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete.

(b) The Permittee may use the attached Certification Form, or its equivalent with each submittal requiring certification. One (1) certification may cover multiple forms in one (1) submittal.

(c) A "responsible official" is defined at 326 IAC 2-7-1(33).

B.9 Annual Compliance Certification [326 IAC 2-7-6(5)]

(a) The Permittee shall annually submit a compliance certification report which addresses the status of the source's compliance with the terms and conditions contained in this permit, including emission limitations, standards, or work practices. All certifications shall cover the time period from January 1 to December 31 of the previous year, and shall be submitted no later than July 1 of each year to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

and

United States Environmental Protection Agency, Region 5
Air and Radiation Division, Air Enforcement Branch - Indiana (AE-17J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

(b) The annual compliance certification report required by this permit shall be considered timely if the date postmarked on the envelope or certified mail receipt, or affixed by the shipper on the private shipping receipt, is on or before the date it is due. If the document is submitted by any other means, it shall be considered timely if received by IDEM, OAQ on or before the date it is due.

(c) The annual compliance certification report shall include the following:

(1) The appropriate identification of each term or condition of this permit that is the basis of the certification;

(2) The compliance status;

(3) Whether compliance was continuous or intermittent;

(4) The methods used for determining the compliance status of the source, currently and over the reporting period consistent with 326 IAC 2-7-5(3); and

(5) Such other facts, as specified in Sections D of this permit, as IDEM, OAQ may require to determine the compliance status of the source.

The submittal by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

B.10 Preventive Maintenance Plan [326 IAC 2-7-5(12)][326 IAC 1-6-3]

(a) A Preventive Maintenance Plan meets the requirements of 326 IAC 1-6-3 if it includes, at a minimum:

(1) Identification of the individual(s) responsible for inspecting, maintaining, and repairing emission control devices;

(2) A description of the items or conditions that will be inspected and the inspection schedule for said items or conditions; and

(3) Identification and quantification of the replacement parts that will be maintained in inventory for quick replacement.

The Permittee shall implement the PMPs.

(b) If required by specific condition(s) in Section D of this permit where no PMP was previously required, the Permittee shall prepare and maintain Preventive Maintenance Plans (PMPs) no later than ninety (90) days after issuance of this permit or ninety (90) days after initial start-up, whichever is later, including the following information on each facility:

(1) Identification of the individual(s) responsible for inspecting, maintaining, and repairing emission control devices;

(2) A description of the items or conditions that will be inspected and the inspection schedule for said items or conditions; and

(3) Identification and quantification of the replacement parts that will be maintained in inventory for quick replacement.

If, due to circumstances beyond the Permittee's control, the PMPs cannot be prepared and maintained within the above time frame, the Permittee may extend the date an additional ninety (90) days provided the Permittee notifies:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

The PMP extension notification does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

The Permittee shall implement the PMPs.

(c) A copy of the PMPs shall be submitted to IDEM, OAQ upon request and within a reasonable time, and shall be subject to review and approval by IDEM, OAQ. IDEM, OAQ may require the Permittee to revise its PMPs whenever lack of proper maintenance

causes or is the primary contributor to an exceedance of any limitation on emissions. The PMPs and their submittal do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(d) To the extent the Permittee is required by 40 CFR Part 60/63 to have an Operation Maintenance, and Monitoring (OMM) Plan for a unit, such Plan is deemed to satisfy the PMP requirements of 326 IAC 1-6-3 for that unit.

B.11 Reserved

B.12 Permit Shield [326 IAC 2-7-15][326 IAC 2-7-20][326 IAC 2-7-12]

(a) Pursuant to 326 IAC 2-7-15, the Permittee has been granted a permit shield. The permit shield provides that compliance with the conditions of this permit shall be deemed compliance with any applicable requirements as of the date of permit issuance, provided that either the applicable requirements are included and specifically identified in this permit or the permit contains an explicit determination or concise summary of a determination that other specifically identified requirements are not applicable. The Indiana statutes from IC 13 and rules from 326 IAC, referenced in conditions in this permit, are those applicable at the time the permit was issued. The issuance or possession of this permit shall not alone constitute a defense against an alleged violation of any law, regulation or standard, except for the requirement to obtain a Part 70 permit under 326 IAC 2-7 or for applicable requirements for which a permit shield has been granted.

This permit shield does not extend to applicable requirements which are promulgated after the date of issuance of this permit unless this permit has been modified to reflect such new requirements.

(b) If, after issuance of this permit, it is determined that the permit is in nonconformance with an applicable requirement that applied to the source on the date of permit issuance, IDEM, OAQ shall immediately take steps to reopen and revise this permit and issue a compliance order to the Permittee to ensure expeditious compliance with the applicable requirement until the permit is reissued. The permit shield shall continue in effect so long as the Permittee is in compliance with the compliance order.

(c) No permit shield shall apply to any permit term or condition that is determined after issuance of this permit to have been based on erroneous information supplied in the permit application. Erroneous information means information that the Permittee knew to be false, or in the exercise of reasonable care should have been known to be false, at the time the information was submitted.

(d) Nothing in 326 IAC 2-7-15 or in this permit shall alter or affect the following:

(1) The provisions of Section 303 of the Clean Air Act (emergency orders), including the authority of the U.S. EPA under Section 303 of the Clean Air Act;

(2) The liability of the Permittee for any violation of applicable requirements prior to or at the time of this permit's issuance;

(3) The applicable requirements of the acid rain program, consistent with Section 408(a) of the Clean Air Act; and

(4) The ability of U.S. EPA to obtain information from the Permittee under Section 114 of the Clean Air Act.

(e) This permit shield is not applicable to any change made under 326 IAC 2-7-20(b)(2) (Sections 502(b)(10) of the Clean Air Act changes) and 326 IAC 2-7-20(c)(2) (trading based on State Implementation Plan (SIP) provisions).

(f) This permit shield is not applicable to modifications eligible for group processing until after IDEM, OAQ, has issued the modifications. [326 IAC 2-7-12(c)(7)]

(g) This permit shield is not applicable to minor Part 70 permit modifications until after IDEM, OAQ, has issued the modification. [326 IAC 2-7-12(b)(8)]

B.13 Prior Permits Superseded [326 IAC 2-1.1-9.5][326 IAC 2-7-10.5]

(a) All terms and conditions of permits established prior to T173-43264-00001 and issued pursuant to permitting programs approved into the state implementation plan have been either:

(1) incorporated as originally stated,

(2) revised under 326 IAC 2-7-10.5, or

(3) deleted under 326 IAC 2-7-10.5.

(b) Provided that all terms and conditions are accurately reflected in this permit, all previous registrations and permits are superseded by this Part 70 operating permit, except for permits issued pursuant to Title IV of the Clean Air Act and 326 IAC 21 (Acid Deposition Control)

B.14 Termination of Right to Operate [326 IAC 2-7-10][326 IAC 2-7-4(a)]

The Permittee's right to operate this source terminates with the expiration of this permit unless a timely and complete renewal application is submitted at least nine (9) months prior to the date of expiration of the source's existing permit, consistent with 326 IAC 2-7-3 and 326 IAC 2-7-4(a).

B.15 Permit Modification, Reopening, Revocation and Reissuance, or Termination [326 IAC 2-7-5(6)(C)][326 IAC 2-7-8(a)][326 IAC 2-7-9]

(a) This permit may be modified, reopened, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a Part 70 Operating Permit modification, revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any condition of this permit. [326 IAC 2-7-5(6)(C)] The notification by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(b) This permit shall be reopened and revised under any of the circumstances listed in IC 13-15-7-2 or if IDEM, OAQ determines any of the following:

(1) That this permit contains a material mistake.

(2) That inaccurate statements were made in establishing the emissions standards or other terms or conditions.

(3) That this permit must be revised or revoked to assure compliance with an applicable requirement. [326 IAC 2-7-9(a)(3)]

(c) Proceedings by IDEM, OAQ to reopen and revise this permit shall follow the same procedures as apply to initial permit issuance and shall affect only those parts of this

permit for which cause to reopen exists. Such reopening and revision shall be made as expeditiously as practicable. [326 IAC 2-7-9(b)]

(d) The reopening and revision of this permit, under 326 IAC 2-7-9(a), shall not be initiated before notice of such intent is provided to the Permittee by IDEM, OAQ at least thirty (30) days in advance of the date this permit is to be reopened, except that IDEM, OAQ may provide a shorter time period in the case of an emergency. [326 IAC 2-7-9(c)]

B.16 Permit Renewal [326 IAC 2-7-3][326 IAC 2-7-4][326 IAC 2-7-8(e)]

(a) The application for renewal shall be submitted using the application form or forms prescribed by IDEM, OAQ and shall include the information specified in 326 IAC 2-7-4. Such information shall be included in the application for each emission unit at this source, except those emission units included on the trivial or insignificant activities list contained in 326 IAC 2-7-1(19) and 326 IAC 2-7-1(39). The renewal application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

Request for renewal shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

(b) A timely renewal application is one that is:

(1) Submitted at least nine (9) months prior to the date of the expiration of this permit; and

(2) If the date postmarked on the envelope or certified mail receipt, or affixed by the shipper on the private shipping receipt, is on or before the date it is due. If the document is submitted by any other means, it shall be considered timely if received by IDEM, OAQ on or before the date it is due.

(c) If the Permittee submits a timely and complete application for renewal of this permit, the source's failure to have a permit is not a violation of 326 IAC 2-7 until IDEM, OAQ takes final action on the renewal application, except that this protection shall cease to apply if, subsequent to the completeness determination, the Permittee fails to submit by the deadline specified, pursuant to 326 IAC 2-7-4(a)(2)(D), in writing by IDEM, OAQ any additional information identified as being needed to process the application.

B.17 Permit Amendment or Modification [326 IAC 2-7-11][326 IAC 2-7-12][40 CFR 72]

(a) Permit amendments and modifications are governed by the requirements of 326 IAC 2-7-11 or 326 IAC 2-7-12 whenever the Permittee seeks to amend or modify this permit.

(b) Pursuant to 326 IAC 2-7-11(b) and 326 IAC 2-7-12(a), administrative Part 70 operating permit amendments and permit modifications for purposes of the acid rain portion of a Part 70 permit shall be governed by regulations promulgated under Title IV of the Clean Air Act. [40 CFR 72]

(c) Any application requesting an amendment or modification of this permit shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(d) The Permittee may implement administrative amendment changes addressed in the request for an administrative amendment immediately upon submittal of the request. [326 IAC 2-7-11(c)(3)]

B.18 Permit Revision Under Economic Incentives and Other Programs [326 IAC 2-7-5(8)][326 IAC 2-7-12(b)(2)]

(a) No Part 70 permit revision or notice shall be required under any approved economic incentives, marketable Part 70 permits, emissions trading, and other similar programs or processes for changes that are provided for in a Part 70 permit.

(b) Notwithstanding 326 IAC 2-7-12(b)(1) and 326 IAC 2-7-12(c)(1), minor Part 70 permit modification procedures may be used for Part 70 modifications involving the use of economic incentives, marketable Part 70 permits, emissions trading, and other similar approaches to the extent that such minor Part 70 permit modification procedures are explicitly provided for in the applicable State Implementation Plan (SIP) or in applicable requirements promulgated or approved by the U.S. EPA.

B.19 Operational Flexibility [326 IAC 2-7-20][326 IAC 2-7-10.5]

(a) The Permittee may make any change or changes at the source that are described in 326 IAC 2-7-20(b) or (c) without a prior permit revision, if each of the following conditions is met:

(1) The changes are not modifications under any provision of Title I of the Clean Air Act;

(2) Any preconstruction approval required by 326 IAC 2-7-10.5 has been obtained;

(3) The changes do not result in emissions which exceed the limitations provided in this permit (whether expressed herein as a rate of emissions or in terms of total emissions);

(4) The Permittee notifies the:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

and

United States Environmental Protection Agency, Region 5
Air and Radiation Division, Regulation Development Branch - Indiana (AR-18J)
77 West Jackson Boulevard
Chicago, Illinois 60604-3590

in advance of the change by written notification at least ten (10) days in advance of the proposed change. The Permittee shall attach every such notice to the Permittee's copy of this permit; and

(5) The Permittee maintains records on-site, on a rolling five (5) year basis, which document all such changes and emission trades that are subject to 326 IAC 2-7-20(b)(1) and (c)(1). The Permittee shall make such records available, upon reasonable request, for public review.

Such records shall consist of all information required to be submitted to IDEM, OAQ in the notices specified in 326 IAC 2-7-20(b)(1) and (c)(1).

(b) The Permittee may make Section 502(b)(10) of the Clean Air Act changes (this term is defined at 326 IAC 2-7-1(35)) without a permit revision, subject to the constraint of 326 IAC 2-7-20(a). For each such Section 502(b)(10) of the Clean Air Act change, the required written notification shall include the following:

(1) A brief description of the change within the source;

(2) The date on which the change will occur;

(3) Any change in emissions; and

(4) Any permit term or condition that is no longer applicable as a result of the change.

The notification which shall be submitted is not considered an application form, report or compliance certification. Therefore, the notification by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) Emission Trades [326 IAC 2-7-20(c)]
The Permittee may trade emissions increases and decreases at the source, where the applicable SIP provides for such emission trades without requiring a permit revision, subject to the constraints of Section (a) of this condition and those in 326 IAC 2-7-20(c).

(d) Alternative Operating Scenarios [326 IAC 2-7-20(d)]
The Permittee may make changes at the source within the range of alternative operating scenarios that are described in the terms and conditions of this permit in accordance with 326 IAC 2-7-5(9). No prior notification of IDEM, OAQ or U.S. EPA is required.

(e) Backup fuel switches specifically addressed in, and limited under, Section D of this permit shall not be considered alternative operating scenarios. Therefore, the notification requirements of part (a) of this condition do not apply.

(f) This condition does not apply to emission trades of $SO_2$ or $NO_X$ under 326 IAC 21.

B.20 Source Modification Requirement [326 IAC 2-7-10.5]

A modification, construction, or reconstruction is governed by the requirements of 326 IAC 2.

B.21 Inspection and Entry [326 IAC 2-7-6][IC 13-14-2-2][IC 13-30-3-1][IC 13-17-3-2]

Upon presentation of proper identification cards, credentials, and other documents as may be required by law, and subject to the Permittee's right under all applicable laws and regulations to assert that the information collected by the agency is confidential and entitled to be treated as such, the Permittee shall allow IDEM, OAQ, U.S. EPA, or an authorized representative to perform the following:

(a) Enter upon the Permittee's premises where a Part 70 source is located, or emissions related activity is conducted, or where records must be kept under the conditions of this permit;

(b) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, have access to and copy any records that must be kept under the conditions of this permit;

(c) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, inspect any facilities, equipment (including monitoring and air pollution control equipment), practices, or operations regulated or required under this permit;

(d) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, sample or monitor substances or parameters for the purpose of assuring compliance with this permit or applicable requirements; and

(e) As authorized by the Clean Air Act, IC 13-14-2-2, IC 13-17-3-2, and IC 13-30-3-1, utilize any photographic, recording, testing, monitoring, or other equipment for the purpose of assuring compliance with this permit or applicable requirements.

B.22 Transfer of Ownership or Operational Control [326 IAC 2-7-11]

(a) The Permittee must comply with the requirements of 326 IAC 2-7-11 whenever the Permittee seeks to change the ownership or operational control of the source and no other change in the permit is necessary.

(b) Any application requesting a change in the ownership or operational control of the source shall contain a written agreement containing a specific date for transfer of permit responsibility, coverage and liability between the current and new Permittee. The application shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) The Permittee may implement administrative amendment changes addressed in the request for an administrative amendment immediately upon submittal of the request. [326 IAC 2-7-11(c)(3)]

B.23 Annual Fee Payment [326 IAC 2-7-19][326 IAC 2-7-5(7)][326 IAC 2-1.1-7]

(a) The Permittee shall pay annual fees to IDEM, OAQ within thirty (30) calendar days of receipt of a billing. Pursuant to 326 IAC 2-7-19(b), if the Permittee does not receive a bill from IDEM, OAQ the applicable fee is due April 1 of each year.

(b) Except as provided in 326 IAC 2-7-19(e), failure to pay may result in administrative enforcement action or revocation of this permit.

(c) The Permittee may call the following telephone numbers: 1-800-451-6027 or 317-233-8590 (ask for OAQ, Billing, Licensing, and Training Section), to determine the appropriate permit fee.

B.24 Credible Evidence [326 IAC 2-7-5(3)][326 IAC 2-7-6][62 FR 8314][326 IAC 1-1-6]

For the purpose of submitting compliance certifications or establishing whether or not the Permittee has violated or is in violation of any condition of this permit, nothing in this permit shall preclude the use, including the exclusive use, of any credible evidence or information relevant to whether the Permittee would have been in compliance with the condition of this permit if the appropriate performance or compliance test or procedure had been performed.

**SECTION C SOURCE OPERATION CONDITIONS**

Entire Source

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

C.1 Particulate Emission Limitations For Processes with Process Weight Rates Less Than One Hundred (100) Pounds per Hour [326 IAC 6-3-2]

Pursuant to 326 IAC 6-3-2(e)(2), particulate emissions from any process not exempt under 326 IAC 6-3-1(b) or (c) which has a maximum process weight rate less than 100 pounds per hour and the methods in 326 IAC 6-3-2(b) through (d) do not apply shall not exceed 0.551 pounds per hour.

C.2 Opacity [326 IAC 5-1]

Pursuant to 326 IAC 5-1-2 (Opacity Limitations), except as provided in 326 IAC 5-1-1 (Applicability) and 326 IAC 5-1-3 (Temporary Alternative Opacity Limitations), opacity shall meet the following, unless otherwise stated in this permit:

(a) Opacity shall not exceed an average of forty percent (40%) in any one (1) six (6) minute averaging period as determined in 326 IAC 5-1-4.

(b) Opacity shall not exceed sixty percent (60%) for more than a cumulative total of fifteen (15) minutes (sixty (60) readings as measured according to 40 CFR 60, Appendix A, Method 9 or fifteen (15) one (1) minute nonoverlapping integrated averages for a continuous opacity monitor) in a six (6) hour period.

C.3 Open Burning [326 IAC 4-1][IC 13-17-9]

The Permittee shall not open burn any material except as provided in 326 IAC 4-1-3, 326 IAC 4-1-4 or 326 IAC 4-1-6. The previous sentence notwithstanding, the Permittee may open burn in accordance with an open burning approval issued by the Commissioner under 326 IAC 4-1-4.1.

C.4 Incineration [326 IAC 4-2][326 IAC 9-1-2]

The Permittee shall not operate an incinerator except as provided in 326 IAC 4-2 or in this permit. The Permittee shall not operate a refuse incinerator or refuse burning equipment except as provided in 326 IAC 9-1-2 or in this permit.

C.5 Fugitive Dust Emissions [326 IAC 6-4]

The Permittee shall not allow fugitive dust to escape beyond the property line or boundaries of the property, right-of-way, or easement on which the source is located, in a manner that would violate 326 IAC 6-4 (Fugitive Dust Emissions). 326 IAC 6-4-2(4) is not federally enforceable.

C.6 Fugitive Particulate Matter Emission Limitations [326 IAC 6-5]

Pursuant to 326 IAC 6-5 (Fugitive Particulate Matter Emission Limitations), fugitive particulate matter emissions shall be controlled according to the attached plan as in Attachment A. The provisions of 326 IAC 6-5 are not federally enforceable.

C.7 Stack Height [326 IAC 1-7]

The Permittee shall comply with the applicable provisions of 326 IAC 1-7 (Stack Height Provisions), for all exhaust stacks through which a potential (before controls) of twenty-five (25) tons per year or more of particulate matter or sulfur dioxide is emitted. The provisions of 326 IAC 1-7-1(3), 326 IAC 1-7-2, 326 IAC 1-7-3(c) and (d), 326 IAC 1-7-4, and 326 IAC 1-7-5(a), (b), and (d) are not federally enforceable.

C.8 Asbestos Abatement Projects [326 IAC 14-10][326 IAC 18][40 CFR 61, Subpart M]

(a) Notification requirements apply to each owner or operator. If the combined amount of regulated asbestos containing material (RACM) to be stripped, removed or disturbed is at least 260 linear feet on pipes or 160 square feet on other facility components, or at least thirty-five (35) cubic feet on all facility components, then the notification requirements of 326 IAC 14-10-3 are mandatory. All demolition projects require notification whether or not asbestos is present.

(b) The Permittee shall ensure that a written notification is sent on a form provided by the Commissioner at least ten (10) working days before asbestos stripping or removal work or before demolition begins, per 326 IAC 14-10-3, and shall update such notice as necessary, including, but not limited to the following:

(1) When the amount of affected asbestos containing material increases or decreases by at least twenty percent (20%); or

(2) If there is a change in the following:

(A) Asbestos removal or demolition start date;

(B) Removal or demolition contractor; or

(C) Waste disposal site.

(c) The Permittee shall ensure that the notice is postmarked or delivered according to the guidelines set forth in 326 IAC 14-10-3(c).

(d) The notice to be submitted shall include the information enumerated in 326 IAC 14-10-3(d).

All required notifications shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

The notice shall include a signed certification from the owner or operator that the information provided in this notification is correct and that only Indiana licensed workers and project supervisors will be used to implement the asbestos removal project. The notifications do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(e) Procedures for Asbestos Emission Control
The Permittee shall comply with the applicable emission control procedures in 326 IAC 14-10-4 and 40 CFR 61.145(c). Per 326 IAC 14-10-1, emission control requirements are applicable for any removal or disturbance of RACM greater than three (3) linear feet on pipes or three (3) square feet on any other facility components or a total of at least 0.75 cubic feet on all facility components.

(f) Demolition and Renovation
The Permittee shall thoroughly inspect the affected facility or part of the facility where the demolition or renovation will occur for the presence of asbestos pursuant to 40 CFR 61.145(a).

(g) Indiana Licensed Asbestos Inspector
The Permittee shall comply with 326 IAC 14-10-1(a) that requires the owner or operator, prior to a renovation/demolition, to use an Indiana Licensed Asbestos Inspector to thoroughly inspect the affected portion of the facility for the presence of asbestos. The requirement to use an Indiana Licensed Asbestos inspector is not federally enforceable.

**Testing Requirements [326 IAC 2-7-6(1)]**

C.9 Performance Testing [326 IAC 3-6]

(a) For performance testing required by this permit, a test protocol, except as provided elsewhere in this permit, shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

no later than thirty-five (35) days prior to the intended test date. The protocol submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(b) The Permittee shall notify IDEM, OAQ of the actual test date at least fourteen (14) days prior to the actual test date. The notification submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) Pursuant to 326 IAC 3-6-4(b), all test reports must be received by IDEM, OAQ not later than forty-five (45) days after the completion of the testing. An extension may be granted by IDEM, OAQ if the Permittee submits to IDEM, OAQ a reasonable written explanation not later than five (5) days prior to the end of the initial forty-five (45) day period.

**Compliance Requirements [326 IAC 2-1.1-11]**

C.10 Compliance Requirements [326 IAC 2-1.1-11]

The commissioner may require stack testing, monitoring, or reporting at any time to assure compliance with all applicable requirements by issuing an order under 326 IAC 2-1.1-11. Any monitoring or testing shall be performed in accordance with 326 IAC 3 or other methods approved by the commissioner or the U. S. EPA.

**Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]**

C.11 Compliance Monitoring [326 IAC 2-7-5(3)][326 IAC 2-7-6(1)][40 CFR 64][326 IAC 3-8]

(a) For new units:
Unless otherwise specified in the approval for the new emission unit(s), compliance monitoring for new emission units shall be implemented on and after the date of initial start-up.

(b) For existing units:
Unless otherwise specified in this permit, for all monitoring requirements not already legally required, the Permittee shall be allowed up to ninety (90) days from the date of

permit issuance to begin such monitoring. If, due to circumstances beyond the Permittee's control, any monitoring equipment required by this permit cannot be installed and operated no later than ninety (90) days after permit issuance, the Permittee may extend the compliance schedule related to the equipment for an additional ninety (90) days provided the Permittee notifies:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

in writing, prior to the end of the initial ninety (90) day compliance schedule, with full justification of the reasons for the inability to meet this date.

The notification which shall be submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

(c) For monitoring required by CAM, at all times, the Permittee shall maintain the monitoring, including but not limited to, maintaining necessary parts for routine repairs of the monitoring equipment.

(d) For monitoring required by CAM, except for, as applicable, monitoring malfunctions, associated repairs, and required quality assurance or control activities (including, as applicable, calibration checks and required zero and span adjustments), the Permittee shall conduct all monitoring in continuous operation (or shall collect data at all required intervals) at all times that the pollutant-specific emissions unit is operating. Data recorded during monitoring malfunctions, associated repairs, and required quality assurance or control activities shall not be used for purposes of this part, including data averages and calculations, or fulfilling a minimum data availability requirement, if applicable. The owner or operator shall use all the data collected during all other periods in assessing the operation of the control device and associated control system. A monitoring malfunction is any sudden, infrequent, not reasonably preventable failure of the monitoring to provide valid data. Monitoring failures that are caused in part by poor maintenance or careless operation are not malfunctions.

C.12 Instrument Specifications [326 IAC 2-1.1-11][326 IAC 2-7-5(3)][326 IAC 2-7-6(1)]

(a) When required by any condition of this permit, an analog instrument used to measure a parameter related to the operation of an air pollution control device shall have a scale such that the expected maximum reading for the normal range shall be no less than twenty percent (20%) of full scale. The analog instrument shall be capable of measuring values outside of the normal range.

(b) The Permittee may request that the IDEM, OAQ approve the use of an instrument that does not meet the above specifications provided the Permittee can demonstrate that an alternative instrument specification will adequately ensure compliance with permit conditions requiring the measurement of the parameters.

**Corrective Actions and Response Steps [326 IAC 2-7-5][326 IAC 2-7-6]**

C.13 Emergency Reduction Plans [326 IAC 1-5-2][326 IAC 1-5-3]

Pursuant to 326 IAC 1-5-2 (Emergency Reduction Plans; Submission):

(a) The Permittee shall maintain the most recently submitted written emergency reduction plans (ERPs) consistent with safe operating procedures.

(b) Upon direct notification by IDEM, OAQ that a specific air pollution episode level is in effect, the Permittee shall immediately put into effect the actions stipulated in the approved ERP for the appropriate episode level. [326 IAC 1-5-3]

C.14 Risk Management Plan [326 IAC 2-7-5(11)][40 CFR 68]

If a regulated substance, as defined in 40 CFR 68, is present at a source in more than a threshold quantity, the Permittee must comply with the applicable requirements of 40 CFR 68.

C.15 Response to Excursions or Exceedances [40 CFR 64][326 IAC 3-8][326 IAC 2-7-5][326 IAC 2-7-6]

(I) Upon detecting an excursion where a response step is required by the D Section, or an exceedance of a limitation, not subject to CAM, in this permit:

(a) The Permittee shall take reasonable response steps to restore operation of the emissions unit (including any control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing excess emissions.

(b) The response shall include minimizing the period of any startup, shutdown or malfunction. The response may include, but is not limited to, the following:

(1) initial inspection and evaluation;

(2) recording that operations returned or are returning to normal without operator action (such as through response by a computerized distribution control system); or

(3) any necessary follow-up actions to return operation to normal or usual manner of operation.

(c) A determination of whether the Permittee has used acceptable procedures in response to an excursion or exceedance will be based on information available, which may include, but is not limited to, the following:

(1) monitoring results;

(2) review of operation and maintenance procedures and records; and/or

(3) inspection of the control device, associated capture system, and the process.

(d) Failure to take reasonable response steps shall be considered a deviation from the permit.

(e) The Permittee shall record the reasonable response steps taken.

(II)

(a) CAM *Response to excursions or exceedances.*

(1) Upon detecting an excursion or exceedance, subject to CAM, the Permittee shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing the period of any startup, shutdown or malfunction and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion or exceedance (other than those caused by excused startup or shutdown conditions). Such actions may include initial inspection and evaluation, recording that operations returned to normal without operator action (such as through response by a computerized distribution control system), or any necessary follow-up actions to return operation to within the indicator range, designated condition, or below the applicable emission limitation or standard, as applicable.

(2) Determination of whether the Permittee has used acceptable procedures in response to an excursion or exceedance will be based on information available, which may include but is not limited to, monitoring results, review of operation and maintenance procedures and records, and inspection of the control device, associated capture system, and the process.

(b) If the Permittee identifies a failure to achieve compliance with an emission limitation, subject to CAM, or standard, subject to CAM, for which the approved monitoring did not provide an indication of an excursion or exceedance while providing valid data, or the results of compliance or performance testing document a need to modify the existing indicator ranges or designated conditions, the Permittee shall promptly notify the IDEM, OAQ and, if necessary, submit a proposed significant permit modification to this permit to address the necessary monitoring changes. Such a modification may include, but is not limited to, reestablishing indicator ranges or designated conditions, modifying the frequency of conducting monitoring and collecting data, or the monitoring of additional parameters.

(c) Based on the results of a determination made under paragraph (II)(a)(2) of this condition, the EPA or IDEM, OAQ may require the Permittee to develop and implement a Quality Improvement Plan (QIP). The Permittee shall develop and implement a QIP if notified to in writing by the EPA or IDEM, OAQ.

(d) Elements of a QIP:
The Permittee shall maintain a written QIP, if required, and have it available for inspection. The plan shall conform to 40 CFR 64.8 b (2).

(e) If a QIP is required, the Permittee shall develop and implement a QIP as expeditiously as practicable and shall notify the IDEM, OAQ if the period for completing the improvements contained in the QIP exceeds 180 days from the date on which the need to implement the QIP was determined.

(f) Following implementation of a QIP, upon any subsequent determination pursuant to paragraph (II)(a)(2) of this condition the EPA or the IDEM, OAQ may require that the Permittee make reasonable changes to the QIP if the QIP is found to have:

(1) Failed to address the cause of the control device performance problems; or

(2) Failed to provide adequate procedures for correcting control device performance problems as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions.

(g) Implementation of a QIP shall not excuse the Permittee from compliance with any existing emission limitation or standard, or any existing monitoring, testing, reporting or recordkeeping requirement that may apply under federal, state, or local law, or any other applicable requirements under the Act.

(h) *CAM recordkeeping requirements.*

(1) The Permittee shall maintain records of monitoring data, monitor performance data, corrective actions taken, any written quality improvement plan required pursuant to paragraph (II)(c) of this condition and any activities undertaken to implement a quality improvement plan, and other supporting information required to be maintained under this condition (such as data used to document the adequacy of monitoring, or records of monitoring maintenance or corrective actions). Section C - General Record Keeping Requirements of this permit contains the Permittee's obligations with regard to the records required by this condition.

(2) Instead of paper records, the owner or operator may maintain records on alternative media, such as microfilm, computer files, magnetic tape disks, or microfiche, provided that the use of such alternative media allows for expeditious inspection and review, and does not conflict with other applicable recordkeeping requirements

C.16 Actions Related to Noncompliance Demonstrated by a Stack Test [326 IAC 2-7-5][326 IAC 2-7-6]

(a) When the results of a stack test performed in conformance with Section C - Performance Testing, of this permit exceed the level specified in any condition of this permit, the Permittee shall submit a description of its response actions to IDEM, OAQ no later than seventy-five (75) days after the date of the test.

(b) A retest to demonstrate compliance shall be performed no later than one hundred eighty (180) days after the date of the test. Should the Permittee demonstrate to IDEM, OAQ that retesting in one hundred eighty (180) days is not practicable, IDEM, OAQ may extend the retesting deadline.

(c) IDEM, OAQ reserves the authority to take any actions allowed under law in response to noncompliant stack tests.

The response action documents submitted pursuant to this condition do require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

**Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]**

C.17 Malfunctions Report [326 IAC 1-6-2]

Pursuant to 326 IAC 1-6-2 (Records; Notice of Malfunction):

(a) A record of all malfunctions, startups or shutdowns of any emission unit or emission control equipment, that results in violations of applicable air pollution control regulations or applicable emission limitations must be kept and retained for a period of three (3) years and be made available to the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ) or appointed representative upon request.

(b) When a malfunction of any emission unit or emission control equipment occurs that lasts more than one (1) hour, the condition shall be reported to OAQ, using the Malfunction Report Forms (2 pages). Notification must be made by telephone or other electronic means, as soon as practicable, but in no event later than four (4) daytime business hours after the beginning of the occurrence.

(c) Failure to report a malfunction of any emission unit or emission control equipment shall constitute a violation of 326 IAC 1-6, and any other applicable rules. Information on the scope and expected duration of the malfunction must be provided, including the items specified in 326 IAC 1-6-2(c)(3)(A) through (E).

(d) Malfunction is defined as any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner. [326 IAC 1-2-39]

C.18 Emission Statement [326 IAC 2-7-5(3)(C)(iii)][326 IAC 2-7-5(7)][326 IAC 2-7-19(c)][326 IAC 2-6]

Pursuant to 326 IAC 2-6-3(a)(1), the Permittee shall submit by July 1 of each year an emission statement covering the previous calendar year. The emission statement shall contain, at a minimum, the information specified in 326 IAC 2-6-4(c) and shall meet the following requirements:

(1) Indicate estimated actual emissions of all pollutants listed in 326 IAC 2-6-4(a);

(2) Indicate estimated actual emissions of regulated pollutants as defined by 326 IAC 2-7-1(31) (“Regulated pollutant, which is used only for purposes of Section 19 of this rule”) from the source, for purpose of fee assessment.

The statement must be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

The emission statement does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33).

C.19 General Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-6][326 IAC 2-2][326 IAC 2-3]

(a) Records of all required monitoring data, reports and support information required by this permit shall be retained for a period of at least five (5) years from the date of monitoring sample, measurement, report, or application. Support information includes the following, where applicable:
  (AA) All calibration and maintenance records.
  (BB) All original strip chart recordings for continuous monitoring instrumentation.
  (CC) Copies of all reports required by the Part 70 permit.

Records of required monitoring information include the following, where applicable:
  (AA) The date, place, as defined in this permit, and time of sampling or measurements.
  (BB) The dates analyses were performed.
  (CC) The company or entity that performed the analyses.
  (DD) The analytical techniques or methods used.
  (EE) The results of such analyses.

(FF) The operating conditions as existing at the time of sampling or measurement.

These records shall be physically present or electronically accessible at the source location for a minimum of three (3) years. The records may be stored elsewhere for the remaining two (2) years as long as they are available upon request. If the Commissioner makes a request for records to the Permittee, the Permittee shall furnish the records to the Commissioner within a reasonable time.

(b) Unless otherwise specified in this permit, for all record keeping requirements not already legally required, the Permittee shall be allowed up to ninety (90) days from the date of permit issuance or the date of initial start-up, whichever is later, to begin such record keeping.

(c) If there is a reasonable possibility (as defined in 326 IAC 2-2-8 (b)(6)(A), 326 IAC 2-2-8 (b)(6)(B), 326 IAC 2-3-2 (l)(6)(A), and/or 326 IAC 2-3-2 (l)(6)(B)) that a "project" (as defined in 326 IAC 2-2-1(oo) and/or 326 IAC 2-3-1(jj)) at an existing emissions unit, other than projects at a source with a Plantwide Applicability Limitation (PAL), which is not part of a "major modification" (as defined in 326 IAC 2-2-1(dd) and/or 326 IAC 2-3-1(y)) may result in significant emissions increase and the Permittee elects to utilize the "projected actual emissions" (as defined in 326 IAC 2-2-1(pp) and/or 326 IAC 2-3-1(kk)), the Permittee shall comply with following:

(1) Before beginning actual construction of the "project" (as defined in 326 IAC 2-2-1(oo) and/or 326 IAC 2-3-1(jj)) at an existing emissions unit, document and maintain the following records:

(A) A description of the project.

(B) Identification of any emissions unit whose emissions of a regulated new source review pollutant could be affected by the project.

(C) A description of the applicability test used to determine that the project is not a major modification for any regulated NSR pollutant, including:

(i) Baseline actual emissions;

(ii) Projected actual emissions;

(iii) Amount of emissions excluded under section 326 IAC 2-2-1(pp)(2)(A)(iii) and/or 326 IAC 2-3-1 (kk)(2)(A)(iii); and

(iv) An explanation for why the amount was excluded, and any netting calculations, if applicable.

(d) If there is a reasonable possibility (as defined in 326 IAC 2-2-8 (b)(6)(A) and/or 326 IAC 2-3-2 (l)(6)(A)) that a "project" (as defined in 326 IAC 2-2-1(oo) and/or 326 IAC 2-3-1(jj)) at an existing emissions unit, other than projects at a source with a Plantwide Applicability Limitation (PAL), which is not part of a "major modification" (as defined in 326 IAC 2-2-1(dd) and/or 326 IAC 2-3-1(y)) may result in significant emissions increase and the Permittee elects to utilize the "projected actual emissions" (as defined in 326 IAC 2-2-1(pp) and/or 326 IAC 2-3-1(kk)), the Permittee shall comply with following:

(1) Monitor the emissions of any regulated NSR pollutant that could increase as a result of the project and that is emitted by any existing emissions unit identified in (1)(B) above; and

(2) Calculate and maintain a record of the annual emissions, in tons per year on a calendar year basis, for a period of five (5) years following resumption of regular operations after the change, or for a period of ten (10) years following resumption of regular operations after the change if the project increases the design capacity of or the potential to emit that regulated NSR pollutant at the emissions unit.

C.20 General Reporting Requirements [326 IAC 2-7-5(3)(C)][326 IAC 2-1.1-11][326 IAC 2-2][326 IAC 2-3][40 CFR 64][326 IAC 3-8]

(a) The Permittee shall submit the attached Quarterly Deviation and Compliance Monitoring Report or its equivalent. Proper notice submittal under Section C - Malfunctions Report satisfies the reporting requirements of this paragraph. Any deviation from permit requirements, the date(s) of each deviation, the cause of the deviation, and the response steps taken must be reported except that a deviation required to be reported pursuant to an applicable requirement that exists independent of this permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. This report shall be submitted not later than thirty (30) days after the end of the reporting period. The Quarterly Deviation and Compliance Monitoring Report shall include a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(33). A deviation is an exceedance of a permit limitation or a failure to comply with a requirement of the permit.

On and after the date by which the Permittee must use monitoring that meets the requirements of 40 CFR Part 64 and 326 IAC 3-8, the Permittee shall submit CAM reports to the IDEM, OAQ.

A report for monitoring under 40 CFR Part 64 and 326 IAC 3-8 shall include, at a minimum, the information required under paragraph (a) of this condition and the following information, as applicable:

(1) Summary information on the number, duration and cause (including unknown cause, if applicable) of excursions or exceedances, as applicable, and the corrective actions taken;

(2) Summary information on the number, duration and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero and span or other daily calibration checks, if applicable); and

(3) A description of the actions taken to implement a QIP during the reporting period as specified in Section C-Response to Excursions or Exceedances. Upon completion of a QIP, the owner or operator shall include in the next summary report documentation that the implementation of the plan has been completed and reduced the likelihood of similar levels of excursions or exceedances occurring.

The Permittee may combine the Quarterly Deviation and Compliance Monitoring Report and a report pursuant to 40 CFR 64 and 326 IAC 3-8.

(b) The address for report submittal is:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

(c) Unless otherwise specified in this permit, any notice, report, or other submission required by this permit shall be considered timely if the date postmarked on the envelope or certified mail receipt, or affixed by the shipper on the private shipping receipt, is on or before the date it is due. If the document is submitted by any other means, it shall be considered timely if received by IDEM, OAQ on or before the date it is due.

(d) Reporting periods are based on calendar years, unless otherwise specified in this permit. For the purpose of this permit "calendar year" means the twelve (12) month period from January 1 to December 31 inclusive.

(e) If the Permittee is required to comply with the recordkeeping provisions of (d) in Section C - General Record Keeping Requirements for any "project" (as defined in 326 IAC 2-2-1 (oo) and/or 326 IAC 2-3-1 (jj)) at an existing emissions unit, and the project meets the following criteria, then the Permittee shall submit a report to IDEM, OAQ:

(1) The annual emissions, in tons per year, from the project identified in (c)(1) in Section C- General Record Keeping Requirements exceed the baseline actual emissions, as documented and maintained under Section C- General Record Keeping Requirements (c)(1)(C)(i), by a significant amount, as defined in 326 IAC 2-2-1 (ww) and/or 326 IAC 2-3-1 (pp), for that regulated NSR pollutant, and

(2) The emissions differ from the preconstruction projection as documented and maintained under Section C - General Record Keeping Requirements (c)(1)(C)(ii).

(f) The report for project at an existing emissions unit shall be submitted no later than sixty (60) days after the end of the year and contain the following:

(1) The name, address, and telephone number of the major stationary source.

(2) The annual emissions calculated in accordance with (d)(1) and (2) in Section C - General Record Keeping Requirements.

(3) The emissions calculated under the actual-to-projected actual test stated in 326 IAC 2-2-2(d)(3) and/or 326 IAC 2-3-2(c)(3).

(4) Any other information that the Permittee wishes to include in this report such as an explanation as to why the emissions differ from the preconstruction projection.

Reports required in this part shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

(g) The Permittee shall make the information required to be documented and maintained in accordance with (c) in Section C- General Record Keeping Requirements available for review upon a request for inspection by IDEM, OAQ. The general public may request this information from the IDEM, OAQ under 326 IAC 17.1.

**Stratospheric Ozone Protection**

C.21 Compliance with 40 CFR 82 and 326 IAC 22-1

Pursuant to 40 CFR 82 (Protection of Stratospheric Ozone), Subpart F, except as provided for motor vehicle air conditioners in Subpart B, the Permittee shall comply with applicable standards for recycling and emissions reduction.

## SECTION D.1 EMISSIONS UNIT OPERATION CONDITIONS

**Emissions Unit Description:**

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide ($SO_2$), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide ($CO_2$), and a sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

D.1.1 Consent Decree [IP99-1692 C-M/F]

Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the FGD scrubber serving Unit No. 2 shall achieve and maintain a 30-Day Rolling Average $SO_2$ Removal Efficiency of at least ninety-five percent (95%).

D.1.2 Particulate Emission Limitations for Sources of Indirect Heating [326 IAC 6-2-3]

Pursuant to 326 IAC 6-2-3(b), (Particulate Emission Limitations for Sources of Indirect Heating), the particulate matter (PM) emissions from Unit No. 2 shall not exceed the 0.38 pounds per million Btu heat input.

D.1.3 Warrick County Sulfur Dioxide ($SO_2$) Emission Limitations [326 IAC 7-4-10]

(a) Pursuant to 326 IAC 7-4-10, the Sulfur Dioxide ($SO_2$) emissions from Unit No. 2 shall not exceed 2.79 pounds per MMBtu as specified in 326 IAC 7-4-10(a)(1). Unit No. 2 has an alternative $SO_2$ limit; the $SO_2$ emissions shall not exceed 4.40 pounds per MMBtu, as specified in 326 IAC 7-4-10(a)(1)(B). $SO_2$ emissions shall be calculated on a 30-day rolling weighted average basis.

(b) Pursuant to 326 IAC 7-4-10(a)(1)(C), SIGECO shall notify IDEM, OAQ and the U.S. EPA via certified mail at least fourteen (14) days prior to its intention to rely on the alternative $SO_2$ limit (4.4 pounds per MMBtu), or to switch between the primary limit (2.79 pounds per MMBtu) and the alternative $SO_2$ limit (4.4 pounds per MMBtu).

D.1.4 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

**Compliance Determination Requirements [326 IAC 2-7-5(1)]**

D.1.5 Particulate Control [326 IAC 2-7-6(1)]

(a) In order to assure compliance with Condition D.1.2, the Permittee shall operate the electrostatic precipitator (ESP) at all times Unit No. 2 is combusting coal (except as otherwise specified in this permit or when firing only natural gas).

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall operate the electrostatic precipitators (ESP) at all times Unit No. 2 is combusting coal to maximize PM emission reductions, consistent with the operational and maintenance limitations of the unit.

D.1.6 Sulfur Dioxide Control [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][326 IAC 7-4-10]

(a) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, and in order to maintain compliance with all applicable $SO_2$ limits and the Conditions D.1.1 and D.1.3, the Permittee shall operate the FGD scrubber at all times that Unit No. 2 is in operation (except as otherwise specified in this permit or when firing only natural gas).

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall continuously operate the FGD serving Units No. 2 and 3 at all times that the Unit No. 2 is in operation, except in the event of a planned FGD outage. Following startup of natural gas, the Permittee does not need to operate the FGD until the unit is fired with coal.

(c) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, in the event of a planned FGD outage, SIGECO may continue to operate Unit No. 2 but shall burn down the coal existing in the Unit No. 2 bunker to the extent practicable, and, prior to shutting down the FGD, load Compliance Coal into the bunker for use until such time as the FGD resumes operation. In the event of an unplanned FGD outage, SIGECO shall feed Compliance Coal to the Unit No. 2 bunker until such time as the FGD resumes operation. Compliance Coal is defined as 2.0 lb/MMBtu $SO_2$ as demonstrated by a 4-hour composite sample of the feed stock.

D.1.7 Continuous Emission Monitoring [326 IAC 3-5][326 IAC 2-7-6(1),(6)][40 CFR 63]

(a) Pursuant to 326 IAC 3-5 (Continuous Monitoring of Emissions), continuous emission monitoring systems (CEMS) for Unit No. 2, which are shared with Unit No. 3, shall be calibrated, maintained, and operated for measuring $SO_2$, PM, $NO_X$, and $CO_2$, and shall meet all applicable performance specifications of 326 IAC 3-5-2. The data from the respective CEMS shall be used to determine compliance with Conditions D.1.1, D.1.2, and D.1.3.

(b) The CEMS must operate and record data during all periods of operation of the affected facilities including periods of startup, shutdown, malfunction or emergency conditions, except for CEMS breakdowns, repairs, calibration checks, and zero and span adjustments.

(c) All continuous emissions monitoring systems are subject to monitor system certification requirements pursuant to 326 IAC 3-5-3.

(d) Nothing in this permit shall excuse the Permittee from complying with the requirements to operate a continuous emission monitoring system pursuant to 326 IAC 3-5 and 40 CFR 63.

D.1.8 Sulfur Dioxide Emissions [326 IAC 3][326 IAC 7-2][326 IAC 7-1.1-2][326 IAC 7-4-10]

(a) Pursuant to 326 IAC 7-2-1(a), the Permittee shall demonstrate that the Sulfur Dioxide emissions do not exceed the applicable limits in Condition D.1.3. Compliance with these limits shall be determined using $SO_2$ CEMS data and demonstrated using a thirty (30) day rolling weighted average.

(b) In order to demonstrate compliance with Condition D.1.1, the Permittee shall demonstrate that the FGD scrubber operates with the minimum Sulfur Dioxide ($SO_2$) removal efficiency according to the following:

(1) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the inlet $SO_2$ emission rate shall be determined in accordance with 40 CFR 75.15, using CEMS data from the inlet to the scrubber.

(2) The continuous emission monitoring (CEM) data (Condition D.1.7) shall be used to determine the $SO_2$ emissions following the scrubber.

(3) A comparison of the data from (1) and (2) above shall be used to determine the efficiency of the FGD scrubber.

**Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]**

D.1.9 $SO_2$ Continuous Emissions Monitoring System (CEMS) Equipment Downtime

(a) In the event that a breakdown of a SO2 continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever the $SO_2$ continuous emission monitoring (CEMS) system is malfunctioning or down for maintenance or repairs and a backup CEM is not brought on-line, the following shall be used to provide information related to $SO_2$ emissions:

(1) If the CEM system is down for less than twenty-four (24) hours and a backup CEM is not brought on-line, the Permittee shall substitute an average of the quality-assured data from the hour immediately before and the hour immediately after the missing data period for each hour of missing data.

(2) Whenever the SO2 continuous emission monitoring system (CEMS) is malfunctioning or down for repairs or adjustments for twenty-four (24) hours or more, and a backup CEMs cannot be brought on-line, the Permittee shall comply with the requirements of 40 CFR 75, Subpart D to demonstrate compliance with Condition D.1.3 until the primary CEMS or a backup CEMS is brought online.

D.1.10 PM Continuous Emissions Monitoring System (CEMS) Equipment Downtime

(a) In the event that a breakdown of a PM continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever a PM continuous emissions monitoring system (CEMS) is malfunctioning or is down for maintenance or repairs for a period of twenty-four (24) hours or more and a backup PM CEMS is not online within twenty-four (24) hours of shutdown or malfunction of the primary PM CEMS, the Permittee shall comply with the following:

(1) The primary and secondary currents of the transformer-rectifier (T-R) sets;

(2) The primary and secondary voltages of the T-R sets; and

(3) The daily number of T-R sets in service.

(c) Parametric monitoring shall begin not more than twenty-four (24) hours after the start of the malfunction or down time at least twice per day during normal operations, with at least four (4) hours between each set of readings, until a PM CEMS is online.

**Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19][326 IAC 3-5]**

D.1.11 Record Keeping Requirements

(a) In order to document the compliance status with Conditions D.1.1, D.1.2, D.1.3, and D.1.7, the Permittee shall record the output of the continuous monitoring system(s) and shall perform the required record keeping pursuant to 326 IAC 3-5-6 and 326 IAC 3-5-7.

(b) In the event that a breakdown of the SO2 or PM continuous emission monitoring systems (CEMS) occurs, the Permittee shall maintain records of all CEMS malfunctions, out of control periods, calibration and adjustment activities, and repair or maintenance activities.

(c) The Permittee shall maintain records of the information in Condition D.1.9(b) during SO2 CEMS system downtime, including the following:

(1) Boiler load, absorber recirculation slurry stream, slurry feed rate and number of re-circulation pumps in service during $SO_2$ CEMS downtime.

(2) Actual fuel usage during each $SO_2$ CEMS downtime.

(d) The Permittee shall maintain records of the information in Condition D.1.10(b) during PM CEMS system downtime.

(e) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

D.1.12 Reporting Requirements

(a) A quarterly summary of the thirty (30) day rolling weighted average PM emissions rate in pound per million Btu to document the compliance status with Condition D.1.2, as well as a quarterly summary of the information to document compliance with Condition D.1.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(33).

(b) Pursuant to 326 IAC 3-5-5(f)(1), the Permittee shall prepare and submit to IDEM, OAQ a written report for performance audits as follows:

(1) Owners or operators of emissions units required to conduct a:

(A) cylinder gas audit;
(B) relative accuracy test audit; or
(C) continuous opacity monitor calibration error audit;

on continuous emission monitors shall prepare a written report of the results of the performance audit for each calendar quarter, or for other periods required by the department. The owner or operator shall submit quarterly reports to the department within thirty (30) calendar days after the end of each quarter for cylinder gas audits and continuous opacity monitor calibration error audits and within forty-five (45) calendar days after the completion of the test for relative accuracy test audits.

(2) The report must contain the information required by 326 IAC 3-5-5(f)(2).

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1 (35).

(c) Pursuant to 326 IAC 3-5-7(c)(4), reporting of continuous monitoring system instrument downtime, (except for zero (0) and span checks, which shall be reported separately), shall include the following:

(1) Date of downtime.

(2) Time of commencement.

(3) Duration of each downtime.

(4) Reasons for each downtime.

(5) Nature of system repairs and adjustments.

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1 (35).

## SECTION D.2 EMISSIONS UNIT OPERATION CONDITIONS

**Emissions Unit Description:**

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

D.2.1 Consent Decree [Civil Action No. IP99-1692 C-M/F][326 IAC 10-6-1]

Pursuant to Consent Decree: Civil Action No. IP99-1692 C-M/F and 326 IAC 10-6-1, effective June 6, 2003 and Joint Stipulation to Modify Consent Decree, effective December 16, 2015:

(a) SIGECO shall continuously operate the SCR to achieve and maintain a 30-day rolling average emission rate for NOx of not greater than 0.100 lb/MMBtu.

(b) The FGD serving Unit No. 3 shall achieve and maintain a 30-day rolling average $SO_2$ removal efficiency of at least ninety-five percent (95%).

(c) By no later than June 30, 2007, SIGECO shall install and operate a fabric filter at Unit No. 3 that achieves and maintains a PM emission rate of less than or equal to 0.015 lb/MMBtu, on a 3-hour rolling average basis.

(d) SIGECO shall install and continuously operate on a permanent basis a sorbent injection system at F.B. Culley Unit No. 3 to mitigate sulfur trioxide ($SO_3$) and resulting sulfuric acid ($H_2SO_4$) emissions from the unit to achieve and maintain an emission limit of 0.009 lb/MMBtu.

D.2.2 Particulate Emission Limitations for Southern Indiana Gas and Electric Company [326 IAC 6-7-1]

Pursuant to 326 IAC 6-7-1, PM emissions from Unit No.3 shall not exceed 0.015 pounds per MMBtu.

D.2.3 Warrick County Sulfur Dioxide (SO2) Emission Limitations [326 IAC 7-4-10]

Pursuant to 326 IAC 7-4-10, the sulfur dioxide ($SO_2$) emissions from Unit No. 3 shall not exceed 5.41 pounds per MMBtu as specified in 326 IAC 7-4-10(a)(1).

D.2.4 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B

- Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

**Compliance Determination Requirements [326 IAC 2-7-5(1)]**

D.2.5 $SO_2$ Control [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][326 IAC 7-4-10]

(a) In order to assure compliance with Condition D.2.3, the Permittee shall continuously operate the FGD scrubber at all times Unit No. 3 is in operation (except as otherwise specified in this permit or when firing only natural gas).

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall continuously operate the FGD at all times that the Unit No. 3 is in operation, except in the event of a planned FGD outage. Following startup of natural gas, the Permittee does not need to operate the FGD until the unit is fired with coal.

D.2.6 Particulate Control [326 IAC 2-7-6(6)][326 IAC 6-7-1]

In order to assure compliance with Condition D.2.2, the Permittee shall operate the fabric filter at all times (except as otherwise specified in this permit) Unit No. 3 is in operation.

D.2.7 Nitrogen Oxide Control [326 IAC 10-6-1]

(a) The SCR for NOx control shall be in operation at all times (except as otherwise specified in this permit) when Unit No. 3 is in operation.

(b) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the Permittee shall operate the SCR on Unit No. 3 at all times that the facility is in operation, consistent with the technological limitations, manufacturers' specifications, and good operating practices for the SCR.

(c) In order to determine compliance with Condition D.2.1(a), the NOx emissions from Unit No. 3 shall be determined using the following equation:

$$N = \frac{\sum_{i=1}^{30}\sum_{j=1}^{n} x_{j,i}}{\sum_{i=1}^{30} n_i}$$

Where:
N = 30-day rolling average NOx emissions, lb/MMBtu
i = Each operating day
j = Each hour on an operating day during which the unit combusted fuel
n = Number of operating hours in an operating day
$x_{j,j}$ = Hourly NOx emissions, lb/MMBtu

D.2.8 Continuous Emission Monitoring [326 IAC 3-5][326 IAC 2-7-6(1),(6)][40 CFR 63]

(a) Pursuant to 326 IAC 3-5 (Continuous Monitoring of Emissions) continuous emission monitoring systems for Unit No. 3, which are shared with Unit No. 2, shall be calibrated, maintained, and operated for measuring $SO_2$, PM, $NO_X$, and $CO_2$, and shall meet all applicable performance specifications of 326 IAC 3-5-2. The data from the respective CEMS shall be used to determine compliance with Conditions D.2.1, D.2.2, and D.2.3.

(b) The CEMS must operate and record data during all periods of operation of the affected facilities including periods of startup, shutdown, malfunction or emergency conditions, except for CEMS breakdowns, repairs, calibration checks, and zero and span adjustments.

(c) All continuous emissions monitoring systems are subject to monitor system certification

requirements pursuant to 326 IAC 3-5-3.

(d) Nothing in this permit shall excuse the Permittee from complying with the requirements to operate a CEMS pursuant to 326 IAC 3-5 and 40 CFR 63.

D.2.9 Sulfur Dioxide Emissions [326 IAC 3][326 IAC 7-2][326 IAC 7-1.1-2]

(a) Pursuant to 326 IAC 7-2-1(a), the Permittee shall demonstrate that the sulfur dioxide emissions do not exceed the applicable limits in Condition D.2.3. Compliance with these limits shall be determined using $SO_2$ CEMS data and demonstrated using a thirty (30) day rolling weighted average.

(b) In order to demonstrate compliance with Condition D.2.1, the Permittee shall demonstrate that the FGD scrubber operates with the minimum sulfur dioxide ($SO_2$) removal efficiency required by Condition D.2.1.

(1) Pursuant to Consent Decree Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, the inlet $SO_2$ emission rate shall be determined in accordance with 40 CFR 75.15, using CEMS data from the inlet to the scrubber.

(2) The continuous emission monitoring (CEM) data (Condition D.2.8) shall be used to determine the $SO_2$ emissions following the scrubber.

(3) A comparison of the data from (1) and (2) above shall be used to determine the efficiency of the FGD scrubber.

D.2.10 Testing Requirements [326 IAC 2-1.1-11]

Pursuant to Consent Decree: Civil Action No. IP99-1692 C-M/F, effective June 6, 2003, and Joint Stipulation to Modify Consent Decree, effective December 16, 2015, within six (6) months of this modified consent decree, the Permittee shall perform $H_2SO_4$ testing of the Unit No. 3 Stack utilizing methods approved by the commissioner annually from the date of the most recent valid compliance demonstration. Testing shall be conducted in accordance with the provisions of 326 IAC 3-6 (Source Sampling Procedures). Section C - Performance Testing contains the Permittee's obligation with regard to the performance testing required by this condition.

**Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]**

D.2.11 SO2 Continuous Emissions Monitoring System (CEMS) Equipment Downtime

(a) In the event that a breakdown of a SO2 continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever the $SO_2$ continuous emission monitoring (CEMS) system is malfunctioning or down for maintenance or repairs and a backup CEM is not brought on-line, the following shall be used to provide information related to $SO_2$ emissions:

(1) If the CEM system is down for less than twenty-four (24) hours and a backup CEM is not brought on-line, the Permittee shall substitute an average of the quality-assured data from the hour immediately before and the hour immediately after the missing data period for each hour of missing data.

(2) Whenever the SO2 continuous emission monitoring system (CEMS) is malfunctioning or down for maintenance or repairs for twenty-four (24) hours or more, and a backup CEMs cannot be brought on-line, the Permittee shall comply with the requirements of 40 CFR 75, Subpart D to demonstrate compliance with Condition D.2.3 until the primary CEMS or a backup CEMS is brought online.

D.2.12 NOx Continuous Emissions Monitoring (CEMS) Equipment Downtime

(a) In the event that a breakdown of a NOx continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever a $NO_x$ CEMS is down for more than twenty-four (24) hours, the Permittee shall monitor the catalyst bed inlet temperature with a continuous temperature monitoring system no less often than once per four (4) hours. When for any one reading, the catalyst bed inlet temperature is below the minimum temperature, the Permittee shall take a reasonable response. The minimum temperature for this catalyst bed inlet is 380 °F, unless a new minimum temperature is determined during the most recent valid compliant stack test.

Section C - Response to Excursions or Exceedances contains the Permittee's obligation with regard to the reasonable response steps required by this condition. A temperature reading that is below the minimum temperature is not a deviation from this permit. Failure to take response steps shall be considered a deviation from this permit.

D.2.13 PM Continuous Emissions Monitoring (CEMS) Equipment Downtime

(a) In the event that a breakdown of a PM continuous emissions monitoring system (CEMS) occurs, a record shall be made of the time and reason of the breakdown and efforts made to correct the problem.

(b) Whenever a PM continuous emissions monitoring system (CEMS) is malfunctioning or is down for maintenance or repairs for a period of twenty-four (24) hours or more and a backup PM CEMS is not online within twenty-four (24) hours of shutdown or malfunction of the primary PM CEMS, the Permittee shall comply with the following:

(1) The Fabric Filter shall be monitored once per day, when the unit is in operation, by monitoring and recording the number of Fabric Filter compartments in service.

(A) The number of Fabric Filter compartments in service shall be maintained at a level consistent with the net air-to-cloth ratio operating condition of two compartments out of service or greater.

(B) Failure to maintain the number of operating compartments in service at a level equal to or greater with the net-net air-to-cloth ratio operating condition will not be considered a deviation from this permit; rather, failure to take response steps to remedy the situation shall be considered a deviation from this permit.

(2) The Permittee shall record the pressure drop across the Fabric Filter at least once per day when Unit No. 3 is in operation. When, for any one reading, the pressure drop across a fabric filter is outside the normal range, the Permittee shall take a reasonable response. The normal range for this unit is a pressure drop between 6.0 and 8.0 inches of water unless a different upper-bound or lower-bound value for this range is determined during the latest stack test.

**Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19][326 IAC 3-5]**

D.2.14 Record Keeping Requirements

(a) In order to document the compliance status with Conditions D.2.1, 2.2, 2.3, and D.2.8, the Permittee shall record the output of the continuous monitoring system(s) and shall

perform the required record keeping pursuant to 326 IAC 3-5-6 and 326 IAC 3-5-7.

(b) In the event that a breakdown of the SO2, NOx, or PM continuous emission monitoring systems (CEMS) occurs, the Permittee shall maintain records of all CEMS malfunctions, out of control periods, calibration and adjustment activities, and repair or maintenance activities.

(c) The Permittee shall maintain records of the information in Condition D.2.11(b) during SO2 CEMS system downtime, including the following:

(1) Boiler load, absorber recirculation slurry stream, slurry feed rate and number of re-circulation pumps in service during $SO_2$ CEMS downtime.

(2) Actual fuel usage during each $SO_2$ CEMS downtime.

(d) The Permittee shall maintain records of the information in Condition D.2.12(b) during NOx CEMS system downtime.

(e) The Permittee shall maintain records of the information in Condition D.2.13(b) during PM CEMS system downtime, including the following:

(1) The number of Fabric Filter compartments in service shall be maintained at a level consistent with the net air-to-cloth ratio operating condition of two compartments out of service or greater;

(2) The pressure drop across the Fabric Filter at least once per day when Unit No. 3 is in operation. When, for any one reading, the pressure drop across a fabric filter is outside the normal range, the Permittee shall take a reasonable response. The normal range for this unit is a pressure drop between 6.0 and 8.0 inches of water unless a different upper-bound or lower-bound value for this range is determined during the latest stack test.

(f) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

D.2.15 Reporting Requirements

(a) A quarterly summary of the information to document the compliance status with Conditions D.2.2 and D.2.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(33).

(b) Pursuant to 326 IAC 3-5-5(f)(1), the Permittee shall prepare and submit to IDEM, OAQ a written report for performance audits as follows:

(1) Owners or operators of emissions units required to conduct a:

(A) Cylinder gas audit;
(B) Relative accuracy test audit; or
(C) Continuous opacity monitor calibration error audit;

on continuous emission monitors shall prepare a written report of the results of the performance audit for each calendar quarter, or for other periods required by the department. The owner or operator shall submit quarterly reports to the

department within thirty (30) calendar days after the end of each quarter for cylinder gas audits and continuous opacity monitor calibration error audits and within forty-five (45) calendar days after the completion of the test for relative accuracy test audits.

(2) The report must contain the information required by 326 IAC 3-5-5(f)(2).

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a “responsible official,” as defined by 326 IAC 2-7-1 (35).

(c) Pursuant to 326 IAC 3-5-7(c)(4), reporting of continuous monitoring system instrument downtime, (except for zero (0) and span checks, which shall be reported separately), shall include the following:

(1) Date of downtime.

(2) Time of commencement.

(3) Duration of each downtime.

(4) Reasons for each downtime.

(5) Nature of system repairs and adjustments.

The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a “responsible official,” as defined by 326 IAC 2-7-1 (35).

**SECTION D.3 EMISSIONS UNIT OPERATION CONDITIONS**

**Emissions Unit Description:**

(c) Coal storage and handling operations, identified as Unit 5F, constructed in 1954, expanded in 1963 and 1970, and modified in 1994, consisting of the following activities:

(1) Floating dock unloading clamshell serving both coal and limestone unloading operations (served by S/V 6).

(2) Truck load-out station serving both coal and limestone unloading operations (served by S/V 9).

(3) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 600 tons per hour.

(4) Unit No. 2 coal hopper conveyor (C1) with a maximum coal feed belt capacity of 600 tons per hour.

(5) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 600 tons per hour.

(6) Unit No. 2 coal transfer house conveyor (#4) with a maximum coal feed belt capacity of 1240 tons per hour.

(7) Unit No. 2 coal transfer house conveyor drop with a maximum coal feed belt capacity of 1240 tons per hour.

(8) Unit No. 2 coal transfer house conveyor with a maximum coal feed belt capacity of 1240 tons per hour.

(9) Unit No. 2 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(10) Unit No. 2 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(11) Unit No. 2 powerhouse coal bunkers with a maximum coal feed belt capacity of 1240 tons per hour and with an enclosed powerhouse and sealed transfer points.

(12) Units No. 2 and No. 3 coal pile of 645,000 tons.

(13) Unit No. 2 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(14) Unit No. 2 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(15) Unit No. 3 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour.

(16) Unit No. 3 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour.

(17) Unit No. 3 coal transfer house conveyor, with a maximum coal feed belt capacity of 640 tons per hour.

(18) Unit No. 3 coal transfer house conveyor drop with a maximum coal feed belt capacity of 640 tons per hour with an enclosed transfer house and fabric filter (served by S/V 8).

(19) Unit No. 3 powerhouse coal tripper conveyor with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(20) Unit No. 3 powerhouse coal tripper conveyor bunker drop with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(21) Unit No. 3 powerhouse coal bunker with a maximum coal feed belt capacity of 640 tons per hour and with an enclosed powerhouse and sealed transfer points.

(22) Miscellaneous enclosed coal bunker and weigh-scales with vents.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

D.3.1 Particulate Emission Limitations for Manufacturing Processes [326 IAC 6-3-2]

(a) Pursuant to 326 IAC 6-3-2, (Particulate Emission Limitations for Manufacturing Processes) the allowable particulate emissions from the:

(1) Unit No. 2 coal pile hopper, coal hopper conveyor, coal transfer house and conveyor drop shall each not exceed 71.16 pounds per hour when each operating at a process weight rate of 600 tons per hour.

(2) Unit No. 2 coal handling system consisting of: coal transfer house conveyor drop, coal transfer house conveyor, powerhouse coal tripper conveyor, powerhouse coal tripper conveyor bunker drop, power house coal bunkers shall each not exceed 80.4 pounds per hour each when operating at a process weight rate of 1240 tons per hour.

(3) Unit No. 2 coal handling system consisting of: coal pile hopper and coal pile hopper conveyor shall each not exceed 71.95 pounds per hour when each operating at a process weight rate of 640 tons per hour.

(4) Unit No. 3 coal handling system consisting of: coal pile hopper, coal pile hopper conveyor, coal transfer house conveyor drop 1, coal transfer house conveyor, coal transfer house conveyor drop 2, powerhouse coal tripper conveyor, powerhouse coal tripper conveyor bunker drop, and powerhouse coal bunker shall each not exceed 71.95 pounds per hour each when operating at a process weight rate of 640 tons per hour.

The pound per hour limitation was calculated with the following equation:

Interpolation and extrapolation of the data for the process weight rate in excess of sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (55.0) \times (P^{0.11}) - 40$$

where E = rate of emission in pounds per hour and
P = process weight rate in tons per hour

(b) Pursuant to 326 IAC 6-3-2(e)(3), when the process weight exceeds 200 tons per hour, the maximum allowable emissions may exceed the emission limits shown paragraph (a), provided the concentration of particulate matter in the gas discharged to the atmosphere is less than 0.10 pounds per 1,000 pounds of gases.

D.3.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

**Compliance Determination Requirements [326 IAC 2-7-5(1)]**

D.3.3 Particulate Control [326 IAC 2-7-6(6)]

(a) Except as otherwise provided by statute or rule or in this permit, in order to assure compliance with Condition D.3.1 the enclosures and fabric filters for particulate control shall be in place and operate at all times the associated coal handling facilities are in operation.

(b) In the event that bag failure is observed in a multi-compartment fabric filters, if operations will continue for ten (10) days or more after the failure is observed before the failed units will be repaired or replaced, the Permittee shall promptly notify the IDEM, OAQ of the expected date the failed units will be repaired or replaced. The notification shall also include the status of the applicable compliance monitoring parameters with respect to normal, and the results of any response actions taken up to the time of notification.

**Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]**

D.3.4 Visible Emissions Notations [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)]

(a) Visible emission notations for all coal storage piles, coal transfer points, and stack exhausts (Nos. 6, 8, & 9) shall be performed once per week during normal daylight operations when transferring coal. A trained employee shall record whether emissions are normal or abnormal.

(b) For processes operated continuously, "normal" means those conditions prevailing, or expected to prevail, eighty percent (80%) of the time the process is in operation, not counting startup or shut down time.

(c) In the case of batch or discontinuous operations, readings shall be taken during that part of the operation that would normally be expected to cause the greatest emissions.

(d) A trained employee is an employee who has worked at the plant at least one (1) month and has been trained in the appearance and characteristics of normal visible emissions for that specific process.

(e) If abnormal emissions are observed, the Permittee shall take a reasonable response. Section C - Response to Excursions and Exceedances contains the Permittee's obligation with regard to the reasonable response steps required by this condition. Failure to take response steps shall be considered a deviation from this permit. Observation of abnormal emissions that do not violate 326 IAC 6-4 (Fugitive Dust Emissions) or an applicable opacity limit is not a deviation from this permit.

D.3.5 Broken or Failed Bag Detection

(a) For a single compartment baghouse/filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced.

(b) For a single compartment baghouse controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the line.

Bag failure can be indicated by a significant drop in the baghouse's pressure reading with abnormal visible emissions, by an opacity violation, or by other means such as gas temperature, flow rate, air infiltration, leaks, dust traces or triboflows.

**Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]**

D.3.6 Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

(a) To document the compliance status with Condition D.3.4, the Permittee shall maintain records of the visible emission notations once per week. The Permittee shall include in its weekly record when a visible emission notation is not taken and the reason for the lack of visible emission notation (e.g. the process did not operate that week).

(b) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

**SECTION D.4 EMISSIONS UNIT OPERATION CONDITIONS**

**Emissions Unit Description:**

(d) A fly ash handling facility, identified as Unit 6, constructed in 1994, consisting of the following operations:

(1) One (1) fly ash storage silo receiving fly ash via a close-pipe vacuum handling system from the electrostatic precipitator and fabric filter hoppers of Units No. 2 and No. 3, respectively, with a maximum capacity of 1000 tons, and a maximum throughput of 179.9 tons per hour, with a fabric filter separator exhausting to stack 16 and a bin filter exhausting to stack 17.

(2) One (1) fly ash silo truck loadout station, with a maximum capacity of 25 tons per hour, with an enclosed telescoping discharged chute and emissions reduced by fly ash wetting and partial loading of the trucks.

(3) One (1) Ash Pond (East and West) receiving sluiced (closed-pipe) bottom ash from Units No. 2 and No. 3. The ash is discharged to the pond at a maximum annual rate of 4.65 tons per hour and stored in wet form, that is, a layer of water maintained above the ponded ash and dredging operations conducted periodically to maintain the ponded storage state.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

D.4.1 Particulate Emission Limitations for Manufacturing Processes [326 IAC 6-3-2]

(a) Pursuant to 326 IAC 6-3-2, the allowable particulate emissions from the fly ash storage silo shall not exceed 57.4 pounds per hour when operating at a process weight rate of 179.9 tons per hour.

The pound per hour limitation was calculated with the following equation:

Interpolation and extrapolation of the data for the process weight rate in excess of sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (55.0) \times (P^{0.11}) - 40$$

where E = rate of emission in pounds per hour and
P = process weight rate in tons per hour

(b) Pursuant to 326 IAC 6-3-2, the allowable particulate emissions from the fly ash silo truck loadout station shall not exceed 35.4 pounds per hour when operating at a process weight rate of 25 tons per hour.

The pound per hour limitation was calculated with the following equation:

Interpolation of the data for the process weight rate up to sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (4.10) \times (P^{0.67})$$

where E = rate of emission in pounds per hour and

P = process weight rate in tons per hour

D.4.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

**Compliance Determination Requirements [326 IAC 2-7-5(1)]**

D.4.3 Particulate Control [326 IAC 2-7-6(6)]

Except as otherwise provided by statute or rule or in this permit, in order to comply with Condition D.4.1 the fabric filters and bin filters for particulate control shall be in place and operate at all times the associated fly ash handling facilities are in operation.

**Compliance Monitoring Requirements [326 IAC 2-7-5(1)][326 IAC 2-7-6(1)]**

D.4.4 Visible Emissions Notations [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][40 CFR 64]

(a) Visible emission notations of the exhaust from the fly ash silo truck loadout station shall be performed at least once per day during normal daylight operations. A trained employee shall record whether emissions are normal or abnormal.

(b) Visible emission notations of the exhaust from all fly ash transfer points shall be performed once per day during normal daylight when transferring the respective material. A trained employee shall record whether emissions are normal or abnormal.

(c) For processes operated continuously, "normal" means those conditions prevailing, or expected to prevail, eighty percent (80%) of the time the process is in operation.

(d) In the case of batch or discontinuous operations, readings shall be taken during that part of the operation that would normally be expected to cause the greatest emissions.

(e) A trained employee is an employee who has worked at the plant at least one (1) month and has been trained in the appearance and characteristics of normal visible emissions for that specific process.

(f) If abnormal emissions are observed from the fly ash silo truck loadout station, the Permittee shall take a reasonable response. Section C - Response to Excursions and Exceedances contains the Permittee's obligation with regard to the reasonable response steps required by this condition. Failure to take response steps shall be considered a deviation from this permit. Observation of abnormal emissions that do not violate an applicable opacity limit is not a deviation from this permit.

D.4.5 Broken or Failed Bag Detection [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][40 CFR 64]

(a) For a single compartment fabric filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced.

(b) For a single compartment fabric filter controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the emission units.

Bag failure can be indicated by a significant drop in the baghouse’s pressure reading with abnormal visible emissions, by an opacity violation, or by other means such as gas temperature, flow rate, air infiltration, leaks, dust traces or triboflows.

**Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]**

D.4.6 Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

(a) To document the compliance status with Condition D.4.4, the Permittee shall maintain records of the once per day visible emission notations of the fly ash silo truck loadout station, fly ash and bottom ash storage pond areas, temporary stockpiles and transfer points. The Permittee shall include in its daily record when a visible emission notation is not taken and the reason for the lack of visible emission notation (e.g. the process did not operate that day).

(b) Section C - General Record Keeping Requirements contains the Permittee's obligations with regard to the records required by this condition.

## SECTION D.5 EMISSIONS UNIT OPERATION CONDITIONS

**Emissions Unit Description:**

Insignificant Activities:

(a) Vents from ash transport systems not operated at positive pressure.

(b) Coal bunker and coal scale exhausts and associated dust collector vents.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

D.5.1 Particulate Emission Limitations for Manufacturing Processes [326 IAC 6-3-2]

Pursuant to 326 IAC 6-3-2, the allowable particulate emissions from vents from ash transport systems not operated at positive pressure and from coal bunker and coal scale exhausts and associated dust collector vents shall be limited by the following:

Interpolation of the data for the process weight rate up to sixty thousand (60,000) pounds per hour shall be accomplished by use of the equation:

$$E = (4.10) \times (P^{0.67})$$

where E = rate of emission in pounds per hour; and
P = process weight rate in tons per hour

D.5.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

## SECTION D.6 EMISSIONS UNIT OPERATION CONDITIONS

**Emissions Unit Description:**

Insignificant activities:

(c) Degreasing operations that do not exceed 145 gallons per 12 months, except if subject to 326 IAC 20-6.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

D.6.1 Volatile Organic Compounds (VOC) [326 IAC 8-3-2]

(a) Pursuant to 326 IAC 8-3-2 (Cold Cleaner Degreaser Control Equipment and Operating Requirements), for cold cleaning degreasers without remote solvent reservoirs constructed after July 1, 1990:

(1) Equip the degreaser with a cover.

(2) Equip the degreaser with a device for draining cleaned parts.

(3) Close the degreaser cover whenever parts are not being handled in the degreaser.

(4) Drain cleaned parts for at least fifteen (15) seconds or until dripping ceases.

(5) Provide a permanent, conspicuous label that lists the operating requirements in (a)(3), (a)(4), (a)(6), and (a)(7) of this condition.

(6) Store waste solvent only in closed containers.

(7) Prohibit the disposal or transfer of waste solvent in such a manner that could allow greater than twenty percent (20%) of the waste solvent (by weight) to evaporate into the atmosphere.

(b) The Permittee shall ensure the following additional control equipment and operating requirements are met:

(1) Equip the degreaser with one (1) of the following control devices if the solvent is heated to a temperature of greater than forty-eight and nine-tenths (48.9) degrees Celsius (one hundred twenty (120) degrees Fahrenheit):

(A) A freeboard that attains a freeboard ratio of seventy-five hundredths (0.75) or greater.

(B) A water cover when solvent used is insoluble in, and heavier than, water.

(C) A refrigerated chiller.

(D) Carbon adsorption.

(E) An alternative system of demonstrated equivalent or better control as those outlined in (b)(1)(A) through (D) of this condition that is approved

by the department. An alternative system shall be submitted to the U.S. EPA as a SIP revision.

(2) Ensure the degreaser cover is designed so that it can be easily operated with one (1) hand if the solvent is agitated or heated.

(3) If used, solvent spray:

(A) must be a solid, fluid stream; and

(B) shall be applied at a pressure that does not cause excessive splashing.

D.6.2 Material Requirements for Cold Cleaner Degreasers [326 IAC 8-3-8]

Pursuant to 326 IAC 8-3-8 (Material Requirements for Cold Cleaner Degreasers), on and after January 1, 2015, the Permittee shall not operate a cold cleaner degreaser with a solvent that has a VOC composite partial vapor pressure than exceeds one (1) millimeter of mercury (nineteen-thousandths (0.019) pound per square inch) measured at twenty (20) degrees Celsius (sixty-eight (68) degrees Fahrenheit).

D.6.3 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

**Record Keeping and Reporting Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]**

D.6.4 Record Keeping Requirements [326 IAC 2-7-5(3)][326 IAC 2-7-19]

(a) Pursuant to 326 IAC 8-3-8(c)(2), after January 1, 2015, the following records shall be maintained for each purchase of cold cleaner degreaser solvent:

(1) The name and address of the solvent supplier.

(2) The date of purchase (or invoice/bill dates of contract servicer indicating service date).

(3) The type of solvent purchased.

(4) The total volume of the solvent purchased.

(5) The true vapor pressure of the solvent measured in millimeters of mercury at twenty (20) degrees Celsius (sixty-eight (68) degrees Fahrenheit).

(b) Section C - General Record Keeping Requirements of this permit contains the Permittee’s obligations with regard to the records required by this condition.

## SECTION D.7 EMISSIONS UNIT OPERATION CONDITIONS

**Emissions Unit Description:**

Insignificant activities:

(d) Two (2) Natural Gas-Fired water heaters located in the Maintenance Shop, each with heat input capacity of 0.04 MMBtu/hr; each constructed in 2008 and exhausting to stacks.

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**Emission Limitations and Standards [326 IAC 2-7-5(1)]**

D.7.1 Particulate Emission Limitations for Sources of Indirect Heating [326 IAC 6-2-4]

Pursuant to 326 IAC 6-2-4, the allowable PM emissions from the natural gas-fired water heaters located in the Maintenance Shop, shall be limited to 0.22 pounds PM per MMBtu heat input.

D.7.2 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

**SECTION E.1 NSPS**

**Emission Unit Description:**
**Gypsum and Limestone Handling Facilities**

(e) A limestone handling facility, identified as Unit 7, constructed in 1994, consisting of the following operations:

(1) One (1) limestone unloading floating clamshell dock with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 6. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(2) One (1) covered conveyor, identified as Conveyor 1 (CL-1), with a maximum throughput of 550 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(3) One (1) limestone truck loadout to conveyor with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 9. (This operation serves both coal and limestone unloading operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(4) One (1) covered conveyor, identified as Conveyor 2 (L-1), with a maximum throughput of 800 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) limestone storage building with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 10.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(6) One (1) limestone reclaim system located inside a totally-enclosed building adjacent to the limestone storage building.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) limestone storage building loadout with a maximum capacity of 750 tons per hour, an enclosed building for dust control, and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(8) One (1) covered conveyor, identified as Conveyor 3 (L-2), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(9) One (1) limestone transfer house (No. 1) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 12.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(10) One (1) covered conveyor, identified as Conveyor 4 (L-3), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) coal and limestone transfer house (serving Unit No. 3) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 8. (This operation serves both coal and limestone transferring operations.)

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(12) One (1) covered conveyor, identified as Conveyor 5 (L-4), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(13) One (1) limestone transfer house (No. 2) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 14.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(14) One (1) covered conveyor, identified as Conveyor 6 (L-5), with a maximum throughput of 300 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(15) One (1) limestone day silo with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to stack 15.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(f) A gypsum wet filter cake handling facility, identified as Unit 8, constructed in 1994, consisting of the following operations:

(1) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 11.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(2) One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to stack 13.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(3) One (1) covered conveyor, identified as G1A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(4) One (1) covered conveyor, identified as G1B (operates only when G1A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(5) One (1) gypsum filter cake transfer house conveyor drop with a maximum capacity of

35 tons per hour, a fabric filter for dust control, and exhausting to stack 4.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(6) One (1) covered conveyor, identified as G2A, with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(7) One (1) covered conveyor, identified as G2B (operates only when G2A is offline), with a maximum capacity of 50 tons per hour.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(8) One (1) gypsum storage building consisting of two (2) 1000-ton gypsum storage silos and one (1) storage pile designated for truck haul-away exhausting indoors.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(9) One (1) covered silo to barge loadout primary filter cake transfer conveyor, identified as Conveyor 4, with a maximum capacity of 400 tons per hour, with a fabric filter for dust control, exhausting to stack 7.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(10) One (1) covered silo to truck secondary transfer conveyor, identified as Conveyor 3, with a maximum capacity of 400 tons per hour and exhausting indoors.

[Under 40 CFR 60, Subpart OOO, this unit is an affected source.]

(11) One (1) gypsum barge loadout conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control and exhausting to stack 5.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(12) One (1) gypsum barge loadout with two (2) telescoping transfer chutes delivering filter cake gypsum to river barges with a maximum capacity of 400 tons per hour.

[Under 40 CFR 60, Subpart OOO, these units are an affected source.]

(g) One (1) flue gas desulfurization (FGD) system for Units No. 2 and No. 3, constructed in 1994, consisting of the following limestone operations:

(1) Two (2) wet ball mills (one operational and one full capacity spare), receiving limestone from the day silo of the limestone handling facility (Unit 7). Each ball mill is a closed-device (hard-piped, enclosed design), wet mill capable of handling 20.5 tons per hour of dry limestone feed.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

(2) Two (2) limestone slurry storage tanks, receiving the ball mill product (fresh limestone slurry), which is then discharged into the scrubber system. The scrubbed gas stream exits the absorber tower through the scrubber stack.

[Under 40 CFR 60, Subpart OOO, these units are affected sources.]

**New Source Performance Standards (NSPS) Requirements [326 IAC 2-7-5(1)]**

E.1.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

(a) Pursuant to 40 CFR 60.1, the Permittee shall comply with the provisions of 40 CFR Part 60, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 12-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 60, Subpart OOO.

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.1.2 Nonmetallic Mineral Processing Plants NSPS [326 IAC 12][40 CFR Part 60, Subpart OOO]

The Permittee shall comply with the following provisions of 40 CFR Part 60, Subpart OOO (included as Attachment B to the operating permit), which are incorporated by reference as 326 IAC 12, for the emission unit(s) listed above:

(1) 40 CFR 60.670(a)(1), (d)(1-3), (e-f)
(2) 40 CFR 60.671
(3) 40 CFR 60.672(a-b), (d-f), (e)(1-2), (f)
(4) 40 CFR 60.673
(5) 40 CFR 60.674(a)(1), (a)(2)
(6) 40 CFR 60.675(b)(1), (b)(2), (c)(1)(i-ii); (c)(2)(i-ii); (c)(3), (d)(2)
(7) 40 CFR 60.675(e)(1)(i-ii); (e)(2)(i-iii); (e)(3), (e)(4), (g)
(8) 40 CFR 60.676(a)(1), (a)(3), (a)(4), (f), (j), (k)
(9) 40 CFR 60, Subpart OOO, Table 1
(10) 40 CFR 60, Subpart OOO, Table 2
(11) 40 CFR 60, Subpart OOO, Table 3

E.1.3 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

**SECTION E.2 NSPS**

**Emissions Unit Description:**

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**New Source Performance Standards (NSPS) Requirements [326 IAC 2-7-5(1)]**

E.2.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

(a) Pursuant to 40 CFR 60.1, the Permittee shall comply with the provisions of 40 CFR Part 60, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 12-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 60, Subpart Da.

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.2.2 Electric Utility Steam Generating Units NSPS [326 IAC 12][40 CFR Part 60, Subpart Da]

The Permittee shall comply with the following provisions of 40 CFR Part 60, Subpart Da (included as Attachment E to the operating permit), which are incorporated by reference as 326 IAC 12, for the emission unit(s) listed above:

(1) 40 CFR 60.40Da(a)
(2) 40 CFR 60.41Da
(3) 40 CFR 60.42Da (b)(1), (e)(1)(ii), (e)(2)
(4) 40 CFR 60.43Da (g), (l)(2)
(5) 40 CFR 60.44Da (g)(3)
(6) 40 CFR 60.48Da (a) through (i), (m), (p), (q), (s)
(7) 40 CFR 60.49Da (b) through (e), (f)(2), (g) through (m), (s), (t), (v), (w)
(8) 40 CFR 60.50Da (a) through (e)

(9) 40 CFR 60.51Da (a) through (c), (f), (h) through (k)
(10) 40 CFR 60.52Da

**SECTION E.3 NESHAP**

**Emissions Unit Description:**

**Unit No. 2 and Unit No. 3**

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide ($SO_2$), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide ($CO_2$), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**National Emission Standards for Hazardous Air Pollutants (NESHAP) Requirements [326 IAC 2-7-5(1)]**

E.3.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

(a) Pursuant to 40 CFR 63.1 the Permittee shall comply with the provisions of 40 CFR Part 63, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 20-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 63, Subpart UUUUU.

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.3.2 Coal and Oil Fired Electric Utility Steam Generating Units NESHAP [40 CFR Part 63, Subpart UUUUU]

The Permittee shall comply with the following provisions of 40 CFR Part 63, Subpart UUUUU (included as Attachment C to the operating permit for the emission unit(s) listed above:

(1) 40 CFR 63.9981
(2) 40 CFR 63.9982(a)(1), (d)
(3) 40 CFR 63.9984(b), (c), (f)
(4) 40 CFR 63.9990(a)(1), (a)(2)
(5) 40 CFR 63.9991(a)(1), (a)(2), (b), (c)(1), (c)(2)
(6) 40 CFR 63.10000(a), (b), (c)(1)(iv); (v), (vi)(B), (d)(1), (d)(2)(i), (d)(2)(ii), (d)(3), (d)(4), (d)(5)(i-vii); (e), (l)
(7) 40 CFR 63.10005(a), (a)(1), (a)(2)(i-iii); (b)(1-5); (d)(1), (d)(2)(i-iii); (d)(3), (e), (h)(1)(i)-(ii)(A-B); (h)(2)(i-ii); (h)(3)(i)(A-D); (h)(3)(ii); (h)(3)(iii)(A-B); (h)(3)(iii)(C)(1-5); (j), (k)
(8) 40 CFR 63.10006(b)(1-2); (c), (d), (f), (i), (j)
(9) 40 CFR 63.10007(a)(1), (a)(2), (b), (d), (e)(1), (e)(2), (f)(1)(ii) and (2); (g)
(10) 40 CFR 63.10009(a), (b)(1), (b)(2), (d), (e), (f)(1), (g)(1), (h- k), (n)
(11) 40 CFR 63.10010(a)(2)(ii); (b-e), (a)(4), (c-e), (f)(1-4); (g), (h)(1-7); (i)(1-5); (j)(1-4); (l)(1-5)
(12) 40 CFR 63.10011(a-g)
(13) 40 CFR 63.10020(a-d), (e)(1) - (3)(i)(A-D)
(14) 40 CFR 63.10021(a-c); (d)(1-2); (e-i)
(15) 40 CFR 63.10022
(16) 40 CFR 63.10023(a), (b)(1), (c)
(17) 40 CFR 63.10030(a), (b), (d), (e)
(18) 40 CFR 63.10031(a-g)
(19) 40 CFR 63.10032(a), (b), (d)(1)
(20) 40 CFR 63.10033(a-c)
(21) 40 CFR 63.10040
(22) 40 CFR 63.10041(a-b)
(23) 40 CFR 63.10042
(24) 40 CFR 63 Appendix A to Subpart UUUUU
(25) 40 CFR 63 Appendix B to Subpart UUUUU
(26) 40 CFR 63, Subpart UUUUU, Table 1
(27) 40 CFR 63, Subpart UUUUU, Table 2, Subcategory 1
(28) 40 CFR 63, Subpart UUUUU, Table 3, Subcategory 1
(29) 40 CFR 63, Subpart UUUUU, Table 4, Subcategory 1
(30) 40 CFR 63, Subpart UUUUU, Table 5, Subcategories 1-5
(31) 40 CFR 63, Subpart UUUUU, Table 6, Subcategory 1
(32) 40 CFR 63, Subpart UUUUU, Table 7, Subcategory 1
(33) 40 CFR 63, Subpart UUUUU, Table 8, Subcategory 1
(34) 40 CFR 63, Subpart UUUUU, Table 9

**SECTION E.4 NESHAP**

**Emissions Unit Description:**

(h) One (1) diesel-fired Emergency Generator, constructed in March 2005, with a rated output capacity of 267 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

(i) One (1) emergency diesel-fired fire pump, constructed in 1994 with a rated output capacity of 500 hp.

[Under 40 CFR Part 63, Subpart ZZZZ, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

**National Emission Standards for Hazardous Air Pollutants (NESHAP) Requirements [326 IAC 2-7-5(1)]**

E.4.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

(a) Pursuant to 40 CFR 63.1 the Permittee shall comply with the provisions of 40 CFR Part 63, Subpart A - General Provisions, which are incorporated by reference as 326 IAC 20-1, for the emission unit(s) listed above, except as otherwise specified in 40 CFR Part 63, Subpart ZZZZ.

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251

E.4.2 Stationary Reciprocating Internal Combustion Engines NESHAP [40 CFR Part 63, Subpart ZZZZ][326 IAC 20-82]

The Permittee shall comply with the following provisions of 40 CFR Part 63, Subpart ZZZZ (included as Attachment D to the operating permit), which are incorporated by reference as 326 IAC 20-82, for the emission unit(s) listed above:

(1) 40 CFR 63.6585(a), (b)
(2) 40 CFR 63.6590(a)(1)(ii)
(3) 40 CFR 63.6595(a)(1), (c)
(4) 40 CFR 63.6602
(5) 40 CFR 63.6604(b)
(6) 40 CFR 63.6605(a)
(7) 40 CFR 63.6625(e)(2); (f)
(8) 40 CFR 63.6640(a); (e); (f)(1); (f)(2)(i); (f)(3)-(4)
(9) 40 CFR 63.6650(a); (h)
(10) 40 CFR 63.6655(d); (e)(2); (f)(1)
(11) 40 CFR 63.6660
(12) 40 CFR 63.6670
(13) 40 CFR 63.6675

(14) 40 CFR 63, Subpart ZZZZ, Table 2c, Subcategory 1
(15) 40 CFR 63, Subpart ZZZZ, Table 6, Subcategory 9
(16) 40 CFR 63, Subpart ZZZZ, Table 7, Subcategory 4
(17) 40 CFR 63, Subpart ZZZZ, Table 8

E.4.3 Preventive Maintenance Plan [326 IAC 2-7-5(12)]

A Preventive Maintenance Plan is required for these facilities and any control devices. Section B - Preventive Maintenance Plan contains the Permittee's obligation with regard to the preventive maintenance plan required by this condition.

## SECTION F TITLE IV OPERATION CONDITIONS

**Emissions Unit Description :**

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide ($SO_2$), Nitrogen Oxides (NOx), Particulate Matter (PM), Carbon Dioxide ($CO_2$), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this facility description box is descriptive information and does not constitute enforceable conditions.)

### Acid Rain Program

F.1 Acid Rain Permit [326 IAC 2-7-5(1)(C)][326 IAC 21][40 CFR 72 through 40 CFR 78]

Pursuant to 326 IAC 21 (Acid Deposition Control), the Permittee shall comply with all provisions of the Acid Rain permit issued for this source, and any other applicable requirements contained in 40 CFR 72 through 40 CFR 78.

F.2 Title IV Emissions Allowances [326 IAC 2-7-5(4)][326 IAC 21]

Emissions exceeding any allowances that the Permittee lawfully holds under the Title IV Acid Rain Program of the Clean Air Act are prohibited, subject to the following limitations:

(a) No revision of this permit shall be required for increases in emissions that are authorized by allowances acquired under the Title IV Acid Rain Program, provided that such increases do not require a permit revision under any other applicable requirement.

(b) No limit shall be placed on the number of allowances held by the Permittee. The Permittee may not use allowances as a defense to noncompliance with any other applicable requirement.

(c) Any such allowance shall be accounted for according to the procedures established in regulations promulgated under Title IV of the Clean Air Act.

## SECTION G Reserved

## SECTION H TR NOX Annual Trading Program, TR NOX Ozone Season Trading Program, and TR SO2 Group 1 Trading Program Requirements (40 CFR 97.406), (40 CFR 97.506), (40 CFR 97.606)

**ORIS Code: 1012**

**Emissions Unit Description:**

(a) One (1) coal/natural gas fired boiler, identified as Unit No. 2, constructed in 1963, with a maximum fuel heat input rating of 1031 MMBtu per hour (HHV basis), using an electrostatic precipitator for particulate matter (PM) emissions control, and a low NOx burner for NOx control, and exhausting to Stack No. 3. Unit No. 2 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and exhaust stack with Unit No. 3.

Unit No. 2 has continuous emissions monitoring systems (CEMs) for Sulfur Dioxide (SO2), Nitrogen Oxides (NOx), Particulate Matter (PM), and sorbent trap monitor for Mercury (Hg), which are shared with Unit No. 3.

[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(b) One (1) coal/natural gas fired boiler, identified as Unit No. 3, constructed in 1970, with a maximum fuel heat input rating of 2,724 MMBtu per hour (HHV basis), using a fabric filter for particulate matter (PM) emissions control, and low NOx burner and selective catalytic reduction (SCR) for NOx reduction, with a sorbent injection system for control of sulfur trioxide (SO3) and resulting sulfuric acid (H2SO4) emissions, and exhausting to Stack No. 3. Unit No. 3 shares the flue gas desulfurization (FGD) system, which controls SO2 emissions, and an exhaust stack with Unit No. 2.

Unit No. 3 has continuous emissions monitoring systems (CEMS) for SO2, NOx, PM, CO2, and a sorbent trap monitor for mercury (Hg), which are shared with Unit No. 2. Unit 3 is equipped with a spray dryer evaporator (SDE), commissioned in 2023, which eliminates FGD wastewater discharges.

[Under 40 CFR 60, Subpart Da, this is an affected source.]
[Under 40 CFR 63, Subpart UUUUU, this is an existing affected source.]

(The information describing the process contained in this emissions unit description box is descriptive information and does not constitute enforceable conditions.)

### H.1 Designated Representative Requirements

The owners and operators shall comply with the requirement to have a designated representative, and may have an alternate designated representative, in accordance with the following:

(a) 40 CFR 97.413 through 97.418;
(b) 40 CFR 97.513 through 97.518; and
(c) 40 CFR 97.613 through 97.618.

### H.2 Emissions Monitoring, Reporting, and Recordkeeping Requirements

(a) The owners and operators, and the designated representative, of each TR $NO_X$ Annual source, TR NOx Ozone Season source, and TR SO2 Group 1 source, and each TR $NO_X$ Annual unit at the source, TR NOx Ozone Season unit at the source, and TR SO2 Group 1 unit at the source shall comply with the monitoring, reporting, and recordkeeping requirements of 40 CFR 97.430, 40 CFR 97.530, and 40 CFR 97.630 (general

requirements, including installation, certification, and data accounting, compliance deadlines, reporting data, prohibitions, and long-term cold storage), 97.431, 97.531, and 97.631 (initial monitoring system certification and recertification procedures), 97.432, 97.532, and 97.632 (monitoring system out-of-control periods), 97.433, 97.533, and 97.633 (notifications concerning monitoring), 97.434, 97.534, and 97.634 (recordkeeping and reporting, including monitoring plans, certification applications, quarterly reports, and compliance certification), and 97.435, 97.535, and 97.635 (petitions for alternatives to monitoring, recordkeeping, or reporting requirements).

(b) The emissions data determined in accordance with 40 CFR 97.430 through 97.435 shall be used to calculate allocations of TR $NO_X$ Annual allowances under 40 CFR 97.411(a)(2) and (b) and 97.412 and to determine compliance with the TR $NO_X$ Annual emissions limitation and assurance provisions under Condition H.3 below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.430 through 97.435 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

(c) The emissions data determined in accordance with 40 CFR 97.530 through 97.535 shall be used to calculate allocations of TR $NO_X$ Ozone Season allowances under 40 CFR 97.511(a)(2) and (b) and 97.512 and to determine compliance with the TR $NO_X$ Ozone Season emissions limitation and assurance provisions under Condition H.4 below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.530 through 97.535 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

(d) The emissions data determined in accordance with 40 CFR 97.630 through 97.635 shall be used to calculate allocations of TR $SO_2$ Group 1 allowances under 40 CFR 97.611(a)(2) and (b) and 97.612 and to determine compliance with the TR $SO_2$ Group 1 emissions limitation and assurance provisions under Condition H.5 below, provided that, for each monitoring location from which mass emissions are reported, the mass emissions amount used in calculating such allocations and determining such compliance shall be the mass emissions amount for the monitoring location determined in accordance with 40 CFR 97.630 through 97.635 and rounded to the nearest ton, with any fraction of a ton less than 0.50 being deemed to be zero.

## H.3 NOX Annual Emissions Requirements

(a) TR $NO_X$ Annual emissions limitation.

(1) As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR $NO_X$ Annual source and each TR $NO_X$ Annual unit at the source shall hold, in the source's compliance account, TR $NO_X$ Annual allowances available for deduction for such control period under 40 CFR 97.424(a) in an amount not less than the tons of total $NO_X$ emissions for such control period from all TR $NO_X$ Annual units at the source.

(2) If total $NO_X$ emissions during a control period in a given year from the TR $NO_X$ Annual units at a TR $NO_X$ Annual source are in excess of the TR $NO_X$ Annual emissions limitation set forth in Condition H.3(a)(1) above, then:

(A) The owners and operators of the source and each TR $NO_X$ Annual unit at the source shall hold the TR $NO_X$ Annual allowances required for

deduction under 40 CFR 97.424(d); and

(B) The owners and operators of the source and each TR $NO_X$ Annual unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart AAAAA and the Clean Air Act.

(b) TR $NO_X$ Annual assurance provisions.

(1) If total $NO_X$ emissions during a control period in a given year from all TR $NO_X$ Annual units at TR $NO_X$ Annual sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such $NO_X$ emissions during such control period exceeds the common designated representative's assurance level for the state and such control period, shall hold (in the assurance account established for the owners and operators of such group) TR $NO_X$ Annual allowances available for deduction for such control period under 40 CFR 97.425(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.425(b), of multiplying— (A) The quotient of the amount by which the common designated representative's share of such $NO_X$ emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such $NO_X$ emissions exceeds the respective common designated representative's assurance level; and (B) The amount by which total $NO_X$ emissions from all TR $NO_X$ Annual units at TR $NO_X$ Annual sources in the state for such control period exceed the state assurance level.

(2) The owners and operators shall hold the TR $NO_X$ Annual allowances required under Condition H.3(b)(1) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(3) Total $NO_X$ emissions from all TR $NO_X$ Annual units at TR $NO_X$ Annual sources in the State during a control period in a given year exceed the state assurance level if such total $NO_X$ emissions exceed the sum, for such control period, of the state $NO_X$ Annual trading budget under 40 CFR 97.410(a) and the state's variability limit under 40 CFR 97.410(b).

(4) It shall not be a violation of 40 CFR Part 97, Subpart AAAAA or of the Clean Air Act if total $NO_X$ emissions from all TR $NO_X$ Annual units at TR $NO_X$ Annual sources in the State during a control period exceed the state assurance level or if a common designated representative's share of total $NO_X$ emissions from the TR $NO_X$ Annual units at TR $NO_X$ Annual sources in the state during a control period exceeds the common designated representative's assurance level.

(5) To the extent the owners and operators fail to hold TR $NO_X$ Annual allowances for a control period in a given year in accordance with Conditions H.3(b)(1) through (3) above,

(A) The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B) Each TR $NO_X$ Annual allowance that the owners and operators fail to hold for such control period in accordance with Conditions H.3(b)(1) through (3) above and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart AAAAA and the Clean Air Act.

(c) Compliance periods.

(1) A TR $NO_X$ Annual unit shall be subject to the requirements under Condition H.3(a) above for the control period starting on the later of January 1, 2015, or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.430(b) and for each control period thereafter.

(2) A TR $NO_X$ Annual unit shall be subject to the requirements under Condition H.3(b) above for the control period starting on the later of January 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.430(b) and for each control period thereafter.

(d) Vintage of allowances held for compliance.

(1) A TR $NO_X$ Annual allowance held for compliance with the requirements under Condition H.3(a)(1) above for a control period in a given year must be a TR $NO_X$ Annual allowance that was allocated for such control period or a control period in a prior year.

(2) A TR $NO_X$ Annual allowance held for compliance with the requirements under Condition H.3(a)(2)(1) and (b)(1) through (3) above for a control period in a given year must be a TR $NO_X$ Annual allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(e) Allowance Management System requirements. Each TR $NO_X$ Annual allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in accordance with 40 CFR Part 97, Subpart AAAAA.

(f) Limited authorization. A TR $NO_X$ Annual allowance is a limited authorization to emit one ton of $NO_X$ during the control period in one year. Such authorization is limited in its use and duration as follows:

(1) Such authorization shall only be used in accordance with the TR $NO_X$ Annual Trading Program; and

(2) Notwithstanding any other provision of 40 CFR Part 97, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(g) Property right. A TR $NO_X$ Annual allowance does not constitute a property right.

H.4 NOx Ozone Season Requirements

(a) TR $NO_X$ Ozone Season emissions limitation.

(1) As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR $NO_X$ Ozone Season source and each TR $NO_X$

Ozone Season unit at the source shall hold, in the source's compliance account, TR $NO_X$ Ozone Season allowances available for deduction for such control period under 40 CFR 97.524(a) in an amount not less than the tons of total $NO_X$ emissions for such control period from all TR $NO_X$ Ozone Season units at the source.

(2) If total $NO_X$ emissions during a control period in a given year from the TR $NO_X$ Ozone Season units at a TR $NO_X$ Ozone Season source are in excess of the TR $NO_X$ Ozone Season emissions limitation set forth in Condition H.4(a)(1) above, then:

(A) The owners and operators of the source and each TR $NO_X$ Ozone Season unit at the source shall hold the TR $NO_X$ Ozone Season allowances required for deduction under 40 CFR 97.524(d); and

(B) The owners and operators of the source and each TR $NO_X$ Ozone Season unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart BBBBB and the Clean Air Act.

(b) TR $NO_X$ Ozone Season assurance provisions.

(1) If total $NO_X$ emissions during a control period in a given year from all TR $NO_X$ Ozone Season units at TR $NO_X$ Ozone Season sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such $NO_X$ emissions during such control period exceeds the common designated representative's assurance level for the state and such control period, shall hold (in the assurance account established for the owners and operators of such group) TR $NO_X$ Ozone Season allowances available for deduction for such control period under 40 CFR 97.525(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.525(b), of multiplying:

(A) The quotient of the amount by which the common designated representative's share of such $NO_X$ emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such $NO_X$ emissions exceeds the respective common designated representative's assurance level; and

(B) The amount by which total $NO_X$ emissions from all TR $NO_X$ Ozone Season units at TR $NO_X$ Ozone Season sources in the state for such control period exceed the state assurance level.

(2) The owners and operators shall hold the TR $NO_X$ Ozone Season allowances required under Condition H.4(b)(1) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(3) Total $NO_X$ emissions from all TR $NO_X$ Ozone Season units at TR $NO_X$ Ozone Season sources in the state during a control period in a given year exceed the state assurance level if such total $NO_X$ emissions exceed the sum, for such control period, of the State $NO_X$ Ozone Season trading budget under 40 CFR 97.510(a) and the state's variability limit under 40 CFR 97.510(b).

(4) It shall not be a violation of 40 CFR part 97, subpart BBBBB or of the Clean Air Act if total $NO_X$ emissions from all TR $NO_X$ Ozone Season units at TR $NO_X$ Ozone Season sources in the state during a control period exceed the state assurance level or if a common designated representative's share of total $NO_X$ emissions from the TR $NO_X$ Ozone Season units at TR $NO_X$ Ozone Season sources in the state during a control period exceeds the common designated representative's assurance level.

(5) To the extent the owners and operators fail to hold TR $NO_X$ Ozone Season allowances for a control period in a given year in accordance with Conditions H.4(b)(1) through (3) above,

(A) The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B) Each TR NOX Ozone Season allowance that the owners and operators fail to hold for such control period in accordance with Conditions H.4(b)(1) through (3) above and each day of such control period shall constitute a separate violation of 40 CFR Part 97, Subpart BBBBB and the Clean Air Act.

(c) Compliance Periods.

(1) A TR NOx Ozone Season unit shall be subject to the requirements under Condition H.4(a) above for the control period starting on the later of May 1, 2015 or the deadline for meeting the unit's monitor certificate requirements under 40 CFR 97.530(b) and for each control period thereafter.

(2) A TR NOx Ozone Season unit shall be subject to the requirements under Condition H.4(b) above for the control period starting on the later of May 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.530(b) and for each control period thereafter.

(d) Vintage of allowances held for compliance.

(1) A TR NOx Ozone Season allowance held for compliance with the requirements under Condition H.4(a)(1) above for a control period in a given year must be a TR NOx Ozone Season Allowance that was allocated for such control period or a control period in a prior year.

(2) A TR NOx Ozone Season allowance held for compliance with the requirements under Conditions H.4(a)(2)(A) and (b)(1) through (3) above for a control period in a given year must be a TR NOx Ozone Season allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(e) Allowances Management System Requirements.

(1) Each TR NOx Ozone Season allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in

accordance with 40 CFR Part 97, Subpart BBBBB.

(f) Limited Authorization.

(1) A TR NOx Ozone Season allowance is a limited authorization to emit one ton of NOx during the control period in one year. Such authorization is limited in its use and duration as follows:

(A) Such authorization shall only be used in accordance with the TR NOx Ozone Season Trading Program; and

(B) Notwithstanding any other provision of 40 CFR Part 97, Subpart BBBBB, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(g) Property Right.

(1) A TR NOx Ozone Season allowance does not constitute a property right.

H.5 $SO_2$ Emissions Requirements

(a) TR $SO_2$ Group 1 emissions limitation.

(1) As of the allowance transfer deadline for a control period in a given year, the owners and operators of each TR $SO_2$ Group 1 source and each TR SO2 Group 1 unit at the source shall hold, in the source's compliance account, TR $SO_2$ Group 1 allowances available for deduction for such control period under 40 CFR 97.624(a) in an amount not less than the tons of total $SO_2$ emissions for such control period from all TR $SO_2$ Group 1 units at the source.

(2) If total $SO_2$ emissions during a control period in a given year from the TR $SO_2$ Group 1 units at a TR $SO_2$ Group 1 source are in excess of the TR $SO_2$ Group 1 emissions limitation set forth in Condition H.5(a)(1) above, then:

(A) The owners and operators of the source and each TR $SO_2$ Group 1 unit at the source shall hold the TR $SO_2$ Group 1 allowances required for deduction under 40 CFR 97.624(d); and

(B) The owners and operators of the source and each TR $SO_2$ Group 1 unit at the source shall pay any fine, penalty, or assessment or comply with any other remedy imposed, for the same violations, under the Clean Air Act, and each ton of such excess emissions and each day of such control period shall constitute a separate violation 40 CFR Part 97, Subpart CCCCC and the Clean Air Act.

(b) TR $SO_2$ Group 1 assurance provisions

(1) If total $SO_2$ emissions during a control period in a given year from all TR $SO_2$ Group 1 units at TR $SO_2$ Group 1 sources in the state exceed the state assurance level, then the owners and operators of such sources and units in each group of one or more sources and units having a common designated representative for such control period, where the common designated representative's share of such $SO_2$ emissions during such control period exceeds the common designated representative's assurance level for the state and such

control period, shall hold (in the assurance account established for the owners and operators of such group) TR $SO_2$ Group 1 allowances available for deduction for such control period under 40 CFR 97.625(a) in an amount equal to two times the product (rounded to the nearest whole number), as determined by the Administrator in accordance with 40 CFR 97.625(b), of multiplying—

(2) The quotient of the amount by which the common designated representative's share of such $SO_2$ emissions exceeds the common designated representative's assurance level divided by the sum of the amounts, determined for all common designated representatives for such sources and units in the state for such control period, by which each common designated representative's share of such $SO_2$ emissions exceeds the respective common designated representative's assurance level; and

(3) The amount by which total $SO_2$ emissions from all TR $SO_2$ Group 1 units at TR $SO_2$ Group 1 sources in the state for such control period exceed the state assurance level.

(4) The owners and operators shall hold the TR $SO_2$ Group 1 allowances required under Condition H.5(b)(1) above, as of midnight of November 1 (if it is a business day), or midnight of the first business day thereafter (if November 1 is not a business day), immediately after such control period.

(5) Total $SO_2$ emissions from all TR $SO_2$ Group 1 units at TR $SO_2$ Group 1 sources in the state during a control period in a given year exceed the state assurance level if such total $SO_2$ emissions exceed the sum, for such control period, of the state $SO_2$ Group 1 trading budget under 40 CFR 97.610(a) and the state's variability limit under 40 CFR 97.610(b).

(6) It shall not be a violation of 40 CFR part 97, subpart CCCCC or of the Clean Air Act if total $SO_2$ emissions from all TR $SO_2$ Group 1 units at TR $SO_2$ Group 1 sources in the state during a control period exceed the state assurance level or if a common designated representative's share of total $SO_2$ emissions from the TR $SO_2$ Group 1 units at TR $SO_2$ Group 1 sources in the state during a control period exceeds the common designated representative's assurance level.

(7) To the extent the owners and operators fail to hold TR $SO_2$ Group 1 allowances for a control period in a given year in accordance with Conditions H.5(b)(1) through (3) above,

(A) The owners and operators shall pay any fine, penalty, or assessment or comply with any other remedy imposed under the Clean Air Act; and

(B) Each TR $SO_2$ Group 1 allowance that the owners and operators fail to hold for such control period in accordance with Conditions H.5(b)(1) through (3) above and each day of such control period shall constitute a separate violation of 40 CFR part 97, subpart CCCCC and the Clean Air Act.

(c) Compliance periods.

(1) A TR $SO_2$ Group 1 unit shall be subject to the requirements under Condition H.5(a) above for the control period starting on the later of January 1, 2015 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.630(b) and for each control period thereafter.

(2) A TR $SO_2$ Group 1 unit shall be subject to the requirements under Condition H.5(b) above for the control period starting on the later of January 1, 2017 or the deadline for meeting the unit's monitor certification requirements under 40 CFR 97.630(b) and for each control period thereafter.

(d) Vintage of allowances held for compliance.

(1) A TR $SO_2$ Group 1 allowance held for compliance with the requirements under Condition H.5(a)(1) above for a control period in a given year must be a TR $SO_2$ Group 1 allowance that was allocated for such control period or a control period in a prior year.

(2) A TR $SO_2$ Group 1 allowance held for compliance with the requirements under Condition H.5(a)(2)(A) and (b)(1) through (3) above for a control period in a given year must be a TR $SO_2$ Group 1 allowance that was allocated for a control period in a prior year or the control period in the given year or in the immediately following year.

(e) Allowance Management System requirements. Each TR $SO_2$ Group 1 allowance shall be held in, deducted from, or transferred into, out of, or between Allowance Management System accounts in accordance with 40 CFR Part 97, Subpart CCCCC.

(f) Limited authorization. A TR $SO_2$ Group 1 allowance is a limited authorization to emit one ton of $SO_2$ during the control period in one year. Such authorization is limited in its use and duration as follows:

(1) Such authorization shall only be used in accordance with the TR $SO_2$ Group 1 Trading Program; and

(2) Notwithstanding any other provision of 40 CFR Part 97, Subpart CCCCC, the Administrator has the authority to terminate or limit the use and duration of such authorization to the extent the Administrator determines is necessary or appropriate to implement any provision of the Clean Air Act.

(g) Property right. A TR $SO_2$ Group 1 allowance does not constitute a property right.

H.6 Title V Permit Revision Requirements

(a) No title V permit revision shall be required for any allocation, holding, deduction, or transfer of TR $NO_X$ Annual allowances in accordance with 40 CFR Part 97, Subpart AAAAA, TR $NO_X$ Ozone Season allowances in accordance with 40 CFR Part 97, Subpart BBBBB, and TR $SO_2$ Group 1 allowances in accordance with 40 CFR Part 97, Subpart CCCCC.

(b) This permit incorporates the TR emissions monitoring, recordkeeping and reporting requirements pursuant to 40 CFR 97.430 through 97.435, 40 CFR 97.530 through 97.535, and 40 CFR 97.630 through 97.635, and the requirements for a continuous emission monitoring system (pursuant to 40 CFR part 75, subparts B and H), an excepted monitoring system (pursuant to 40 CFR part 75, appendices D and E), a low mass emissions excepted monitoring methodology (pursuant to 40 CFR 75.19), and an alternative monitoring system (pursuant to 40 CFR part 75, subpart E). Therefore, the Description of TR Monitoring Provisions table for units identified in this permit may be added to, or changed, in this title V permit using minor permit modification procedures in accordance with 40 CFR 97.406(d)(2), 40 CFR 97.506(d)(2), and 40 CFR 97.606(d)(2) and 70.7(e)(2)(i)(B) or 71.7(e)(1)(i)(B).

H.7 Additional recordkeeping and reporting requirements

(a) Unless otherwise provided, the owners and operators of each TR $NO_X$ Annual source and each TR $NO_X$ Annual unit, TR $NO_X$ Ozone Season source and each TR $NO_X$ Ozone Season unit, and TR $SO_2$ Group 1 source and each TR $SO_2$ Group 1 unit at the source shall keep on site at the source each of the following documents (in hardcopy or electronic format) for a period of 5 years from the date the document is created. This period may be extended for cause, at any time before the end of 5 years, in writing by the Administrator.

(1) The certificate of representation under 40 CFR 97.416, 40 CFR 97.516, and 40 CFR 97.616 for the designated representative for the source and each TR $NO_X$ Annual unit, TR NOx Ozone Season unit, and TR $SO_2$ Group 1 unit at the source and all documents that demonstrate the truth of the statements in the certificate of representation; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such certificate of representation and documents are superseded because of the submission of a new certificate of representation under 40 CFR 97.416, 40 CFR 97.516, and 40 CFR 97.616 changing the designated representative.

(2) All emissions monitoring information, in accordance with 40 CFR Part 97, Subpart AAAAA, 40 CFR Part 97, Subpart BBBBB, and 40 CFR Part 97, Subpart CCCCC.

(3) Copies of all reports, compliance certifications, and other submissions and all records made or required under, or to demonstrate compliance with the requirements of, the TR $NO_X$ Annual Trading Program, TR $NO_X$ Ozone Season Trading Program, and TR $SO_2$ Group 1 Trading Program.

(b) The designated representative of a TR $NO_X$ Annual source and each TR $NO_X$ Annual unit, a TR $NO_X$ Ozone Season source and each TR $NO_X$ Ozone Season unit, and a TR $SO_2$ Group 1 source and each TR $SO_2$ Group 1 unit at the source shall make all submissions required under the TR $NO_X$ Annual Trading Program, TR $NO_X$ Ozone Season Trading Program, and TR $SO_2$ Group 1 Trading Program, except as provided in 40 CFR 97.418, 40 CFR 97.518, and 40 CFR 97.618. This requirement does not change, create an exemption from, or otherwise affect the responsible official submission requirements under a title V operating permit program in 40 CFR Parts 70 and 71.

H.8 Liability

(a) Any provision of the TR $NO_X$ Annual Trading Program that applies to a TR $NO_X$ Annual source or the designated representative of a TR $NO_X$ Annual source shall also apply to the owners and operators of such source and of the TR $NO_X$ Annual units at the source.

(b) Any provision of the TR $NO_X$ Annual Trading Program that applies to a TR $NO_X$ Annual unit or the designated representative of a TR $NO_X$ Annual unit shall also apply to the owners and operators of such unit.

(c) Any provision of the TR $NO_X$ Ozone Season Trading Program that applies to a TR $NO_X$ Ozone Season source or the designated representative of a TR $NO_X$ Ozone Season source shall also apply to the owners and operators of such source and of the TR $NO_X$ Ozone Season units at the source.

(d) Any provision of the TR $NO_X$ Ozone Season Trading Program that applies to a TR $NO_X$ Ozone Season unit or the designated representative of a TR $NO_X$ Ozone Season unit shall also apply to the owners and operators of such unit.

(e) Any provision of the TR $SO_2$ Group 1 Trading Program that applies to a TR $SO_2$ Group 1 source or the designated representative of a TR $SO_2$ Group 1 source shall also apply to the owners and operators of such source and of the TR $SO_2$ Group 1 units at the source.

(f) Any provision of the TR $SO_2$ Group 1 Trading Program that applies to a TR $SO_2$ Group 1 unit or the designated representative of a TR $SO_2$ Group 1 unit shall also apply to the owners and operators of such unit.

## H.9 Effect on Other Authorities

No provision of the TR $NO_X$ Annual Trading Program or exemption under 40 CFR 97.405, TR $NO_X$ Ozone Season Trading Program or exemption under 40 CFR 97.505, and TR $SO_2$ Group 1 Trading Program or exemption under 40 CFR 97.605 shall be construed as exempting or excluding the owners and operators, and the designated representative, of a TR $NO_X$ Annual source or TR $NO_X$ Annual unit, TR $NO_X$ Ozone Season source or TR $NO_X$ Ozone Season unit, and TR $SO_2$ Group 1 source or TR $SO_2$ Group 1 unit from compliance with any other provision of the applicable, approved state implementation plan, a federally enforceable permit, or the Clean Air Act.

## H.10 Description of TR Monitoring Provisions

The TR subject unit(s) and the unit-specific monitoring provisions at this source are identified in the following table(s). These units are subject to the requirements for the TR NOx Annual Trading Program, TR NOx Ozone Season Trading Program, and TR SO2 Group 1 Trading Program.

| Unit ID: 2<br>ORIS ID: 1012 | | | | | |
|---|---|---|---|---|---|
| Parameter | Continuous emission monitoring system or systems (CEMS) requirements pursuant to 40 CFR part 75, subpart B (for $SO_2$ monitoring) and 40 CFR part 75, subpart H (for $NO_X$ monitoring) | Excepted monitoring system requirements for gas- and oil-fired units pursuant to 40 CFR part 75, appendix D | Excepted monitoring system requirements for gas- and oil-fired peaking units pursuant to 40 CFR part 75, appendix E | Low Mass Emissions excepted monitoring (LME) requirements for gas- and oil-fired units pursuant to 40 CFR 75.19 | EPA-approved alternative monitoring system requirements pursuant to 40 CFR part 75, subpart E |
| $SO_2$ | x | | ---------- | | |
| $NO_X$ | x | ---------- | | | |
| Heat input | x | | ---------- | | |

| Unit ID: 3<br>ORIS ID: 1012 | | | | | |
|---|---|---|---|---|---|
| Parameter | Continuous emission monitoring system or systems (CEMS) requirements pursuant to 40 CFR part 75, subpart B (for $SO_2$ monitoring) and 40 CFR part 75, subpart H (for $NO_X$ monitoring) | Excepted monitoring system requirements for gas- and oil-fired units pursuant to 40 CFR part 75, appendix D | Excepted monitoring system requirements for gas- and oil-fired peaking units pursuant to 40 CFR part 75, appendix E | Low Mass Emissions excepted monitoring (LME) requirements for gas- and oil-fired units pursuant to 40 CFR 75.19 | EPA-approved alternative monitoring system requirements pursuant to 40 CFR part 75, subpart E |
| $SO_2$ | x | | ---------- | | |
| $NO_X$ | x | ---------- | | | |
| Heat input | x | | ---------- | | |

# INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
# OFFICE OF AIR QUALITY
# COMPLIANCE AND ENFORCEMENT BRANCH
# PART 70 OPERATING PERMIT
# CERTIFICATION

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Part 70 Permit No.: T173-43264-00001

**This certification shall be included when submitting monitoring, testing reports/results or other documents as required by this permit.**

Please check what document is being certified:

☐ Annual Compliance Certification Letter

☐ Test Result (specify) _____

☐ Report (specify) _____

☐ Notification (specify) _____

☐ Affidavit (specify) _____

☐ Other (specify) _____

| I certify that, based on information and belief formed after reasonable inquiry, the statements and information in the document are true, accurate, and complete. |
|---|
| Signature: |
| Printed Name: |
| Title/Position: |
| Phone: |
| Date: |

## MALFUNCTION REPORT

**INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**
**OFFICE OF AIR QUALITY**
**COMPLIANCE AND ENFORCEMENT BRANCH**
**FAX NUMBER: (317) 233-6865**
**EMAIL: AirCompl@idem.in.gov**

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Permit No.: T173-43264-00001

For any malfunction lasting one (1) hour or longer, the Permittee must submit this form to the Office of Air Quality (OAQ), within four (4) daytime business hours of malfunction start.

If any of the following are not applicable, mark N/A. This form consists of two (2) pages.

Page 1 of 2

| |
|---|
| This malfunction resulted in a violation of the following Indiana Administrative Code, permit condition, and/or permit limit and meets the definition of "malfunction" as listed on reverse side (e.g., 326 IAC 5-1, Permit Condition D.1.1, 40 CFR 60.62, etc.): |

| | |
|---|---|
| Describe affected facility/equipment/operation (e.g., Coating Line #2, Boiler D, Diesel engine, No. 3 smelter, etc.): | |
| Control equipment (e.g., Baghouse B4, Thermal oxidizer for Paint Line #1, etc.): | |
| Description of the malfunction and cause: | |
| When the malfunction started: | Date (MM/DD/YYYY): |
| | Time (HH:MM): |
| When the malfunction was corrected or is expected to be corrected: | Date (MM/DD/YYYY): |
| | Time (HH:MM): |

| |
|---|
| Type of pollutant(s) emitted (e.g., PM, PM10, PM2.5, VOC, etc.): |
| Estimated amount of pollutant(s) emitted during malfunction (e.g., VOC at 35 lbs/hr, 5 tons of PM, etc.): |
| Describe the corrective actions and interim control measures taken to minimize emissions (e.g., shut coating line down, isolated failing baghouse compartment, idled furnace operations until repairs completed, etc.): |

Form completed by: _____

Title/position: _____

Signature:_____

Date:_____

Phone: _____

Email: _____

**326 IAC 1-6-1 Applicability of rule**

Sec. 1. This rule applies to the owner or operator of any facility required to obtain a permit under 326 IAC 2-5.1, 326 IAC 2-6.1, 326 IAC 2-7, or 326 IAC 2-8.

**326 IAC 1-2-39 "Malfunction" definition**

Sec. 39. Any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner.

# INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
# OFFICE OF AIR QUALITY
# COMPLIANCE AND ENFORCEMENT BRANCH
# PART 70 OPERATING PERMIT
# QUARTERLY DEVIATION AND COMPLIANCE MONITORING REPORT

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Part 70 Permit No.: T173-43264-00001

**Months: _____ to _____ Year: _____**



This report shall be submitted quarterly based on a calendar year. Proper notice submittal under Section C - Malfunctions Report satisfies the reporting requirements of paragraph (a) of Section C-General Reporting. Any deviation from the requirements of this permit, the date(s) of each deviation, the probable cause of the deviation, and the response steps taken must be reported. A deviation required to be reported pursuant to an applicable requirement that exists independent of the permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. Additional pages may be attached if necessary. If no deviations occurred, please specify in the box marked "No deviations occurred this reporting period".

☐ NO DEVIATIONS OCCURRED THIS REPORTING PERIOD.

☐ THE FOLLOWING DEVIATIONS OCCURRED THIS REPORTING PERIOD

| | |
|---|---|
| **Permit Requirement** (specify permit condition #) | |
| **Date of Deviation:** | **Duration of Deviation:** |
| **Number of Deviations:** | |
| **Probable Cause of Deviation:** | |
| **Response Steps Taken:** | |

| | |
|---|---|
| **Permit Requirement** (specify permit condition #) | |
| **Date of Deviation:** | **Duration of Deviation:** |
| **Number of Deviations:** | |
| **Probable Cause of Deviation:** | |
| **Response Steps Taken:** | |

| | |
|---|---|
| **Permit Requirement** (specify permit condition #) | |
| **Date of Deviation:** | **Duration of Deviation:** |
| **Number of Deviations:** | |
| **Probable Cause of Deviation:** | |
| **Response Steps Taken:** | |
| **Permit Requirement** (specify permit condition #) | |
| **Date of Deviation:** | **Duration of Deviation:** |
| **Number of Deviations:** | |
| **Probable Cause of Deviation:** | |
| **Response Steps Taken:** | |
| **Permit Requirement** (specify permit condition #) | |
| **Date of Deviation:** | **Duration of Deviation:** |
| **Number of Deviations:** | |
| **Probable Cause of Deviation:** | |
| **Response Steps Taken:** | |

Form Completed by:_____

Title / Position: _____

Date:_____

Phone: _____

# Addendum to the Technical Support Document (ATSD) for a Minor Permit Modification

## Source Background and Description

| | |
|---|---|
| **Source Name:** | **Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station** |
| **Source Location:** | **3711 Darlington Road, Newburgh, IN 47630** |
| **County:** | **Warrick** |
| **SIC Code:** | **4911 and 4922 (Electric Services & Natural Gas Transmission** |
| **Operation Permit No.:** | **T 173-43264-00001** |
| **Operation Permit Issuance Date:** | **August 17, 2021** |
| **Minor Permit Modification No.:** | **173-48980-00001** |
| **Permit Reviewer:** | **Hachem Ismaili Alaoui** |

IDEM, OAQ has made the following revisions to the permit as described below due to the Emergency Affirmative Defense Removal, with deleted language as ~~strikeouts~~ and new language **bolded**.

## Proposed Changes Due to Emergency Affirmative Defense Removal

In the Federal Register Notice 88 FR 47029 dated July 21, 2023, U.S. EPA finalized the removal of the "emergency" affirmative defense provisions from Clean Air Act operating permit program regulations effective August 21, 2023. A rulemaking to amend the Indiana rules at 326 IAC 2-7 (Part 70 Permit Program), 326 IAC 2-8 (Federally Enforceable State Operating Permit Program), and 326 IAC 1-6-1 (Malfunctions) was effective June 21, 2025, making them consistent with federal regulations. IDEM OAQ has determined that changes to the permit are required to be consistent with state and federal law. The permit is revised as shown below with deleted language as ~~strikeouts~~ and new language **bolded**.

(a) The permit is amended to remove Section B - Emergency Provisions and replace the section title with the word "Reserved", to remove the Emergency Occurrence Report form, and to remove any references to the requirements of Section B - Emergency Provisions from permit conditions.

(b) The permit is amended to include a new Section C - Malfunctions Report (and a new associated Malfunctions Report form) that incorporates the record keeping and reporting requirements of 326 IAC 1-6-2 (Records; Notice of Malfunction). All subsequent Section C conditions are renumbered accordingly. Permit Section C - General Reporting Requirements and the Quarterly Deviation And Compliance Monitoring Report form is amended to reference Section C - Malfunctions Report.

(c) Permit citations to definitions within 326 IAC 2-7-1 are amended throughout the permit as necessary, since the definitions under 326 IAC 2-7-1(12) and 326 IAC 2-7-1(20) have been deleted from the rule. Any occurrence of the following 326 IAC 2-7-1 definition citations are amended as shown below, with deleted language as strikeouts and new language **bolded**:

326 IAC 2-7-1~~(21)~~**(19)**
326 IAC 2-7-1~~(22)~~**(20)**
326 IAC 2-7-1~~(33)~~**(31)**
326 IAC 2-7-1~~(35)~~**(33)**
326 IAC 2-7-1~~(37)~~**(35)**
326 IAC 2-7-1~~(42)~~**(39)**

**The Permit was revised as follows:**

The Permittee must comply with all conditions of this permit. Noncompliance with any provisions of this permit is grounds for enforcement action; permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Noncompliance with any provision of this permit, except any provision specifically designated as not federally enforceable, constitutes a violation of the Clean Air Act. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. ~~An emergency does constitute an affirmative defense in an enforcement action provided the Permittee complies with the applicable requirements set forth in Section B, Emergency Provisions.~~

*****

A.1 General Information [326 IAC 2-7-4(c)][326 IAC 2-7-5(14)][326 IAC 2-7-1(~~22~~**20**)]

*****

A.3 Specifically Regulated Insignificant Activities [326 IAC 2-7-1(~~21~~**19**)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities which are specifically regulated, as defined in 326 IAC 2-7-1(~~21~~**19**):

*****

A.4 Insignificant Activities [326 IAC 2-7-1(~~21~~**19**)][326 IAC 2-7-4(c)][326 IAC 2-7-5(14)]

This stationary source also includes the following insignificant activities, as defined in 326 IAC 2-7-1(~~21~~**19**):

*****

(aa) A laboratory as defined in 326 IAC 2-7-1(~~21~~**19**)(D).

*****

A.5 Part 70 Permit Applicability [326 IAC 2-7-2]

*****

(a) It is a major source, as defined in 326 IAC 2-7-1(~~22~~**20**);

*****

B.8 Certification [326 IAC 2-7-4(f)][326 IAC 2-7-6(1)][326 IAC 2-7-5(3)(C)]

(a) *****

(1) it contains a certification by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**), and

*****

*****

(c) A "responsible official" is defined at 326 IAC 2-7-1(~~35~~**33**).

*****

B.9 Annual Compliance Certification [326 IAC 2-7-6(5)]

*****

The submittal by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

B.10 Preventive Maintenance Plan [326 IAC 2-7-5(12)][326 IAC 1-6-3]

*****

(b) *****

The PMP extension notification does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

(c) A copy of the PMPs shall be submitted to IDEM, OAQ upon request and within a reasonable time, and shall be subject to review and approval by IDEM, OAQ. IDEM, OAQ may require the Permittee to revise its PMPs whenever lack of proper maintenance causes or is the primary contributor to an exceedance of any limitation on emissions. The PMPs and their submittal do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

******

*****

B.11 **Reserved**

~~Emergency Provisions [326 IAC 2-7-16]~~

~~(a) An emergency, as defined in 326 IAC 2-7-1(12), is not an affirmative defense for an action brought for noncompliance with a federal or state health-based emission limitation.~~

~~(b) An emergency, as defined in 326 IAC 2-7-1(12), constitutes an affirmative defense to an action brought for noncompliance with a technology-based emission limitation if the affirmative defense of an emergency is demonstrated through properly signed, contemporaneous operating logs or other relevant evidence that describe the following:~~

~~(1) An emergency occurred and the Permittee can, to the extent possible, identify the causes of the emergency;~~

~~(2) The permitted facility was at the time being properly operated;~~

~~(3) During the period of an emergency, the Permittee took all reasonable steps to minimize levels of emissions that exceeded the emission standards or other requirements in this permit;~~

~~(4) For each emergency lasting one (1) hour or more, the Permittee notified IDEM, OAQ or Southwest Regional Office within four (4) daytime business hours after the beginning of the emergency, or after the emergency was discovered or reasonably should have been discovered;~~

~~Telephone Number: 1-800-451-6027 (ask for Office of Air Quality, Compliance and Enforcement Branch), or~~
~~Telephone Number: 317-233-0178 (ask for Office of Air Quality, Compliance and Enforcement Branch)~~
~~Facsimile Number: 317-233-6865~~
~~Southwest Regional Office phone: (812) 380-2305; fax: (812) 380-2304.~~

~~(5) For each emergency lasting one (1) hour or more, the Permittee submitted the attached Emergency Occurrence Report Form or its equivalent, either by mail or facsimile to:~~

~~Indiana Department of Environmental Management~~
~~Compliance and Enforcement Branch, Office of Air Quality~~
~~Indiana Government Center North~~
~~100 North Senate Avenue, Room 13W~~
~~Indianapolis, Indiana 46204-2251~~

~~within two (2) working days of the time when emission limitations were exceeded due to the emergency.~~

~~The notice fulfills the requirement of 326 IAC 2-7-5(3)(C)(ii) and must contain the following:~~

~~(A) A description of the emergency;~~

~~(B) Any steps taken to mitigate the emissions; and~~

~~(C) Corrective actions taken.~~

~~The notification which shall be submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(35).~~

~~(6) The Permittee immediately took all reasonable steps to correct the emergency.~~

~~(c) In any enforcement proceeding, the Permittee seeking to establish the occurrence of an emergency has the burden of proof.~~

~~(d) This emergency provision supersedes 326 IAC 1-6 (Malfunctions). This permit condition is in addition to any emergency or upset provision contained in any applicable requirement.~~

~~(e) The Permittee seeking to establish the occurrence of an emergency shall make records available upon request to ensure that failure to implement a PMP did not cause or contribute to an exceedance of any limitations on emissions. However, IDEM, OAQ may require that the Preventive Maintenance Plans required under 326 IAC 2-7-4(c)(8) be revised in response to an emergency.~~

~~(f) Failure to notify IDEM, OAQ by telephone or facsimile of an emergency lasting more than one (1) hour in accordance with (b)(4) and (5) of this condition shall constitute a violation of 326 IAC 2-7 and any other applicable rules.~~

~~(g) If the emergency situation causes a deviation from a technology based limit, the Permittee may continue to operate the affected emitting facilities during the emergency provided the Permittee immediately takes all reasonable steps to correct the emergency and minimize emissions.~~

*****

B.15 Permit Modification, Reopening, Revocation and Reissuance, or Termination
[326 IAC 2-7-5(6)(C)][326 IAC 2-7-8(a)][326 IAC 2-7-9]

(a) This permit may be modified, reopened, revoked and reissued, or terminated for cause. The filing of a request by the Permittee for a Part 70 Operating Permit modification,

revocation and reissuance, or termination, or of a notification of planned changes or anticipated noncompliance does not stay any condition of this permit. [326 IAC 2-7-5(6)(C)] The notification by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

B.16 Permit Renewal [326 IAC 2-7-3][326 IAC 2-7-4][326 IAC 2-7-8(e)]

(a) The application for renewal shall be submitted using the application form or forms prescribed by IDEM, OAQ and shall include the information specified in 326 IAC 2-7-4. Such information shall be included in the application for each emission unit at this source, except those emission units included on the trivial or insignificant activities list contained in 326 IAC 2-7-1(~~21~~**19**) and 326 IAC 2-7-1(~~42~~**39**). The renewal application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

B.17 Permit Amendment or Modification [326 IAC 2-7-11][326 IAC 2-7-12][40 CFR 72]

*****

(c) *****

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

******

*****

B.19 Operational Flexibility [326 IAC 2-7-20][326 IAC 2-7-10.5]

*****

(b) The Permittee may make Section 502(b)(10) of the Clean Air Act changes (this term is defined at 326 IAC 2-7-1(~~37~~**35**)) without a permit revision, subject to the constraint of 326 IAC 2-7-20(a). For each such Section 502(b)(10) of the Clean Air Act change, the required written notification shall include the following:

*****

The notification which shall be submitted is not considered an application form, report or compliance certification. Therefore, the notification by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

B.22 Transfer of Ownership or Operational Control [326 IAC 2-7-11]

*****

(b) *****

Any such application does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

******

*****

C.8 Asbestos Abatement Projects [326 IAC 14-10][326 IAC 18][40 CFR 61, Subpart M]

*****

(d) *****

The notice shall include a signed certification from the owner or operator that the information provided in this notification is correct and that only Indiana licensed workers and project supervisors will be used to implement the asbestos removal project. The notifications do not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

C.9 Performance Testing [326 IAC 3-6]

(a) *****

no later than thirty-five (35) days prior to the intended test date. The protocol submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

(b) The Permittee shall notify IDEM, OAQ of the actual test date at least fourteen (14) days prior to the actual test date. The notification submitted by the Permittee does not require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

C.11 Compliance Monitoring [326 IAC 2-7-5(3)][326 IAC 2-7-6(1)][40 CFR 64][326 IAC 3-8]

*****

The notification which shall be submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

C.16 Actions Related to Noncompliance Demonstrated by a Stack Test [326 IAC 2-7-5][326 IAC 2-7-6]

*****

(c) *******

The response action documents submitted pursuant to this condition do require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

**C.17 Malfunctions Report [326 IAC 1-6-2]**

**Pursuant to 326 IAC 1-6-2 (Records; Notice of Malfunction):**

**(a) A record of all malfunctions, startups or shutdowns of any emission unit or emission control equipment, that results in violations of applicable air pollution control regulations or applicable emission limitations must be kept and retained for a period of three (3) years and be made available to the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ) or appointed representative upon request.**

**(b) When a malfunction of any emission unit or emission control equipment occurs that lasts more than one (1) hour, the condition shall be reported to OAQ, using the Malfunction Report Forms (2 pages). Notification must be made by telephone or**

**other electronic means, as soon as practicable, but in no event later than four (4) daytime business hours after the beginning of the occurrence.**

**(c) Failure to report a malfunction of any emission unit or emission control equipment shall constitute a violation of 326 IAC 1-6, and any other applicable rules. Information on the scope and expected duration of the malfunction must be provided, including the items specified in 326 IAC 1-6-2(c)(3)(A) through (E).**

**(d) Malfunction is defined as any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner. [326 IAC 1-2-39]**

*****

C.18 Emission Statement [326 IAC 2-7-5(3)(C)(iii)][326 IAC 2-7-5(7)][326 IAC 2-7-19(c)][326 IAC 2-6]

*****

(2) Indicate estimated actual emissions of regulated pollutants as defined by 326 IAC 2-7-1(~~33~~**31**) (“Regulated pollutant, which is used only for purposes of Section 19 of this rule”) from the source, for purpose of fee assessment.

*****

The emission statement does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

C.20 General Reporting Requirements [326 IAC 2-7-5(3)(C)][326 IAC 2-1.1-11][326 IAC 2-2][326 IAC 2-3][40 CFR 64][326 IAC 3-8]

(a) The Permittee shall submit the attached Quarterly Deviation and Compliance Monitoring Report or its equivalent. Proper notice submittal under ~~Section B - Emergency Provisions~~ **Section C - Malfunctions Report** satisfies the reporting requirements of this paragraph. Any deviation from permit requirements, the date(s) of each deviation, the cause of the deviation, and the response steps taken must be reported except that a deviation required to be reported pursuant to an applicable requirement that exists independent of this permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. This report shall be submitted not later than thirty (30) days after the end of the reporting period. The Quarterly Deviation and Compliance Monitoring Report shall include a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official" as defined by 326 IAC 2-7-1(~~35~~**33**). A deviation is an exceedance of a permit limitation or a failure to comply with a requirement of the permit.

*****

D.1.12 Reporting Requirements

(a) A quarterly summary of the thirty (30) day rolling weighted average PM emissions rate in pound per million Btu to document the compliance status with Condition D.1.2, as well as a quarterly summary of the information to document compliance with Condition D.1.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

D.2.15 Reporting Requirements

(a) A quarterly summary of the information to document the compliance status with Conditions D.2.2 and D.2.3 shall be submitted not later than thirty (30) days after the end of the quarter being reported. Section C - General Reporting contains the Permittee's obligation with regard to the reporting required by this condition. The report submitted by the Permittee does require a certification that meets the requirements of 326 IAC 2-7-6(1) by a "responsible official," as defined by 326 IAC 2-7-1(~~35~~**33**).

*****

*****

D.3.5 Broken or Failed Bag Detection

(a) For a single compartment baghouse/filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

(b) For a single compartment baghouse controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the line. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

*****

*****

D.4.5 Broken or Failed Bag Detection [326 IAC 2-7-6(1)][326 IAC 2-7-5(1)][40 CFR 64]

(a) For a single compartment fabric filter controlling emissions from a process operated continuously, a failed unit and the associated process shall be shut down immediately until the failed unit has been repaired or replaced. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

(b) For a single compartment fabric filter controlling emissions from a batch process, the feed to the process shall be shut down immediately until the failed unit has been repaired or replaced. The emissions unit shall be shut down no later than the completion of the processing of the material in the emission units. ~~Operations may continue only if the event qualifies as an emergency and the Permittee satisfies the requirements of the emergency provisions of this permit (Section B - Emergency Provisions).~~

*****

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
Indiana Government Center North
100 North Senate Avenue, Room 13W
Indianapolis, Indiana 46204-2251
Phone: (317) 233-0178
Fax: (317) 233-6865

PART 70 OPERATING PERMIT
EMERGENCY OCCURRENCE REPORT

Source Name: Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
Source Address: 3711 Darlington Road, Newburgh, Indiana 47630
Part 70 Permit No.: T173-43264-00001

This form consists of 2 pages Page 1 of 2

□ This is an emergency as defined in 326 IAC 2-7-1(12)
- The Permittee must notify the Office of Air Quality (OAQ), within four (4) daytime business hours (1-800-451-6027 or 317-233-0178, ask for Compliance Section); and
- The Permittee must submit notice in writing or by facsimile within two (2) working days (Facsimile Number: 317-233-6865), and follow the other requirements of 326 IAC 2-7-16.

If any of the following are not applicable, mark N/A

| |
|---|
| Facility/Equipment/Operation: |
| Control Equipment: |
| Permit Condition or Operation Limitation in Permit: |
| Description of the Emergency: |
| Describe the cause of the Emergency: |

~~If any of the following are not applicable, mark N/A~~ ~~Page 2 of 2~~

| |
|---|
| ~~Date/Time Emergency started:~~ |
| ~~Date/Time Emergency was corrected:~~ |
| ~~Was the facility being properly operated at the time of the emergency? Y N~~ |
| ~~Type of Pollutants Emitted: TSP, PM 10, $SO_2$, VOC, $NO_x$, CO, Pb, other:~~ |
| ~~Estimated amount of pollutant(s) emitted during emergency:~~ |
| ~~Describe the steps taken to mitigate the problem:~~ |
| ~~Describe the corrective actions/response steps taken:~~ |
| ~~Describe the measures taken to minimize emissions:~~ |
| ~~If applicable, describe the reasons why continued operation of the facilities are necessary to prevent imminent injury to persons, severe damage to equipment, substantial loss of capital investment, or loss of product or raw materials of substantial economic value:~~ |

~~Form Completed by:~~ _____

~~Title / Position:~~ _____

~~Date:~~ _____

~~Phone:~~ _____

## MALFUNCTION REPORT

**INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**
**OFFICE OF AIR QUALITY**
**COMPLIANCE AND ENFORCEMENT BRANCH**
**FAX NUMBER: (317) 233-6865**
**EMAIL: AirCompl@idem.in.gov**

**Source Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
**Source Address:** 3711 Darlington Road, Newburgh, Indiana 47630
**Permit No.:** T173-43264-00001

**For any malfunction lasting one (1) hour or longer, the Permittee must submit this form to the Office of Air Quality (OAQ), within four (4) daytime business hours of malfunction start.**

**If any of the following are not applicable, mark N/A. This form consists of two (2) pages.**



| |
|---|
| **This malfunction resulted in a violation of the following Indiana Administrative Code, permit condition, and/or permit limit and meets the definition of "malfunction" as listed on reverse side (e.g., 326 IAC 5-1, Permit Condition D.1.1, 40 CFR 60.62, etc.):** |

| |
|---|
| **Describe affected facility/equipment/operation (e.g., Coating Line #2, Boiler D, Diesel engine, No. 3 smelter, etc.):** |
| **Control equipment (e.g., Baghouse B4, Thermal oxidizer for Paint Line #1, etc.):** |
| **Description of the malfunction and cause:** |

| | |
|---|---|
| **When the malfunction started:** | **Date (MM/DD/YYYY):** |
| | **Time (HH:MM):** |
| **When the malfunction was corrected or is expected to be corrected:** | **Date (MM/DD/YYYY):** |
| | **Time (HH:MM):** |

**Page 2 of 2**

| |
|---|
| **Type of pollutant(s) emitted (e.g., PM, PM10, PM2.5, VOC, etc.):** |
| **Estimated amount of pollutant(s) emitted during malfunction (e.g., VOC at 35 lbs/hr, 5 tons of PM, etc.):** |
| **Describe the corrective actions and interim control measures taken to minimize emissions (e.g., shut coating line down, isolated failing baghouse compartment, idled furnace operations until repairs completed, etc.):** |

**Form completed by:**_____

**Title/position:** _____

**Signature:** _____

**Date:** _____

**Phone:** _____

**Email:**_____

**326 IAC 1-6-1 Applicability of rule**

**Sec. 1. This rule applies to the owner or operator of any facility required to obtain a permit under 326 IAC 2-5.1, 326 IAC 2-6.1, 326 IAC 2-7, or 326 IAC 2-8.**

**326 IAC 1-2-39 "Malfunction" definition**

**Sec. 39. Any sudden, unavoidable failure of any air pollution control equipment, process, or combustion or process equipment to operate in a normal and usual manner.**

*****

QUARTERLY DEVIATION AND COMPLIANCE MONITORING REPORT

| | |
|---|---|
| Source Name: | Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station |
| Source Address: | 3711 Darlington Road, Newburgh, Indiana 47630 |
| Part 70 Permit No.: | T173-43264-00001 |

This report shall be submitted quarterly based on a calendar year. Proper notice submittal under ~~Section B - Emergency Provisions~~ **Section C - Malfunctions Report** satisfies the reporting requirements of paragraph (a) of Section C-General Reporting. Any deviation from the requirements of this permit, the date(s) of each deviation, the probable cause of the deviation, and the response steps taken must be reported. A deviation required to be reported pursuant to an applicable requirement that exists independent of the permit, shall be reported according to the schedule stated in the applicable requirement and does not need to be included in this report. Additional pages may be attached if necessary. If no deviations occurred, please specify in the box marked "No deviations occurred this reporting period".

*****

**IDEM Contact**

(a) If you have any questions regarding this permit, please contact Hachem Ismaili Alaoui, Indiana Department Environmental Management, Office of Air Quality, Permits Branch, Indiana Government Center North, 100 North Senate Avenue, Room 13W, Indianapolis, Indiana 46204-2251, or by telephone at (317) 232-2827 or (800) 451-6027, and ask for Hachem Ismaili Alaoui or (317) 232-2827.

(b) A copy of the findings is available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/

(c) For additional information about air permits and how the public and interested parties can participate, refer to the IDEM Air Permits page on the Internet at: https://www.in.gov/idem/airpermit/public-participation/; and the Citizens' Guide to IDEM on the Internet at: https://www.in.gov/idem/resources/citizens-guide-to-idem/.

**Indiana Department of Environmental Management**
**Office of Air Quality**

# Technical Support Document (TSD) for a Part 70 Minor Source Modification and Minor Permit Modification

## Source Description and Location

| | |
|---|---|
| **Source Name:** | **Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station** |
| **Source Location:** | **3711 Darlington Road, Newburgh, IN 47630** |
| **County:** | **Warrick** |
| **SIC Code:** | **4911 and 4922 (Electric Services & Natural Gas Transmission** |
| **Operation Permit No.:** | **T 173-43264-00001** |
| **Operation Permit Issuance Date:** | **August 17, 2021** |
| **Minor Source Modification No.:** | **173-48924-00001** |
| **Minor Permit Modification No.:** | **173-48980-00001** |
| **Permit Reviewer:** | **Hachem Ismaili Alaoui** |

## Existing Approvals

The source was issued Part 70 Operating Permit Renewal No. 173-43264-00001 on August 17, 2021. The source has since received the following approvals:

| Permit Type | Permit Number | Issuance Date |
|---|---|---|
| Significant Source Modification | 173-44846-00001 | April 7, 2022 |
| Significant Permit Modification | 173-44874-00001 | April 25, 2022 |

## County Attainment Status

The source is located in Warrick County.

Pursuant to amendments to Indiana Code IC 13-17-3-14, effective July 1, 2023, a federal regulation that classifies or amends a designation of attainment, nonattainment, or unclassifiable for any area in Indiana under the federal Clean Air Act is effective and enforceable in Indiana on the effective date of the federal regulation.

| Pollutant | Designation |
|---|---|
| $SO_2$ | Unclassifiable or attainment effective April 9, 2018, for the 2010 primary 1-hour $SO_2$ standard. Cannot be classified effective March 3, 1978, for the national secondary standards. |
| CO | Unclassifiable or attainment effective November 15, 1990. |
| $O_3$ | Unclassifiable or attainment effective January 16, 2018, for the 2015 8-hour ozone standard. |
| $PM_{2.5}$ | Unclassifiable or attainment effective April 15, 2015, for the 2012 annual $PM_{2.5}$ standard. |
| $PM_{2.5}$ | Unclassifiable or attainment effective December 13, 2009, for the 2006 24-hour $PM_{2.5}$ standard. |
| $PM_{10}$ | Unclassifiable effective November 15, 1990. |
| $NO_2$ | Unclassifiable or attainment effective January 29, 2012, for the 2010 $NO_2$ standard. |
| Pb | Unclassifiable or attainment effective December 31, 2011, for the 2008 lead standard. |

(a) Ozone Standards
Volatile organic compounds (VOC) and Nitrogen Oxides ($NO_x$) are regulated under the Clean Air Act (CAA) for the purposes of attaining and maintaining the National Ambient Air Quality Standards (NAAQS) for ozone. Therefore, VOC and $NO_x$ emissions are considered when evaluating the rule applicability relating to ozone. Warrick County has been designated as attainment or unclassifiable for ozone. Therefore, VOC and $NO_x$ emissions were reviewed pursuant to the requirements of Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

(b) $PM_{2.5}$
Warrick County has been classified as attainment for $PM_{2.5}$. Therefore, direct $PM_{2.5}$, $SO_2$, and NOx emissions were reviewed pursuant to the requirements of Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

(c) Other Criteria Pollutants
Warrick County has been classified as attainment or unclassifiable in Indiana for all the other criteria pollutants. Therefore, these emissions were reviewed pursuant to the requirements for Prevention of Significant Deterioration (PSD), 326 IAC 2-2.

## Fugitive Emissions

Since this source is classified as a fossil fuel-fired steam electric plants with boilers totaling more than two hundred fifty million (250,000,000) Btu per hour, it is considered one (1) of the twenty-eight (28) listed source categories, as specified in 326 IAC 2-2-1(ff)(1), 326 IAC 2-3-2(g), or 326 IAC 2-7-1(22)(B). Therefore, fugitive emissions are counted toward the determination of PSD, Emission Offset, and Part 70 Permit applicability.

The fugitive emissions of hazardous air pollutants (HAP) are counted toward the determination of Part 70 Permit applicability and source status under Section 112 of the Clean Air Act (CAA).

## Greenhouse Gas (GHG) Emissions

On June 23, 2014, in the case of *Utility Air Regulatory Group v. EPA*, cause no. 12-1146, (available at http://www.supremecourt.gov/opinions/13pdf/12-1146_4g18.pdf) the United States Supreme Court ruled that the U.S. EPA does not have the authority to treat greenhouse gases (GHGs) as an air pollutant for the purpose of determining operating permit applicability or PSD Major source status. On July 24, 2014, the U.S. EPA issued a memorandum to the Regional Administrators outlining next steps in permitting decisions in light of the Supreme Court's decision. U.S. EPA's guidance states that U.S. EPA will no longer require PSD or Title V permits for sources "previously classified as 'Major' based solely on greenhouse gas emissions."

The Indiana Environmental Rules Board adopted the GHG regulations required by U.S. EPA at 326 IAC 2-2-1(zz), pursuant to Ind. Code § 13-14-9-8(h) (Section 8 rulemaking). A rule, or part of a rule, adopted under Section 8 is automatically invalidated when the corresponding federal rule, or part of the rule, is invalidated. Due to the United States Supreme Court Ruling, IDEM, OAQ cannot consider GHG emissions to determine operating permit applicability or PSD applicability to a source or modification.

## Source Status - Existing Source

The table below summarizes the potential to emit of the entire source, prior to the proposed modification, after consideration of all enforceable limits established in the effective permits. If the control equipment

has been determined to be integral, the table reflects the potential to emit (PTE) after consideration of the integral control device.

| | Source-Wide Emissions Prior to Modification (ton/year) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PM[1]** | **$PM_{10}$[1]** | **$PM_{2.5}$[1, 2]** | **$SO_2$** | **$NO_X$** | **VOC** | **CO** | **Single HAP[3]** | **Total HAPs** |
| **Total PTE of Entire Source Including Fugitives*** | >100 | >100 | >100 | >100 | >100 | 90 | >100 | >10 | >25 |
| Title V Major Source Thresholds | NA | 100 | 100 | 100 | 100 | 100 | 100 | 10 | 25 |
| PSD Major Source Thresholds | 100 | 100 | 100 | 100 | 100 | 100 | 100 | -- | -- |

[1]Under the Part 70 Permit program (40 CFR 70), $PM_{10}$ and $PM_{2.5}$, not particulate matter (PM), are each considered as a "regulated air pollutant."

[2]$PM_{2.5}$ listed is direct $PM_{2.5}$.

[3]Single highest source-wide HAP (HCl)

*Fugitive HAP emissions are always included in the source-wide emissions.

(a) This existing source is a major stationary source, under PSD (326 IAC 2-2), because a PSD regulated pollutant(s), PM, PM10, PM2.5, SO2, NOx, and CO, is emitted at a rate of 100 tons per year or more, and it is one of the twenty-eight (28) listed source categories, as specified in 326 IAC 2-2-1(ff)(1).

(b) This existing source is a major source of HAP, as defined in 40 CFR 63.2, because HAP emissions are equal to or greater than ten (10) tons per year for a single HAP and equal to or greater than twenty-five (25) tons per year for a combination of HAPs.

(c) These emissions are based on the TSD of SSM No. 173-44846-00001, issued on April 7, 2022.

## Description of Proposed Modification

The Office of Air Quality (OAQ) has reviewed an application, submitted by SIGECO - F.B. Culley Generating Station on April 3, 2025, relating to construction and operation of one (1) limestone storage pile covering an area of two (2) acres, Two (2) limestone material handling drop points associated with the storage pile, and paved and unpaved roads traffic associated with limestone handling and storage.

The following is a list of the new emission units:

(a) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(b) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(c) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(d) Paved and Unpaved Roads.

## Enforcement Issues

There are no pending enforcement actions related to this modification.

## Emission Calculations

See Appendix A of this Technical Support Document for detailed emission calculations.

## Permit Level Determination – Part 70 Modification to an Existing Source

Pursuant to 326 IAC 2-1.1-1(12), Potential to Emit is defined as "the maximum capacity of a stationary source or emission unit to emit any air pollutant under its physical and operational design. Any physical or operational limitation on the capacity of a source to emit an air pollutant, including air pollution control equipment and restrictions on hours of operation or type or amount of material combusted, stored, or processed shall be treated as part of its design if the limitation is enforceable by the U. S. EPA, IDEM, or the appropriate local air pollution control agency."

The following table is used to determine the appropriate permit level under 326 IAC 2-7-10.5. This table reflects the PTE before controls. If the control equipment has been determined to be integral, the table reflects the potential to emit (PTE) after consideration of the integral control device.

| | PTE Before Controls of the New Emission Units (ton/year) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Process / Emission Unit** | **PM** | **$PM_{10}$** | **$PM_{2.5}$[1]** | **$SO_2$** | **$NO_X$** | **VOC** | **CO** | **Total HAPs** |
| Limestone Storage Pile | 1.49 | 0.74 | 0.30 | -- | -- | -- | -- | -- |
| Limestone Drop to Storage Pile | 0.15 | 0.06 | 0.06 | -- | -- | -- | -- | -- |
| Limestone Drop to Truck | 0.15 | 0.06 | 0.06 | -- | -- | -- | -- | -- |
| Paved Roads | 3.59 | 0.72 | 0.18 | -- | -- | -- | -- | -- |
| Unpaved Roads | 6.80 | 1.81 | 0.18 | -- | -- | -- | -- | -- |
| **Total PTE Before Controls of the New Emission Units:** | **12.18** | **3.38** | **0.76** | **--** | **--** | **--** | **--** | **--** |

[1] $PM_{2.5}$ listed is direct $PM_{2.5}$.

Appendix A of this TSD reflects the detailed potential emissions of the modification.

(a) Approval to Construct

Pursuant to 326 IAC 2-7-10.5(e)(1)(A), a Minor Source Modification is required because this modification has the potential to emit PM that is less than twenty-five (25) tons per year and equal to or greater than five (5) tons per year.

(b) Approval to Operate

Pursuant to 326 IAC 2-7-12(b)(1), this change to the permit is being made through a Minor Permit Modification because:

(A) The modification does not violate any applicable requirement.
(B) The modification does not involve significant changes to existing monitoring, reporting or record keeping requirements in the Part 70 permit.
(C) The modification does not require or change:
  (i) a case-by-case determination of an emission limitation or other standard;
  (ii) source specific determination for temporary sources of ambient impacts; or
  (iii) visibility or increment analysis.
(D) The modification does not seek to establish or change a Part 70 permit term or condition for which there is no corresponding underlying applicable requirement and that the source has assumed to avoid an applicable requirement to which the source would otherwise be subject. This includes the following:
  (i) A federally enforceable emissions cap assumed to avoid classification as a modification under any provision of Title I of the CAA.

(ii) An alternative emissions limit approved under regulations promulgated under Section 112(i)(5) of the CAA.

(E) This change is not a modification under any provision of Title I of the CAA.

(F) This change is not required by the Part 70 program to be processed as a significant modification.

**Permit Level Determination – PSD Emissions Increase**

(a) Actual to Potential (ATP) Applicability Test

Since this project only involves the construction of new emissions units and/or emissions units considered new for this evaluation, an Actual to Potential (ATP) applicability test, specified in 326 IAC 2-2-2(d)(4), is used to determine if the project results in a Significant Emissions Increase.

The following proposed emissions unit(s) are considered as new emissions units for this evaluation.

(1) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(2) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(3) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(4) Paved and Unpaved Roads.

(b) Actual to Potential (ATP) Summary

The Emissions Increase of the project is the sum of the difference between the potential to emit (PTE) from **each new emissions** unit following completion of the project and the baseline actual emissions of these units before the project.

$ATP_{(new\ unit)} = PTE_{(new\ unit)} - Baseline\ Emissions_{(new\ unit)}$

See Appendix A of this Technical Support Document for detailed emission calculations.

| Project Emissions Increase (tons/year) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Process/Emissions Unit** | **PM** | **$PM_{10}$** | **$PM_{2.5}$*** | **$SO_2$** | **$NO_X$** | **VOC** | **CO** | **GHGs** |
| Limestone Storage Pile | 1.49 | 0.74 | 0.30 | -- | -- | -- | -- | -- |
| Limestone Drop to Storage Pile | 0.15 | 0.06 | 0.06 | -- | -- | -- | -- | -- |
| Limestone Drop to Truck | 0.15 | 0.06 | 0.06 | -- | -- | -- | -- | -- |
| Paved Roads | 3.59 | 0.72 | 0.18 | -- | -- | -- | -- | -- |
| Unpaved Roads | 6.80 | 1.81 | 0.18 | -- | -- | -- | -- | -- |
| **Project Emissions Increase** | **12.18** | **3.38** | **0.76** | **--** | **--** | **--** | **--** | **--** |
| Significant Levels | 25 | 15 | 10 | 40 | 40 | 40 | 100 | 75,000 $CO_2e$ |

*PM2.5 listed is direct PM2.5.
Any values that are highlighted in gray correspond to the limited potential to emit.

See Technical Support Document (TSD) State Rule Applicability - Entire Source section, 326 IAC 2-2 (PSD) and 326 IAC 2-3 (Emission Offset) applicability determination for more information regarding the limits.

(c) Upstream/Downstream Increased Utilization
The proposed new emission units will be an alternative way to deliver limestone to the existing limestone handling process which will not result in an increase or decrease in limestone usage. It is just a different limestone delivery method. Therefore, there will be no potential increase utilization of any upstream or downstream emissions due to the construction and operation of these proposed new units.

(d) Conclusion
This modification to an existing major PSD stationary source is not major because the Emissions Increase of each PSD regulated pollutant is less than the PSD significant level (i.e., the modification does not cause a Significant Emissions Increase). Therefore, pursuant to 326 IAC 2-2, the PSD requirements do not apply.

**PTE of the Entire Source After Issuance of the Part 70 Modification**

The table below summarizes the after issuance source-wide potential to emit, reflecting all limits, of the emission units. Any control equipment is considered federally enforceable only after issuance of the Part 70 modification, and only to the extent that the effect of the control equipment is made practically enforceable in the permit. If the control equipment has been determined to be integral, the table reflects the potential to emit (PTE) after consideration of the integral control device.

| | Source-Wide Emissions After Issuance (ton/year) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PM[1]** | **$PM_{10}$[1]** | **$PM_{2.5}$[1, 2]** | **$SO_2$** | **$NO_X$** | **VOC** | **CO** | **Single HAP[3]** | **Total HAPs** |
| **Total PTE of Entire Source Including Fugitives*** | **329.72** | **596.87** | **474.07** | **4,693.03** | **3,451.79** | **90.50** | **1,382.07** | **32.89** | **85.74** |
| Title V Major Source Thresholds | NA | 100 | 100 | 100 | 100 | 100 | 100 | 10 | 25 |
| PSD Major Source Thresholds | 100 | 100 | 100 | 100 | 100 | 100 | 100 | -- | -- |

[1]Under the Part 70 Permit program (40 CFR 70), $PM_{10}$ and $PM_{2.5}$, not particulate matter (PM), are each considered as a "regulated air pollutant."
[2]$PM_{2.5}$ listed is direct $PM_{2.5}$.
[3]Single highest source-wide HAP (HCl)
*Fugitive HAP emissions are always included in the source-wide emissions.

(a) This existing major PSD stationary source will continue to be major under 326 IAC 2-2 because at least one pollutant, PM, PM10, PM2.5, SO2, NOx, and CO, has emissions equal to or greater than the PSD major source threshold.

(b) This existing major source of HAP will continue to be a major source of HAP, as defined in 40 CFR 63.2, because HAP emissions will continue to be equal to or greater than ten (10) tons per year for any single HAP and/or equal to or greater than twenty-five (25) tons per year of a combination of HAPs. Therefore, this source is a major source under Section 112 of the Clean Air Act (CAA).

**Federal Rule Applicability Determination**

Due to the modification at this source, federal rule applicability has been reviewed as follows:

**New Source Performance Standards (NSPS):**

(a) The requirements of the New Source Performance Standard for Nonmetallic Mineral Processing Plants, 40 CFR 60, Subpart OOO and 326 IAC 12, are not included in the permit for emission units listed below, because these units are not one (1) of the following affected facilities in fixed or portable nonmetallic mineral processing plants: each crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, enclosed truck or railcar loading station.

(1) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(2) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.

(3) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.

(b) There are no other New Source Performance Standards (40 CFR Part 60) and 326 IAC 12 included in the permit for this proposed modification.

**National Emission Standards for Hazardous Air Pollutants (NESHAP):**

(c) There are no National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR Part 63, 326 IAC 14, and 326 IAC 20) included in the permit for this proposed modification.

**Compliance Assurance Monitoring (CAM):**

(a) Pursuant to 40 CFR 64.2, Compliance Assurance Monitoring (CAM) is applicable to each pollutant-specific emission unit that meets the following criteria:

(1) has a potential to emit before controls equal to or greater than the major source threshold for the regulated pollutant involved;

(2) is subject to an emission limitation or standard for that pollutant (or a surrogate thereof); and

(3) uses a control device, as defined in 40 CFR 64.1, to comply with that emission limitation or standard.

(b) Pursuant to 40 CFR 64.2(b)(1)(i), emission limitations or standards proposed after November 15, 1990 pursuant to a NSPS or NESHAP under Section 111 or 112 of the Clean Air Act are exempt from the requirements of CAM. Therefore, an evaluation was not conducted for any emission limitations or standards proposed after November 15, 1990 pursuant to a NSPS or NESHAP under Section 111 or 112 of the Clean Air Act.

(c) Pursuant to 40 CFR 64.2(b)(1)(iii), Acid Rain requirements pursuant to Sections 404, 405, 406, 407(a), 407(b), or 410 of the Clean Air Act are exempt emission limitations or standards. Therefore, CAM was not evaluated for emission limitations or standards for $SO_2$ and $NO_X$ under the Acid Rain Program.

(d) Pursuant to 40 CFR 64.3(d), if a continuous emission monitoring system (CEMS) is required pursuant to other federal or state authority, the owner or operator shall use the CEMS to satisfy the requirements of CAM according to the criteria contained in 40 CFR 64.3(d).

Based on this evaluation, the requirements of 40 CFR Part 64, CAM, are not applicable to any of the new units as part of this modification.

**State Rule Applicability - Entire Source**

Due to this modification, state rule applicability has been reviewed as follows:

**326 IAC 2-2 (PSD) and 326 IAC 2-3 (Emission Offset)**
PSD and Emission Offset applicability is discussed under the Permit Level Determination – PSD and Emission Offset section and the Permit Level Determination - PSD Emissions Increase of this document.

**326 IAC 2-4.1 (Major Sources of Hazardous Air Pollutants (HAP))**
The provisions of 326 IAC 2-4.1 apply to any owner or operator who constructs or reconstructs a major source of hazardous air pollutants (HAP), as defined in 40 CFR 63.41, after July 27, 1997, unless the major source has been specifically regulated under or exempted from regulation under a NESHAP that was issued pursuant to Section 112(d), 112(h), or 112(j) of the Clean Air Act (CAA) and incorporated under 40 CFR 63. On and after June 29, 1998, 326 IAC 2-4.1 is intended to implement the requirements of Section 112(g)(2)(B) of the Clean Air Act (CAA).

The operation of one (1) limestone drop to storage pile, one (1) limestone storage pile, and one (1) limestone drop to truck will emit less than ten (10) tons per year for a single HAP and less than twenty-five (25) tons per year for a combination of HAPs. Therefore, 326 IAC 2-4.1 does not apply.

**326 IAC 2-7-6(5) (Annual Compliance Certification)**
The U.S. EPA Federal Register 79 FR 54978 notice does not exempt Title V Permittees from the requirements of 40 CFR 70.6(c)(5)(iv) or 326 IAC 2-7-6(5)(D), but the submittal of the Title V annual compliance certification to IDEM satisfies the requirement to submit the Title V annual compliance certifications to EPA. IDEM does not intend to revise any permits since the requirements of 40 CFR 70.6(c)(5)(iv) or 326 IAC 2-7-6(5)(D) still apply, but Permittees can note on their Title V annual compliance certifications that submission to IDEM has satisfied reporting to EPA per Federal Register 79 FR 54978. This only applies to Title V Permittees and Title V compliance certifications.

**326 IAC 5-1 (Opacity Limitations)**
This source is subject to the opacity limitations specified in 326 IAC 5-1-2(1)

**326 IAC 6-4 (Fugitive Dust Emissions Limitations)**
Pursuant to 326 IAC 6-4 (Fugitive Dust Emissions Limitations), the source shall not allow fugitive dust to escape beyond the property line or boundaries of the property, right-of-way, or easement on which the source is located, in a manner that would violate 326 IAC 6-4.

**326 IAC 6-5 (Fugitive Particulate Matter Emission Limitations)**
This source was constructed after December 13, 1985, and has potential fugitive particulate emissions of twenty-five (25) tons per year or more. Pursuant to 326 IAC 6-5 (Fugitive Particulate Matter Emission Limitations), fugitive particulate matter emissions shall be controlled according to the Fugitive Dust Control Plan that is included as Attachment A to the permit.

**326 IAC 6.5 (Particulate Matter Limitations Except Lake County)**
Pursuant to 326 IAC 6.5-1-1(a), this source (located in Warrick County) is not subject to the requirements of 326 IAC 6.5 because it is not located in one of the following counties: Clark, Dearborn, Dubois, Howard, Marion, St. Joseph, Vanderburgh, Vigo or Wayne.

**326 IAC 6.8 (Particulate Matter Limitations for Lake County)**
Pursuant to 326 IAC 6.8-1-1(a), this source (located in Warrick County) is not subject to the requirements of 326 IAC 6.8 because it is not located in Lake County.

**326 IAC 6.8 (Lake County: Fugitive Particulate Matter)**
Pursuant to 326 IAC 6.8-10-1, this source (located in Warrick County) is not subject to the requirements of 326 IAC 6.8-10 because it is not located in Lake County.

## State Rule Applicability – Individual Facilities

Due to this modification, state rule applicability has been reviewed as follows:

*Limestone Storage Pile*

**326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes)**
Pursuant to 326 IAC 6-3-1(b)(14), the limestone storage pile is not subject to the requirements of 326 IAC 6-3, since it is a manufacturing process with potential emissions less than five hundred fifty-one thousandths (0.551) pound per hour.

*Limestone Drop to Storage Pile*

**326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes)**
Pursuant to 326 IAC 6-3-1(b)(14), the limestone drop to storage pile is not subject to the requirements of 326 IAC 6-3, since it is a manufacturing process with potential emissions less than five hundred fifty-one thousandths (0.551) pound per hour.

*Limestone Drop to Truck*

**326 IAC 6-3-2 (Particulate Emission Limitations for Manufacturing Processes)**
Pursuant to 326 IAC 6-3-1(b)(14), the limestone drop to truck is not subject to the requirements of 326 IAC 6-3, since it is a manufacturing process with potential emissions less than five hundred fifty-one thousandths (0.551) pound per hour.

## Compliance Determination and Monitoring Requirements

Permits issued under 326 IAC 2-7 are required to assure that sources can demonstrate compliance with all applicable state and federal rules on a continuous basis. All state and federal rules contain compliance provisions; however, these provisions do not always fulfill the requirement for a continuous demonstration. When this occurs, IDEM, OAQ, in conjunction with the source, must develop specific conditions to satisfy 326 IAC 2-7-5. As a result, Compliance Determination Requirements are included in the permit. The Compliance Determination Requirements in Section D of the permit are those conditions that are found directly within state and federal rules and the violation of which serves as grounds for enforcement action.

If the Compliance Determination Requirements are not sufficient to demonstrate continuous compliance, they will be supplemented with Compliance Monitoring Requirements, also in Section D of the permit. Unlike Compliance Determination Requirements, failure to meet Compliance Monitoring conditions would serve as a trigger for corrective actions and not grounds for enforcement action. However, a violation in relation to a compliance monitoring condition will arise through a source's failure to take the appropriate corrective actions within a specific time period.

There are no new or modified compliance requirements included with this modification.

**Proposed Changes**

As part of this permit approval, the permit may contain new or different permit conditions and some conditions from previously issued permits/approvals may have been corrected, changed, or removed. These corrections, changes, and removals may include Title I changes.

The following changes listed below are due to the proposed modification. Deleted language appears as ~~strikethrough~~ text and new language appears as **bold** text (these changes may include Title I changes):

(1) Section A.2(c) of the permit has been modified to include the new emission units description.

A.2 Emission Units and Pollution Control Equipment Summary [326 IAC 2-7-4(c)(3)][326 IAC 2-7-5(14)]

This stationary source consists of the following emission units and pollution control devices:

*****

(e) A limestone handling facility, identified as Unit 7, constructed in 1994, consisting of the following operations:

*****

**(16) One (1) limestone drop to storage pile, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.**

**(17) One (1) limestone storage pile, approved in 2025 for construction, covering an area of two (2) acres.**

**(18) One (1) limestone drop to truck, approved in 2025 for construction, with a maximum capacity of 11.42 tons per hour, using no controls, and exhausting outdoors.**

**Additional Changes**

IDEM, OAQ made additional changes to the permit as described below in order to update the language to match the most current version of the applicable rule, to eliminate redundancy within the permit, and to provide clarification regarding the requirements of these conditions.

IDEM, OAQ has made model updates to standard permit language in the Sections B, C, D, E, and associated reporting forms of the permit to help clarify the intent of these requirements.

B.9 Annual Compliance Certification [326 IAC 2-7-6(5)]

*****

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251

*****

B.10 Preventive Maintenance Plan [326 IAC 2-7-5(12)][326 IAC 1-6-3]

*****

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Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

B.11 Emergency Provisions [326 IAC 2-7-16]

*****

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Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

B.16 Permit Renewal [326 IAC 2-7-3][326 IAC 2-7-4][326 IAC 2-7-8(e)]

*****

Indiana Department of Environmental Management
Permit Administration and Support Section, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

B.17 Permit Amendment or Modification [326 IAC 2-7-11][326 IAC 2-7-12][40 CFR 72]

*****

Indiana Department of Environmental Management
Permit Administration and Support Section, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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*****

B.19 Operational Flexibility [326 IAC 2-7-20][326 IAC 2-7-10.5]

*****

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Permit Administration and Support Section, Office of Air Quality
**Indiana Government Center North**
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*****

B.22 Transfer of Ownership or Operational Control [326 IAC 2-7-11]

*****

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Permit Administration and Support Section, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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*****

C.8 Asbestos Abatement Projects [326 IAC 14-10][326 IAC 18][40 CFR 61, Subpart M]

*****

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*****

C.9 Performance Testing [326 IAC 3-6]

*****

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100 North Senate Avenue, **Room 13W**
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*****

C.11 Compliance Monitoring [326 IAC 2-7-5(3)][326 IAC 2-7-6(1)][40 CFR 64][326 IAC 3-8]

*****

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

C.17 Emission Statement [326 IAC 2-7-5(3)(C)(iii)][326 IAC 2-7-5(7)][326 IAC 2-7-19(c)][326 IAC 2-6]

*****

Indiana Department of Environmental Management
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*****

C.19 General Reporting Requirements [326 IAC 2-7-5(3)(C)][326 IAC 2-1.1-11][326 IAC 2-2][326 IAC 2-3][40 CFR 64][326 IAC 3-8]

*****

(b) The address for report submittal is:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251

*****

(f) The report for project at an existing emissions unit shall be submitted no later than sixty (60) days after the end of the year and contain the following:

*****

Reports required in this part shall be submitted to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251

*****

E.1.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

*****

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251

*****

E.2.1 General Provisions Relating to New Source Performance Standards [326 IAC 12-1][40 CFR Part 60, Subpart A]

*****

(b) Pursuant to 40 CFR 60.4, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

E.3.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

*****

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

E.4.1 General Provisions Relating to National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63 [326 IAC 20-1][40 CFR Part 63, Subpart A]

*****

(b) Pursuant to 40 CFR 63.10, the Permittee shall submit all required notifications and reports to:

Indiana Department of Environmental Management
Compliance and Enforcement Branch, Office of Air Quality
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
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Indianapolis, Indiana 46204-2251

*****

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY
COMPLIANCE AND ENFORCEMENT BRANCH
**Indiana Government Center North**
100 North Senate Avenue, **Room 13W**
~~MC 61-53 IGCN 1003~~
Indianapolis, Indiana 46204-2251
Phone: (317) 233-0178
Fax: (317) 233-6865

## Conclusion and Recommendation

Unless otherwise stated, information used in this review was derived from the application and additional information submitted by the applicant. An application for the purposes of this review was received on April 3, 2025.

The construction of this proposed modification shall be subject to the conditions of the attached proposed Part 70 Minor Source Modification No. 173-48924-00001. The operation of this proposed modification shall be subject to the conditions of the attached proposed Minor Permit Modification No. 173-48980-00001.

The staff recommends to the Commissioner that the Part 70 Minor Source Modification and Minor Permit Modification be approved.

## IDEM Contact

(a) If you have any questions regarding this permit, please contact Hachem Ismaili Alaoui, Indiana Department Environmental Management, Office of Air Quality, Permits Branch, Indiana Government Center North, 100 North Senate Avenue, Room 13W, Indianapolis, Indiana 46204-2251, or by telephone at (317) 232-2827 or (800) 451-6027, and ask for Hachem Ismaili Alaoui or (317) 232-2827.

(b) A copy of the findings is available on the Internet at: http://www.in.gov/ai/appfiles/idem-caats/

(c) For additional information about air permits and how the public and interested parties can participate, refer to the IDEM Air Permits page on the Internet at: https://www.in.gov/idem/airpermit/public-participation/; and the Citizens' Guide to IDEM on the Internet at: https://www.in.gov/idem/resources/citizens-guide-to-idem/.

**Appendix A: Emissions Calculations**
**PTE Summary for Entire Source**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

| Uncontrolled PTE | | | | | | | |
|---|---|---|---|---|---|---|---|
| | PM | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | NOx | VOC | CO |
| Boiler Unit 2 (worst case fuel) | 28,737 | 6,609 | 1,724 | 27,300 | 2,258 | 25 | 379 |
| Boiler Unit 3 (worst case fuel) | 75,925 | 17,463 | 4,556 | 72,129 | 5,966 | 66 | 1,002 |
| Unit 5F - Coal Handling | 21 | 21 | 21 | - | - | - | - |
| Unit 6 - Fly Ash | 268 | 268 | 268 | - | - | - | - |
| Unit 7 - Limestone Handling | 293 | 293 | 293 | - | - | - | - |
| Unit 7 - Limestone Drop & Storage | 1.79 | 0.85 | 0.41 | - | - | - | - |
| Unit 8 - Gypsum Handling | 257 | 257 | 257 | - | - | - | - |
| FGD System | 0.0 | 0.0 | 0.0 | - | - | - | - |
| Small NG Combustion Units | 0.01 | 0.04 | 0.04 | 2.83E-03 | 0.47 | 0.03 | 0.40 |
| Kerosene Combustion Units | 0.02 | 0.01 | 0.01 | 0.58 | 0.16 | 2.76E-03 | 0.04 |
| Propane Combustion Units | 0.00 | 0.01 | 0.01 | 1.20E-03 | 0.16 | 0.01 | 0.09 |
| Paved Roads | 38.49 | 7.70 | 1.89 | - | - | - | - |
| Unpaved Roads | 7.60 | 2.03 | 0.20 | - | - | - | - |
| **Total** | **105,549** | **24,922** | **7,122** | **99,429** | **8,223** | **90** | **1,382** |

| Limited and Controlled PTE | | | | | | | |
|---|---|---|---|---|---|---|---|
| | PM | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | NOx | VOC | CO |
| Boiler Unit 2 (Notes 1, 3, 5, 6 and 7) | 136 | 181 | 131 | 1,086 | 2,258 | 25 | 379 |
| Boiler Unit 3 (Notes 2, 5, 8 and 9) | 179 | 406 | 334 | 3,606 | 1,193 | 66 | 1,002 |
| Unit 5F - Coal Handling | 0.17 | 0.17 | 0.17 | - | - | - | - |
| Unit 6 - Fly Ash | 2.66 | 2.66 | 2.66 | - | - | - | - |
| Unit 7 - Limestone Handling | 2.93 | 2.93 | 2.93 | - | - | - | - |
| Unit 7 - Limestone Drop & Storage | 1.79 | 0.85 | 0.41 | - | - | - | - |
| Unit 8 - Gypsum Handling | 2.57 | 2.57 | 2.57 | - | - | - | - |
| FGD System | 0.0 | 0.0 | 0.0 | - | - | - | - |
| Small NG Combustion Units | 0.01 | 0.04 | 0.04 | 2.83E-03 | 0.47 | 0.03 | 0.40 |
| Kerosene Combustion Units | 0.02 | 0.01 | 0.01 | 0.58 | 0.16 | 2.76E-03 | 0.04 |
| Propane Combustion Units | 0.00 | 0.01 | 0.01 | 1.20E-03 | 0.16 | 0.01 | 0.09 |
| Paved Roads (Note 4) | 3.85 | 0.77 | 0.19 | - | - | - | - |
| Unpaved Roads (Note 4) | 0.76 | 0.20 | 0.020 | - | - | - | - |
| **Total** | **329.72** | **596.87** | **474.07** | **4,693.03** | **3,451.79** | **90.50** | **1,382.07** |

**Note 1:** For Unit 2: SO2 is limited by Consent Decree IP99-1692-C-M/F.

**Note 2:** For Unit 3: PM, SO2 and NOx are limited by Consent Decree IP99-1692-C-M/F. For PM: emission rate = 0.015 lb/MMBtu per Consent Decree.

**Note 3:** For Unit 2: Pursuant to NESHAP UUUUU, limited PM = 0.03 lb/MMBtu. (0.03 lb/MMBtu) x (1,031 MMBtu/hr) x (1 ton/2,000 lb) x (8,760 hrs/yr) = 136 tons/yr

**Note 4:** Controlled PM, PM10, and PM2.5 according to fugitive dust plan.

**Note 5:** For Unit 2 and Unit 3; limited HCl: Pursuant to NESHAP UUUUU: HCl E.F. = (0.002 lb/MMBtu)

**Note 6:** 10 micron fraction for filterable PM10 is 67% for ESP exit per Table 1.1-6, AP-42 (0.67 x 0.03 = 0.02 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM10 is 0.04 lb/MMBtu. (0.04 lb/MMBtu) x (1031 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 180.6 tons/yr.

**Note 7:** 2.5 micron fraction for filterable PM2.5 is 29% for ESP exit per Table 1.1-6, AP-42 (0.29 x 0.03 = 0.009 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM2.5 is 0.029 lb/MMBtu. (0.029 lb/MMBtu) x (1031 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 130.9 tons/yr.

**Note 8:** 10 micron fraction for filterable PM10 is 92% for Fabric Filter exit per Table 1.1-6, AP-42 (0.92 x 0.015 = 0.014 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM10 is 0.034 lb/MMBtu. (0.034 lb/MMBtu) x (2724 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 405.65 tons/yr.

**Note 9:** 2.5 micron fraction for filterable PM2.5 is 53% for Fabric Filter exit per AP-42 (0.53 x 0.015 = 0.008 lb/MMBtu). The condensable fraction is 0.02 lb/MMBtu per Table 1.1-5, AP-42. Total PM2.5 is 0.028 lb/MMBtu. (0.028 lb/MMBtu) x (2724 MMBtu/hr) x (1 ton/2000 lb) x (8760 hrs/yr) = 334.07 tons/yr.

**Appendix A Emissions Calculations**
**HAP Emissions Summary**

**Company Name** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification** 173-48924-00001
**Minor Permit Modification** 173-48980-00001
**Reviewer** Hachem Ismaili Alaoui

***HAP Emissions -Uncontrolled***

| Equipment Description | HAPs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HCl | HF | Benzene | Cyanide | PCDD/ PCDF | Selenium | Cadmium | Chromium | Manganese | Nickel | Beryllium | Arsenic | Lead | Hexane | Other HAPs | Total HAPs |
| Boiler 2 | 246.32 | 30.79 | 0 27 | 0 51 | 5 01E-05 | 2.67E-01 | 1 05E-02 | 5 34E-02 | 1.01E-01 | 5.75E-02 | 4.31E-03 | 8.42E-02 | 8.62E-02 | 7.95 | 1 99 | 288.48 |
| Boiler 3 | 650.79 | 81 35 | 0.71 | 1 36 | 1.32E-04 | 7.05E-01 | 2.77E-02 | 1.41E-01 | 2.66E-01 | 1.52E-01 | 1.14E-02 | 2 22E-01 | 2.28E-01 | 21.00 | 5 25 | 762.19 |
| Small NG combustion units | - | - | 9 92E-06 | - | - | | 5 20E-06 | 6 61E-06 | 1.79E-06 | 9.92E-06 | - | - | 2.36E-06 | - | 8.88E-03 | 0 01 |
| Kerosene combustion heaters | - | - | - | - | - | 1.64E-05 | 3 29E-06 | 3 29E-06 | 6.57E-06 | 3.29E-06 | 3.29E-06 | 4 38E-06 | 9.86E-06 | - | 3.29E-06 | 5 37E-05 |
| **Single HAP Totals** | **897.10** | 112.14 | 0 97 | 1 87 | 1 82E-04 | 0.97 | 3 81E-02 | 0.19 | 0.37 | 0.21 | 1.57E-02 | 0 31 | 0.31 | 28.95 | 7 24 | **1050.69** |
| | | | | | | | | | | | | | | **Single Highest HAP** | | **897.10** **HCl** |

***HAP Emissions - Limited/Controlled***

| Equipment Description | HAPs | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HCl | HF | Benzene | Cyanide | PCDD/ PCDF | Selenium | Cadmium | Chromium | Manganese | Nickel | Beryllium | Arsenic | Lead | Hexane | Other HAPs | **Total HAPs** |
| Boiler 2 | 9 03 | 3.69 | 0.27 | 5.15E-01 | 4.97E-05 | 2.26E-02 | 1 35E-02 | 1 26E-02 | 2.21E-02 | 1.58E-02 | 9.03E-04 | 4 97E-03 | 5.42E-03 | 7.95 | 1 99 | 23.54 |
| Boiler 3 | 23.86 | 9.76 | 0.71 | 1 36 | 1.31E-04 | 5.97E-02 | 3 58E-02 | 3 34E-02 | 5.85E-02 | 4.18E-02 | 2.39E-03 | 1 31E-02 | 1.43E-02 | 21.00 | 5 25 | 62.19 |
| Small NG combustion units | - | - | 9 92E-06 | - | - | - | 5.20E-06 | 6 61E-06 | 1.79E-06 | 9.92E-06 | - | - | 2 36E-06 | - | 8.88E-03 | 0 01 |
| Kerosene combustion heaters | - | - | - | - | - | 1.64E-05 | 3 29E-06 | 3 29E-06 | 6.57E-06 | 3.29E-06 | - | - | 9.86E-06 | - | 3.29E-06 | 4 60E-05 |
| **Single HAP Totals** | **32.89** | 13.45 | 0 97 | 1 87 | 1 81E-04 | 0.08 | 4 93E-02 | 0 05 | 0.08 | 0.06 | 3.29E-03 | 0 02 | 0.02 | 28.95 | 7 24 | **85.74** **Total HAPs** |
| | | | | | | | | | | | | | | **Single Highest HAP** | | **32.89** **HCl** |

**Appendix A Emissions Calculations**
**Modification Summary**

**Company Name** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification** 173-48924-00001
**Minor Permit Modification** 173-48980-00001
**Reviewer** Hachem Ismaili Alaoui

| PTE (tons/yr) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Emission Unit** | **PM** | **PM10** | **PM2.5** | **SO2** | **NOx** | **VOC** | **CO** | **Total HAP** | **Single HAP** |
| Limestone Storage Pile | 1.49 | 0.74 | 0.30 | -- | -- | -- | -- | -- | -- |
| Limestone Drop to Storage Pile | 0.15 | 0 06 | 0.06 | -- | -- | -- | -- | -- | -- |
| Limestone Drop to Truck | 0.15 | 0 06 | 0.06 | -- | -- | -- | -- | -- | -- |
| Paved Roads | 3 59 | 0.72 | 0.18 | -- | -- | -- | -- | -- | -- |
| Unpaved Roads | 6 80 | 1.81 | 0.18 | -- | -- | -- | -- | -- | -- |
| **Total** | 12.18 | 3.38 | 0.76 | 0.00 | 0.00 | 0 00 | 0.00 | 0.00 | 0 00 |

**Appendix A Emissions Calculations**
**ATP Test**

**Company Name** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification** 173-48924-00001
**Minor Permit Modification** 173-48980-00001
**Reviewer** Hachem Ismaili Alaoui

| New Emissions Units (ton/yr) | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Process/Emission Unit** | **PM** | **$PM_{10}$** | **$PM_{2.5}$** | **$SO_2$** | **$NO_X$** | **VOC** | **CO** |
| Limestone Storage Pile | 1.49 | 0.74 | 0.30 | -- | -- | -- | -- |
| Limestone Drop to Storage Pile | 0.15 | 0.06 | 0.06 | -- | -- | -- | -- |
| Limestone Drop to Truck | 0.15 | 0.06 | 0.06 | -- | -- | -- | -- |
| Paved Roads | 3.59 | 0.72 | 0.18 | -- | -- | -- | -- |
| Unpaved Roads | 6.80 | 1.81 | 0.18 | -- | -- | -- | -- |
| **Project Emissions Increase** | **12.18** | **3.38** | **0.76** | **0.00** | **0.00** | **0.00** | **0.00** |
| Significant Levels | 25 | 15 | 10 | 40 | 40 | 40 | 100 |

**Appendix A: Emissions Calculations**
**Coal / Natural Gas Fired Boiler, Identified as Unit 2, Constructed in 1963;**
**With Maximum Heat Input Capacity of 1,031 MMBtu/hr**
**Uncontrolled/Controlled PTE**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173 48924 00001
**Minor Permit Modification:** 173 48980 00001
**Reviewer:** Hachem Ismaili Alaoui

| Heat Input Capacity | Coal Heating Value | Potential Coal Throughput | Potential Throughput Gas (HIC*8.76) | Control Efficiency ESP | Control Efficiency Scrubber | Sulfur Content % | Ash Content % |
|---|---|---|---|---|---|---|---|
| MMBtu/hr | Btu/lb | ton/yr | MMCF/yr | | | 3.5 | 14 |
| 1,031 | 11,000 | 410,525 | 9031.6 | 99.2% | 95% | | |

| Uncontrolled/Controlled PTE | | | | | | | |
|---|---|---|---|---|---|---|---|
| **For Coal Combustion** | **PM** | **$PM_{10}$** | **$PM_{2.5}$** | **$SO_2$** | **NOx** | **VOC** | **CO** |
| Emission Factor in lb/ton | 140.00 *(10A)* | 32.20 *(2.3A)* | 8.40 *(0.6A)* | 133.0 *(38S)* | 11.0 | 0.06 | 0.5 |
| Uncontrolled Potential to Em t (ton/yr) | 28,737 | 6,609 | 1,724 | 27,300 | 2,258 | 12 | 103 |
| Controlled Potential to Emit (ton/yr) | 230 | 154 | 122 | 1,365 | 2,258 | 12 | 103 |
| | | | | | | | |
| For Natural Gas Combustion | PM | $PM_{10}$ | $PM_{2.5}$ | $SO_2$ | NOx* | VOC | CO |
| Emission Factor in lb/MMCF | 1.9 | 7.6 | 7.6 | 0.6 | 100.0 | 5.5 | 84.0 |
| Uncontrolled Potential to Em t (ton/yr) | 8.6 | 34.3 | 34.3 | 2.7 | 451.6 | 24.8 | 379.3 |
| Controlled Potential to Emit (ton/yr) | 0.07 | 0.27 | 0.27 | 0.14 | 451.6 | 24.8 | 379.3 |

**Methodology**

*NG Fired Emission Factors for NOx Uncontrolled 100, Low NOx Burner 50, Low NOx Burners/Flue gas recirculation 32
Coal Emission Factors are from AP 42, Chapter 1.1, Tables 1.1-3, 1.1-4.
Potential Throughput (ton/yr) Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 10^6 Btu/MMBtu / Heating Value (Btu/lb) / 2000 lb/ton
Potential Throughput (MMCF/yr) Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Emission (ton/yr) Throughput x Emission Factor / 2,000 b/ton

**Hazardous Air Pollutants (HAPs)**

| Uncontrolled/Unlimited HAPs | | | | | |
|---|---|---|---|---|---|
| | HCl | HF | Benzene | Cyanide | PCDD/ PCDF |
| Emission Factor in lb/ton of coal | 1.2 | 0.15 | 0.0013 | 0.0025 | 2.44E-07 |
| Potential to Em t in tons/yr | 246 | 31 | 0.27 | 0.51 | 5.01E-05 |

| Uncontrolled/Unlimited HAPs Metals | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Selenium | Cadmium | Chromium | Manganese | Nickel | Bery lium | Arsenic | Lead |
| Emission Factor in lb/ton of coal | 1.3E-03 | 5.1E-05 | 2.6E-04 | 4.9E-04 | 2.8E-04 | 2.10E-05 | 4.10E-04 | 4.20E-04 |
| Potential Emission in tons/yr | 2.7E-01 | 1.0E-02 | 5.3E-02 | 1.0E-01 | 5.7E-02 | 4.3E-03 | 8.4E-02 | 8.6E-02 |

Note that HAP emissions from natural gas combustion are negligible.

| **Total HAPs (ton/yr) :** | **279** |
|---|---|

| Limited HAPs (Pursuant to NESHAP, Subpart UUUUU, Table 2) | | | | | |
|---|---|---|---|---|---|
| | HCl (Note 1) | HF ** | Benzene ** | Cyanide ** | PCDD/ PCDF ** |
| Emission Factor in lb/MMBtu of coal | 0.002 | 8.18E-04 | 5.91E-05 | 1.14E-04 | 1.10E-08 |
| Potential to Em t in tons/yr | 9.03 | 3.69E+00 | 2.67E-01 | 5.15E-01 | 4.97E-05 |

| Limited HAPs Metals (Pursuant to NESHAP, Subpart UUUUU, Table 2) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Selenium *** | Cadmium *** | Chromium *** | Manganese *** | Nickel *** | Beryllium *** | Arsenic *** | Lead *** |
| Emission Factor in lb/MMBtu of coal | 5.0E-06 | 3.0E-06 | 2.8E-06 | 4.9E-06 | 3.5E-06 | 2.00E-07 | 1.10E-06 | 1.20E-06 |
| Potential Emission in tons/yr | 0.02 | 0.014 | 0.013 | 0.022 | 0.016 | 0.001 | 0.005 | 0.005 |

| **Total HAPs (Including Additional HAPs (page 3); (ton/yr) :** | **24** |
|---|---|

** The original EFs from AP-42 for Benzene, Cyanide, and PCDD/PCDF were converted from lb/ton of coal to lb/MMBtu of coal which is the unit used for EFs in Table 2 of NESHAP, Subpart UUUUU. (e.g. (0.0013 lb/ton) * ((heat input capacity (hr/1031 MMBtu)) * (yr/8760 hr) * (410525 tons/yr) 5.91E-05 b/MMBtu) Benzene EF.

*** The original EFs from AP-42 were replaced with the EFs from Table 2 of NESHAP, Subpart UUUUU when the Table 2 EFs were more stringent than the AP-42 EFs. The EFs from Table 2 were converted from lb/Tbtu to lb/MMBtu. (e.g. (5 lb/Tbtu) * (1 Tbtu/1,000,000,000,000 Btu) * (1,000,000 Btu/ 1 MMBtu) 5.0E-06 lb/MMBtu)

Note 1 Limited HCl EF Pursuant to NESHAP UUUUU, Table 2 E.F 0.002 lb/MMBtu; (e.g. (0.002 lb/MMBtu) x (1,031 MMBtu/hr) x (1 ton/2,000 lb) x (8,760 hrs/yr) 9.03 tons/yr)

**Appendix A: Emissions Calculations**
**Coal Burning - Additional HAP Emissions from Boiler Unit 2**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

**Boiler Emission Unit 2**

| | |
|---|---|
| **Total Maximum Heat Input Capacity** | **1,031** |
| **Coal Heating Value (Btu/lb)** | **11,000** |
| **Potential Coal Throughput (tons/yr)** | **410,525** |

| Pollutant | Emission Factor (lbs/MMBtu of Coal) | PTE of HAP (tons/year) |
|---|---|---|
| Antimony | 8.18E-07 | 0.004 |
| Cobalt | 4.55E-06 | 0.021 |
| Mercury | 1.2E-06 | 0.005 |
| Acetaldehyde | 2.59E-05 | 0.117 |
| Acetophenone | 6.82E-07 | 0.003 |
| Acrolein | 1.32E-05 | 0.060 |
| Benzyl Chloride | 3.18E-05 | 0.144 |
| DEHP | 3.32E-06 | 0.015 |
| Bromoform | 1.77E-06 | 0.008 |
| Carbon Disulfide | 5.91E-06 | 0.027 |
| 2-Chloroacetophenone | 3.18E-07 | 0.001 |
| Chlorobenzene | 1.00E-06 | 0.005 |
| Chloroform | 2.68E-06 | 0.012 |
| Cumene | 2.41E-07 | 0.001 |
| Dichlorobenzene | 1.18E-06 | 0.005 |
| 2,4-Dinitrotoluene | 1.14E-04 | 0.515 |
| Dimethyl Sulfate | 2.18E-06 | 0.010 |
| Ethyl Benzene | 4.27E-06 | 0.019 |
| Ethyl Chloride | 1.91E-06 | 0.009 |
| Ethylene Dichloride | 1.82E-06 | 0.008 |
| Ethylene Dibromide | 5.45E-08 | 0.0002 |
| Formaldehyde | 1.09E-05 | 0.049 |
| Hexane | 1.76E-03 | 7.95 |
| Isophorone | 2.64E-05 | 0.119 |
| MEK | 1.77E-05 | 0.080 |
| Methyl Bromide | 7.27E-06 | 0.033 |
| Methyl Chloride | 2.41E-05 | 0.109 |
| Methyl Hydrazine | 7.73E-06 | 0.035 |
| Methyl Methacrylate | 9.09E-07 | 0.004 |
| Methyl Tert Butyl Ether | 1.59E-06 | 0.007 |
| Methylene Chloride | 1.32E-05 | 0.060 |
| Naphthalene | 5.98E-07 | 0.003 |
| POM | 7.55E-05 | 0.341 |
| Phenol | 7.27E-07 | 0.003 |
| Propionaldehyde | 1.73E-05 | 0.078 |
| Tetrachloroethylene | 1.95E-06 | 0.009 |
| Toluene | 1.09E-05 | 0.049 |
| 1,1,1-Trichloroethane | 9.09E-07 | 0.004 |
| Styrene | 1.14E-06 | 0.005 |
| Xylenes | 1.68E-06 | 0.008 |
| Vinyl Acetate | 3.45E-07 | 0.002 |
| **Total** | | **9.933** |

Note: Emission factors from, AP-42, Tables 1.1-13, 1.1-14, 1.1-15, and 1.1-18 for Coal Combustion (09/98).
The EFs from AP-42 were converted from lb/ton of coal to lb/MMBtu of coal.

**Methodology**
PTE of HAP (tons/year) = Total Maximum Heat Input (MMBtu/hr) * Emission Factor (lb/MMBtu) * 8,760 hrs/yr * 1 ton/2,000 lb

**Appendix A: Emissions Calculations**
**Coal / Natural Gas Fired Boiler, Identified as Unit 3, Constructed in 1970;**
**With Maximum Heat Input Capacity of 2,689 MMBtu/hr**
**Uncontrolled/Controlled PTE**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173 48924 00001
**Minor Permit Modification:** 173 48980 00001
**Reviewer:** Hachem Ismaili Alaoui

| Heat Input Capacity | Coal Heating Value | Potential Coal Throughput | Potential Throughput Gas (HCl@ 7%) | Control Efficiency FF | Control Efficiency Scrubber | Control Efficiency SCR | Sulfur Content % | Ash Content % |
|---|---|---|---|---|---|---|---|---|
| MMBtu/hr | Btu/lb | ton/yr | MMCF/yr | | | | | |
| 2,724 | 11,000 | 1,084,647 | 23862.2 | 99.81% | 95% | 80% | 3.5 | 14 |

| Uncontrolled/Controlled PTE | | | | | | | |
|---|---|---|---|---|---|---|---|
| For Coal Combustion | **PM** | **$PM_{10}$** | **$PM_{2.5}$** | **$SO_2$** | **NOx** | **VOC** | **CO** |
| Emission Factor in lb/ton | 140.00 *(10A)* | 32.20 *(2.3A)* | 8.40 *(0.6A)* | 133.0 *(38S)* | 11.0 | 0.06 | 0.5 |
| Uncontrolled Potential to Emit (ton/yr) | 75,925 | 17,463 | 4,556 | 72,129 | 5,966 | 33 | 271 |
| Controlled Potential to Emit (ton/yr) | 144 | 133 | 76 | 3,606 | 1,193 | 33 | 271 |

| **For Natural Gas Combustion** | **PM** | **$PM_{10}$** | **$PM_{2.5}$** | **$SO_2$** | **NOx** | **VOC** | **CO** |
|---|---|---|---|---|---|---|---|
| Emission Factor in lb/MMCF | 1.9 | 7.6 | 7.6 | 0.6 | 100.0 | 5.5 | 84.0 |
| Uncontrolled Potential to Emit (ton/yr) | 22.7 | 90.7 | 90.7 | 7.2 | 1193.1 | 65.6 | 1002.2 |
| Controlled Potential to Emit (ton/yr) | 22.7 | 90.7 | 90.7 | 7.2 | 1,193.1 | 65.6 | 1,002.2 |

**Methodology**
*NG Fired Emission Factors for NOx Uncontrolled 100, Low NOx Burner 50, Low NOx Burners/Flue gas recirculation 32
Coal Emission Factors are from AP 42, Chapter 1.1, Tables 1.1-3, 1.1-4.
Potential Throughput (ton/yr) Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 10^6 Btu/MMBtu / Heating Value (Btu/lb) / 2000 lb/ton
Potential Throughput (MMCF/yr) Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,000 MMBtu
Emission (ton/yr) Throughput x Emission Factor / 2,000 b/ton

**Hazardous Air Pollutants (HAPs)**

| Uncontrolled/Unlimited HAPs | | | | | |
|---|---|---|---|---|---|
| | HCl | HF | Benzene | Cyanide | PCDD/ PCDF |
| Emission Factor in lb/ton of coal | 1.2 | 0.15 | 0.0013 | 0.0025 | 2.44E-07 |
| Potential to Emit in tons/yr | 651 | 81 | 0.71 | 1.36 | 1.32E-04 |

| Uncontrolled/Unlimited HAPs Metals | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Selenium | Cadmium | Chromium | Manganese | Nickel | Beryl ium | Arsenic | Lead |
| Emission Factor in lb/ton of coal | 1.3E-03 | 5.1E-05 | 2.6E-04 | 4.9E-04 | 2.8E-04 | 2.10E-05 | 4.10E-04 | 4.20E-04 |
| Potential Emission in tons/yr | 7.1E-01 | 2.8E-02 | 1.4E-01 | 2.7E-01 | 1.5E-01 | 1.1E-02 | 2.2E-01 | 2.3E-01 |

Note that HAP emissions from natural gas combustion are neglig ble.

| **Total HAPs (ton/yr) :** | **736** |
|---|---|

| Limited HAPs (Pursuant to NESHAP, Subpart UUUUU, Table 2) | | | | | |
|---|---|---|---|---|---|
| | HCl (Note 1) | HF ** | Benzene ** | Cyanide ** | PCDD/ PCDF ** |
| Emission Factor in lb/MMBtu of coal | 0.002 | 8.18E-04 | 5.91E-05 | 1.14E-04 | 1.10E-08 |
| Potential to Emit in tons/yr | 23.86 | 9.76E+00 | 7.05E-01 | 1.36E+00 | 1.31E-04 |

| Limited HAPs Metals (Pursuant to NESHAP, Subpart UUUUU, Table 2) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Selenium *** | Cadmium *** | Chromium *** | Manganese *** | Nickel *** | Beryl ium *** | Arsenic *** | Lead *** |
| Emission Factor in lb/MMBtu of coal | 5.0E-06 | 3.0E-06 | 2.8E-06 | 4.9E-06 | 3.5E-06 | 2.00E-07 | 1.10E-06 | 1.20E-06 |
| Potential Emission in tons/yr | 0.06 | 0.04 | 0.03 | 0.06 | 0.04 | 2.39E-03 | 1.31E-02 | 1.43E-02 |

| **Total HAPs (ton/yr) :** | **62** |
|---|---|

** The original EFs from AP-42 for Benzene, Cyanide, and PCDD/PCDF were converted from lb/ton of coal to lb/MMBtu of coal which is the unit used for EFs in Table 2 of NESHAP, Subpart UUUUU. (e.g. (0.0013 lb/ton) * ((heat input capacity (hr/1031 MMBtu)) * (yr/8760 hr) * (410525 tons/yr) 5.91E-05 lb/MMBtu) Benzene EF.

*** The original EFs from AP-42 were replaced with the EFs from Table 2 of NESHAP, Subpart UUUUU when the Table 2 EFs were more stringent than the AP-42 EFs. The EFs from Table 2 were converted from lb/Tbtu to b/MMBtu. (e.g. (5 lb/Tbtu) * (1 Tbtu/1,000,000,000,000 Btu) * (1,000,000 Btu/ 1 MMBtu) 5.0E-06 b/MMBtu)

Note 1 Limited HCl EF Pursuant to NESHAP UUUUU, Table 2 E.F 0.002 lb/MMBtu; (e.g. (0.002 b/MMBtu) x (2,689 MMBtu/hr) x (1 ton/2,000 lb) x (8,760 hrs/yr) 23.56 tons/yr)

**Appendix A: Emissions Calculations**
**Coal Burning - Additional HAP Emissions from Boiler Unit 3**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

**Boiler Emission Unit 3**

| | |
|---|---|
| **Total Maximum Heat Input Capacity** | **2,724** |
| **Coal Heating Value (Btu/lb)** | **11,000** |
| **Potential Coal Throughput (tons/yr)** | **1,084,647** |

| Pollutant | Emission Factor (lbs/MMBtu of Coal) | PTE of HAP (tons/year) |
|---|---|---|
| Antimony | 8.18E-07 | 0.010 |
| Cobalt | 4.55E-06 | 0.054 |
| Mercury | 1.2E-06 | 0.014 |
| Acetaldehyde | 2.59E-05 | 0.309 |
| Acetophenone | 6.82E-07 | 0.008 |
| Acrolein | 1.32E-05 | 0.157 |
| Benzyl Chloride | 3.18E-05 | 0.379 |
| DEHP | 3.32E-06 | 0.040 |
| Bromoform | 1.77E-06 | 0.021 |
| Carbon Disulfide | 5.91E-06 | 0.071 |
| 2-Chloroacetophenone | 3.18E-07 | 0.004 |
| Chlorobenzene | 1.00E-06 | 0.012 |
| Chloroform | 2.68E-06 | 0.032 |
| Cumene | 2.41E-07 | 0.003 |
| Dichlorobenzene | 1.18E-06 | 0.014 |
| 2,4-Dinitrotoluene | 1.14E-04 | 1.360 |
| Dimethyl Sulfate | 2.18E-06 | 0.026 |
| Ethyl Benzene | 4.27E-06 | 0.051 |
| Ethyl Chloride | 1.91E-06 | 0.023 |
| Ethylene Dichloride | 1.82E-06 | 0.022 |
| Ethylene Dibromide | 5.45E-08 | 0.0007 |
| Formaldehyde | 1.09E-05 | 0.130 |
| Hexane | 1.76E-03 | 21.00 |
| Isophorone | 2.64E-05 | 0.315 |
| MEK | 1.77E-05 | 0.211 |
| Methyl Bromide | 7.27E-06 | 0.087 |
| Methyl Chloride | 2.41E-05 | 0.288 |
| Methyl Hydrazine | 7.73E-06 | 0.092 |
| Methyl Methacrylate | 9.09E-07 | 0.011 |
| Methyl Tert Butyl Ether | 1.59E-06 | 0.019 |
| Methylene Chloride | 1.32E-05 | 0.157 |
| Naphthalene | 5.98E-07 | 0.007 |
| POM | 7.55E-05 | 0.901 |
| Phenol | 7.27E-07 | 0.009 |
| Propionaldehyde | 1.73E-05 | 0.206 |
| Tetrachloroethylene | 1.95E-06 | 0.023 |
| Toluene | 1.09E-05 | 0.130 |
| 1,1,1-Trichloroethane | 9.09E-07 | 0.011 |
| Styrene | 1.14E-06 | 0.014 |
| Xylenes | 1.68E-06 | 0.020 |
| Vinyl Acetate | 3.45E-07 | 0.004 |
| **Total** | | **26.244** |

Note: Emission factors from, AP-42, Tables 1.1-13, 1.1-14, 1.1-15, and 1.1-18 for Coal Combustion (09/98).
The EFs from AP-42 were converted from lb/ton of coal to lb/MMBtu of coal.

**Methodology**
PTE of HAP (tons/year) = Total Maximum Heat Input (MMBtu/hr) * Emission Factor (lb/MMBtu) * 8,760 hrs/yr * 1 ton/2,000 lb

**Appendix A Emissions Calculations**
**On-Site Material Handling PTE for Coal and Fly Ash**

**Company Name Southern Indiana Gas and Electric Company (SIGECO) F.B. CulleyStation**
**Address City IN Zip 3711 Darlington Road, Newburgh, Indiana 47630**
**Minor Source Modification 173-48924-00001**
**Minor Permit Modification 173-48980-00001**
**Reviewer Hachem Ismaili Alaoui**

| Permit Reference | Coal | Controlled PM/PM10/PM2.5 (tons/yr) | Uncontrolled PM/PM10/PM2.5 (tons/year) | Uncontrolled PM/PM10/PM2.5 (lb/hr) |
|---|---|---|---|---|
| 1 | Floating dock unloading clamshell serving both coal and limestone unloading operations (served by S/V 6). | - | 1 953 | 0.446 |
| 2 | Truck load-out station serving both coal and limestone unloading operations (served by S/V 9). | - | 0 578 | 0.132 |
| 3 | Unit 2 coal pile hopper with a maximum coal feed belt capacity of 600 tons per hour. | - | 0.158 | 0.036 |
| 4 | Unit 2 coal hopper conveyor (C1) with a maximum coal feed belt capacity of 600 tons per hour. | - | 0.158 | 0.036 |
| 5 | Unit 2 coal transfer house conveyor drop with enclosed transfer drop. | - | - | - |
| 6 | Unit 2 coal transfer house conveyor (#4) with a maximum coal feed belt capacity of 1240 tons per hour. | - | 0 326 | 0.074 |
| 7 | Unit 2 coal transfer-crusher house conveyor drop with enclosed transfer house and internal fabric filter. | - | - | - |
| 8 | Unit 2 coal transfer house conveyor with a maximum coal feed belt capacity of 1240 tons per hour. | - | 0 326 | 0.074 |
| 9 | Unit 2 powerhouse coal tripper conveyor with an enclosed powerhouse and sealed transfer points. | - | - | - |
| 10 | Unit 2 powerhouse coal tripper conveyor bunker drop with an enclosed powerhouse and sealed transfer points. | - | - | - |
| 11 | Unit 2 powerhouse coal bunkers with an enclosed powerhouse and sealed transfer points. | - | - | - |
| 12 | Units 2 and 3 coal pile of 645 000 tons. | - | 0 030 | 0.007 |
| 13 | Unit 2 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour. | - | 0.168 | 0.038 |
| 14 | Unit 2 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour. | - | 0.168 | 0.038 |
| 15 | Unit 3 coal pile hopper with a maximum coal feed belt capacity of 640 tons per hour. | - | 0.168 | 0.038 |
| 16 | Unit 3 coal pile hopper conveyor with a maximum coal feed belt capacity of 640 tons per hour. | - | 0.168 | 0.038 |
| 17 | Unit 3 coal transfer house conveyor drop with an enclosed transfer house and internal fabric filter (served by S/V 8). | - | 0.168 | 0.038 |
| 18 | Unit 3 coal transfer house conveyor with a maximum coal feed belt capacity of 640 tons per hour. | 0.168 | 16.820 | 3.840 |
| 19 | Unit 3 powerhouse coal tripper conveyor with an enclosed powerhouse and sealed transfer points. | - | - | - |
| 20 | Unit 3 powerhouse coal tripper conveyor bunker drop with an enclosed powerhouse and sealed transfer points. | - | - | - |
| 21 | Unit 3 powerhouse coal bunker with an enclosed powerhouse and sealed transfer points. | - | - | - |
| 22 | Miscellaneous enclosed coal bunker and weigh-scales with vents. | - | - | - |
| | **Total** | 0.17 | 21.19 | - |

| Fly Ash | Controlled PM/PM10/PM2.5 (tons/yr) | Uncontrolled PM/PM10/PM2.5 (tons/year) | Uncontrolled PM/PM10/PM2.5 (lb/hr) |
|---|---|---|---|
| One (1) fly ash storage silo receiving fly ash via a close-pipe vacuum handling system from the electrostatic precipitator hoppers of Units 2 and 3, with a maximum capacity of 1000 tons, and a maximum throughput of 179.9 tons per hour, with a fabric filter separator exhausting to S/V 16 and a bin filter exhausting to S/V 17. | 2.661 | 266.1 | 60.753 |
| One (1) fly ash silo truck loadout station, with a maximum capacity of 25 tons per hour (the coal trucks have a maximum capacity of 25 tons and haul ash at the rate of one truck per hour), with an enclosed telescoping discharged chute and emissions reduced by fly ash wetting and partial loading of the trucks. | - | 1.6305 | 0.372 |
| **Total** | 2.7 | 267.7 | |

**Appendix A Emissions Calculations**
**On-Site Material Handling PTE for Coal and Fly Ash**

**Company Name Southern Indiana Gas and Electric Company (SIGECO) F.B. CulleyStation**
**Address City IN Zip 3711 Darlington Road, Newburgh, Indiana 47630**
**Minor Source Modification 173-48924-00001**
**Minor Permit Modification 173-48980-00001**
**Reviewer Hachem Ismaili Alaoui**

The Limestone Handling Process (Unit 7) and the Gypsum Handling Process (Unit 8) are not subject to the requirements of 326 IAC 6-3-2, because pursuant to 326 IAC 6-3-2(c)(5), facilities subject to a more stringent 326 IAC 12 Rule are exempt from 326 IAC 6-3-2. The Limestone Handling Process (Unit 7) and the Gypsum Handling Process (Unit 8) are subject to the requirements of 40 CFR Part 60, Subpart OOO, which are more stringent than the requirements of 326 IAC 6-3-2.

| Limestone | Controlled PM/PM10/PM2.5 (tons/yr) | Uncontrolled PM/PM10/PM2.5 (tons/year) | Uncontrolled PM/PM10/PM2.5 (lb/hr) |
|---|---|---|---|
| One (1) limestone unloading floating clamshell dock with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 6. (This operation serves both coal and limestone unloading operations.) | 1.953 | 195.3 | 44 589 |
| One (1) covered conveyor, identified as Conveyor 1 (CL-1), with a maximum throughput of 550 tons per hour. | - | 0 001 | 2.28E-04 |
| One (1) limestone truck loadout to conveyor with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 9. (This operation serves both coal and limestone unloading operations.) | 0.578 | 57 8 | 13.196 |
| One (1) covered conveyor identified as Conveyor 2 (L-1) with a maximum throughput of 800 tons per hour. | - | 0 001 | 2.28E-04 |
| One (1) limestone storage building with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 10. | 0.153 | 15 3 | 3.493 |
| One (1) limestone reclaim system located inside a totally-enclosed building adjacent to the limestone storage building. | - | - | - |
| One (1) limestone storage building loadout with a maximum capacity of 750 tons/hr, an enclosed building for dust control, and exhausting indoors. | - | - | - |
| One (1) covered conveyor, identified as Conveyor 3 (L-2), with a maximum throughput of 300 tons per hour. | - | 0 001 | 2.28E-04 |
| One (1) limestone transfer house (No. 1) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 12. | - | 0 264 | 0.060 |
| One (1) covered conveyor, identified as Conveyor 4 (L-3), with a maximum throughput of 300 tons per hour. | - | 0 001 | 2.28E-04 |
| One (1) coal and limestone transfer house (serving Unit No. 3) with a maximum capacity of 750 tons per hour, a fabric filter for dust control, and exhausting to S/V 8. (This operation serves both coal and limestone transferring operations.) | 0.161 | 16.1 | 3.676 |
| One (1) covered conveyor, identified as Conveyor 5 (L-4), with a maximum throughput of 300 tons per hour. | - | 0 001 | 2.28E-04 |
| One (1) limestone transfer house (No. 2) with a maximum capacity of 750 tons per hour a fabric filter for dust control and exhausting to S/V 14. | - | 0.184 | 0.042 |
| One (1) covered conveyor, identified as Conveyor 6 (L-5), with a maximum throughput of 300 tons per hour. | - | 0 001 | 2.28E-04 |
| One (1) limestone day silo with a maximum capacity of 750 tons per hour a fabric filter for dust control and exhausting to S/V 15. | 0.083 | 8.3 | 1.895 |
| **Total** | 2.93 | 293 25 | 66.95 |

| Gypsum | Controlled PM/PM10/PM2.5 (tons/yr) | Uncontrolled PM/PM10/PM2.5 (tons/year) | Uncontrolled PM/PM10/PM2.5 (lb/hr) |
|---|---|---|---|
| One (1) gypsum filter cake conveyor drop, with a maximum capacity of 35 tons per hour, with a fabric filter for dust control, exhausting to S/V 11. | 0.396 | 39.55 | 9.030 |
| One (1) gypsum filter cake conveyor drop with a maximum capacity of 35 tons per hour with a fabric filter for dust control exhausting to S/V 13. | 0.064 | 6.35 | 1.450 |
| One (1) covered conveyor, identified as G1A, (operates only when G1B is offline) with a maximum capacity of 50 tons per hour. | - | - | - |
| One (1) covered conveyor identified as G1B (operates only when G1A is offline) with a maximum capacity of 50 tons per hour. | - | - | - |
| One (1) gypsum filter cake transfer house conveyor drop with a maximum capacity of 35 tons/hr, a fabric filter for dust control, exhausting to S/V 4. | 1.530 | 152 99 | 34 929 |
| One (1) covered conveyor, identified as G2A, (operates only when G2B is offline) with a maximum capacity of 50 tons per hour. | - | - | - |
| One (1) covered conveyor, identified as G2B (operates only when G2A is offline), with a maximum capacity of 50 tons per hour. | - | - | - |
| One (1) gypsum storage building consisting of two (2) 1000-ton gypsum storage silos and one (1) storage pile designated for truck haul-away exhausting indoors. | - | - | - |
| One (1) covered silo to barge loadout primary filter cake transfer conveyor, identified as Conveyor 4, with a maximum capacity of 400 tons per hour, with a fabric filter for dust control exhausting to S/V 7. | - | - | - |
| One (1) covered silo to truck secondary transfer conveyor, identified as Conveyor 3, with a maximum capacity of 400 tons/hour and exhausting indoors. | - | - | - |
| One (1) gypsum barge loadout conveyor drop, with a maximum capacity of 35 tons/hr, with a fabric filter for dust control and exhausting to S/V 5. | 0.291 | 29.13 | 6.651 |
| One (1) gypsum barge loadout with two (2) telescoping transfer chutes delivering filter cake gypsum to river barges with a maximum capacity of 400 tons per hour. | 0.291 | 29.13 | 6.651 |
| **Total** | 2.57 | 257.15 | |

| | | | |
|---|---|---|---|
| Two (2) wet ball mills (one operational and one full capacity spare), each receiving limestone through a separate weigh-belft feeder from the day silo of the limestone handling facility (Unit 8). Each ball mill is a closed-device (hard-piped, enclosed design), wet mill capable of handling 20 5 tons per hour of dry limestone feed. | - | - | - |
| Two (2) limestone slurry storage tanks, receiving the ball mill product (fresh limestone slurry), which is then discharged into the scrubber system. The scrubbed gas stream exits the absorber tower through the scrubber stack. | - | - | - |
| **Total** | 0 | 0 | |

**Appendix A: Emissions Calculations**
**Limestone Handling and Storage Pile**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

Particulate matter emissions result from wind erosion of storage piles when gusts of wind cause loose dust on the surface of pile to become airborne. The annual quantity of emissions is dependent on the silt content of the material stored in the pile, the moisture of the pile (predicted by the number of days per year with measurable precipitation), and the percentage of hours per year that the wind speed exceeds the threshold speed of 12 miles per hour. Emissions are calculated on a pounds per day per acre basis using the method from the EPA Document "*Control of Open Fugitive Dust Source (page 4-17)"*. Emission rates are then converted to a pounds per hour and tons per year basis for each pile based for each pile based on the estimated typical outer surface area of each pile.

***Emission Factors***

| Storage Pile | Silt Content of Aggregate (s)[1] (%) | Annual Days of Rain (p)[2] (days) | % of time the unobstructed wind speed > 12 mph (f)[3] (%) | Uncontrolled PM Emission Factor (E) (lb/day/acre) | Uncontrolled PM Emission Factor (lb/hr/ft$^2$) | Control Efficiency (%) | Controlled PM Emission Factor (lb/day/acre) | Controlled PM Emission Factor (lb/hr/ft$^2$) |
|---|---|---|---|---|---|---|---|---|
| Limestone Storage Pile | 1.6 | 125 | 33.0 | 4.07 | 3.90E-06 | 0.00% | 4.07 | 3.90E-06 |

[1] Average Silt Content from AP-42, Table 13.2.4-1
[2] Annual day of rain from AP-42, Figure 13.2.1-2
[3] Based on 2023 daily wind speed data collected at Evansville, Indiana wind section
s: Silt content of aggregate (%)
p: Number of days with greater than 0.01 inch of precipitation per year
f: % of time the unobstructed wind speed exceeds 12 mph at the mean pile height
E: PM Emission factor

$$E = 1.7\left(\frac{s}{1.5}\right)\left(\frac{365-p}{235}\right)\left(\frac{f}{15}\right)(lb/day/acre)$$

*Control of Open Fugitive Dust Sources*
EPA-450/3-88-008. September 1988, Page 4-17.

Uncontrolled PM Emission Factor (lb/hr/ft$^2$) = [Uncontrolled PM Emission Fcator (lb/day/acre) / 24 (hrs/day)] / 43559.66 (ft$^2$/acre)
Controlled PM Emission Factor (lb/day/acre) = Uncontrolled PM Emission Factor (lb/day/acre) * (1 - Control Efficieny (%))
Controlled PM Emission Factor (lb/hr/ft$^2$) = Uncontrolled PM Emission Factor (lb/hr/ft2) * (1 - Control Efficieny (%))

***Limestone Storage Pile Emissions***

| Storage Pile | Outer Surface Area of Storage Pile (acre) | Outer Surface Area of Storage Pile (ft$^2$) | Uncontrolled PM Emissions (lb/hr) | Uncontrolled PM10 Emissions (lb/hr) | Uncontrolled PM2.5 Emissions (lb/hr) | Uncontrolled PM Emissions (tons/yr) | Uncontrolled PM10 Emissions (tons/yr) | Uncontrolled PM2.5 Emissions (tons/yr) |
|---|---|---|---|---|---|---|---|---|
| Limestone Storage Pile | 2.00 | 87120.0 | 0.34 | 0.17 | 0.07 | 1.49 | 0.74 | 0.30 |

PM10 is assumed to be 50% of PM and PM2.5 is assumed to be 20% of PM. These assumptions are based on particle size multipliers for Industrial Wind Erosion from AP-42 Page 13.2.5-3. PM10 being 50% of PM (multipliers of 0.5 and 1.0) and PM2.5 being 7.5% of PM (multipliers of 0.075 and 1.0). These assumptions were approved by IDEM in permit # 40198 for Heidelberg Materials US Cement LLC

***Methodology***
Outer Surface Area of Storage Pile (ft$^2$) = Outer Surface Area of Storage Pile (acre) * (43560 ft$^2$ / 1 acre)
Uncontrolled PM Emissions (lb/hr) = Outer Surface Area of Storage Pile (ft$^2$) * Emission Factor (lb/hr/ft$^2$)
Uncontrolled PM Emissions (tons/yr) = Uncontrolled PM Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)
Uncontrolled PM10 Emissions (lb/hr) = Uncontrolled PM Emissions (lb/hr) * 50%
Uncontrolled PM10 Emissions (tons/yr) = Uncontrolled PM10 Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)
Uncontrolled PM2.5 Emissions (lb/hr) = Uncontrolled PM Emissions (lb/hr) * 20%
Uncontrolled PM2.5 Emissions (tons/yr) = Uncontrolled PM2.5 Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)

***Limestone Handling Emissions***

| Storage Pile | Maximum Throughput (tons/hr) | PM Emission Factor (lb/ton) | PM10/PM2.5 Emission Factor (lb/ton) | Uncontrolled PM Emissions (lb/hr) | Uncontrolled PM10/PM2.5 Emissions (lb/hr) | Uncontrolled PM Emissions (tons/yr) | Uncontrolled PM10/PM2.5 Emissions (tons/yr) |
|---|---|---|---|---|---|---|---|
| Limestone Drop to Storage Pile | 11.42 | 0.003 | 0.0011 | 0.03 | 0.01 | 0.15 | 0.06 |
| Limestone Drop to Truck | 11.42 | 0.003 | 0.0011 | 0.03 | 0.01 | 0.15 | 0.06 |
| | | | Total | 0.07 | 0.03 | 0.30 | 0.11 |

PM, PM10, and PM2.5 emission factors are from AP-42, Chapter 11.19.2, Table 11.19.2-2 for Crushed stone processing operations (SCC 3-05-020-06).

***Methodology***
Uncontrolled Emissions (lb/hr) = Maximum Throughput (tons/hr) * Emission Factor (lb/ton)
Uncontrolled Emissions (tons/yr) = Uncontrolled Emissions (lb/hr) * 8760 (hrs/yr) * (1 ton / 2000 lb)

**Appendix A: Emissions Calculations**
**Small NG Combustion Units**
**Natural Gas Combustion Only**
**MM BTU/HR <100**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

| Unit | Quantity | Max. Heat Input Capacity Each, (MMBtu/hr) | Total Heat Input Capacity (MMBtu/hr) |
|---|---|---|---|
| Forced Air Unit Htrs | 3 | 0.06 | 0.18 |
| Planning Office Furnaces | 4 | 0.09 | 0.36 |
| Maintenance Shop Water Htrs | 2 | 0.04 | 0.08 |
| Maintenance Shop Radiant Htrs | 3 | 0.16 | 0.48 |
| | | **TOTAL:** | **1.10** |

| Heat Input Capacity MMBtu/hr | HHV mmBtu / mmscf | Potential Throughput MMCF/yr |
|---|---|---|
| 1.10 | 1020 | 9.4 |

| | Pollutant | | | | | | |
|---|---|---|---|---|---|---|---|
| | PM* | PM10* | direct PM2.5* | SO2 | NOx | VOC | CO |
| Emission Factor in lb/MMCF | 1.9 | 7.6 | 7.6 | 0.6 | 100 **see below | 5.5 | 84 |
| Potential Emission in tons/yr | 0.01 | 0.04 | 0.04 | 0.00 | 0.47 | 0.03 | 0.40 |

*PM emission factor is filterable PM only. PM10 emission factor is filterable and condensable PM10 combined.
PM2.5 emission factor is filterable and condensable PM2.5 combined.
**Emission Factors for NOx: Uncontrolled = 100, Low NOx Burner = 50, Low NOx Burners/Flue gas recirculation = 32

**Methodology**
All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
MMCF = 1,000,000 Cubic Feet of Gas
Emission Factors are from AP 42, Chapter 1.4, Tables 1.4-1, 1.4-2, 1.4-3, SCC #1-02-006-02, 1-01-006-02, 1-03-006-02, and 1-03-006-03
Potential Throughput (MMCF) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1 MMCF/1,020 MMBtu
Emission (tons/yr) = Throughput (MMCF/yr) x Emission Factor (lb/MMCF)/2,000 lb/ton

**Hazardous Air Pollutants (HAPs)**

| | HAPs - Organics | | | | | |
|---|---|---|---|---|---|---|
| | Benzene | Dichlorobenze | Formaldehyde | Hexane | Toluene | **Total - Organics** |
| Emission Factor in lb/MMcf | 2.1E-03 | 1.2E-03 | 7.5E-02 | 1.8E+00 | 3.4E-03 | |
| Potential Emission in tons/yr | 9.9E-06 | 5.7E-06 | 3.5E-04 | 0.01 | 1.6E-05 | **0.01** |

| | HAPs - Metals | | | | | |
|---|---|---|---|---|---|---|
| | Lead | Cadmium | Chromium | Manganese | Nickel | **Total - Metals** |
| Emission Factor in lb/MMcf | 5.0E-04 | 1.1E-03 | 1.4E-03 | 3.8E-04 | 2.1E-03 | |
| Potential Emission in tons/yr | 2.4E-06 | 5.2E-06 | 6.6E-06 | 1.8E-06 | 9.9E-06 | **2.6E-05** |
| | | | | | **Total HAPs** | **0.01** |
| | | | | | **Worst HAP** | **0.01** |

Methodology is the same as above.
The five highest organic and metal HAPs emission factors are provided above.
Additional HAPs emission factors are available in AP-42, Chapter 1.4.

**Appendix A Emissions Calculations**
**Ten (10) Kerosene-Fired Portable Heaters (Direct-Fired) Each with Heat Input Capacity of 0.05 MMBtu/hr (Assumed)**
**MMBTU/HR <100**

**Company Name** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification** 173-48924-00001
**Minor Permit Modification** 173-48980-00001
**Reviewer** Hachem Ismaili Alaoui

| Unit Name/ID | Quantity | MMBtu/hr (Each) | Total MMBtu/hr |
|---|---|---|---|
| Portable Kerosene Heaters | 5 | 0.05 | 0.25 |
| **Total Heat Input Capacity (MMBtu/hr)** | | | 0.25 |

| | | |
|---|---|---|
| Heating Value | 0.135 | MMBtu/gal |
| S = Weight % Sulfur | 0 5 | % (default value) |
| Total Capacity | 0.002 | kgal/hr |

| | Pollutant | | | | | | |
|---|---|---|---|---|---|---|---|
| | PM* | PM10* | direct PM2.5* | SO2 | NOx | VOC | CO |
| Emission Factor in lb/kgal | 2.0 | 1.3 | 1.3 | 71.0 (142.0S) | 20 | 0.34 | 5.0 |
| Potential Emission in tons/yr | 0.02 | 0.01 | 0.01 | 0.58 | 0.16 | 0.00 | 0 04 |

*PM emission factor is filterable PM only (AP 42, Table 1.3-1). PM10 emission factor is filterable and condensable PM10 combined (AP 42, Table 13.-2). Assume PM10 = PM2.5.

**Methodology**
All emission factors are based on normal firing.
MMBtu = 1,000,000 Btu
Total Capacity (kgal /hr) = Total Capacity (MMBtu / hr) / Heating Value (MMBtu /gal) / (1000 gal / kgal)
Emission Factors are from AP 42, Chapter 1.3, Tables 1.3-1, 1.3-2, 1.3-3, 1.3-8, 1.3-9, 1.3-11, and 1.3-12 for distillate oil-fired boilers < 100 MMBtu/hr.
Emissions (tons / yr) = Throughput (kgal / hr) x Emission Factor (lb / kgal) x (8760 hrs / yr) / (2000 lb / ton)
Emission (tons / yr) = Throughput (MMBtu / hr) x Emission Factor (lb / MMBtu) x (8760 hrs / yr) / (2000 lb / ton)
Assume heating value of Kerosene = 135,000 Btu/gallon.

**HAPS Calculations**

| | HAPs - Metals | | | | | |
|---|---|---|---|---|---|---|
| | Arsenic | Beryllium | Mercury | Selenium | | TOTAL |
| Emission Factor in lb/MMBtu | 4 0E-06 | 3.0E-06 | 3.0E-06 | 1.5E-05 | | |
| Potential Emission in tons/yr | 4.38E-06 | 3.29E-06 | 3.29E-06 | 1 64E-05 | | **2.74E-05** |

| | HAPs - Metals (continued) | | | | | |
|---|---|---|---|---|---|---|
| | Lead | Cadmium | Chromium | Manganese | Nickel | TOTAL |
| Emission Factor in lb/MMBtu | 9 0E-06 | 3.0E-06 | 3.0E-06 | 6.0E-06 | 3.0E-06 | |
| Potential Emission in tons/yr | 9.86E-06 | 3.29E-06 | 3.29E-06 | 6 57E-06 | 3.29E-06 | **2.63E-05** |
| | | | | | **Total HAPs** | **5.37E-05** |
| | | | | | **Worst HAP** | **1.64E-05** |

Methodology is the same as above.
HAPs emission factors are available in AP-42, Chapter 1 3-9 and 1 3-10.

**Appendix A: Emissions Calculations**
**Five (5) Propane Gas-Fired Portable Heaters Each With Heat Input Capacity of 0.05 MMBtu/hr (Assumed)**
**(LPG - Propane Combustion PTE)**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

| Heat Input Capacity MMBtu/hr | Potential Throughput kgals/year |
|---|---|
| 0.25 | 23.9 |

SO2 Emission factor = 0.10 x S
S = Sulfur Content = 1.00 grains/100ft^3

| | Pollutant | | | | | | |
|---|---|---|---|---|---|---|---|
| | PM* | PM10* | direct PM2.5** | SO2 | NOx | VOC | CO |
| Emission Factor in lb/kgal | 0.2 | 0.7 | 0.7 | 0.1 *(0.10S)* | 13.0 | 1.0 **TOC value | 7.5 |
| Potential Emission in tons/yr | 0.00 | 0.01 | 0.01 | 0.00 | 0.16 | 0.01 | 0.09 |

*PM emission factor is filterable PM only. PM emissions are stated to be all less than 10 microns in aerodynamic equivalent diameter, footnote in Table 1.5-1, therefore PM10 is based on the filterable and condensable PM emission factors.
** No direct PM2.5 emission factor was given. Direct PM2.5 is a subset of PM10. If one assumes all PM10 to be all direct PM2.5, then a worst case assumption of direct PM2.5 can be made.
**The VOC value given is TOC. The methane emission factor is 0.2 lb/kgal.
Assume the Sulfur content of the Propane Gas = 1.0 grains per 100 cubic feet of gas.

**Methodology**
1 gallon of LPG has a heating value of 94,000 Btu
1 gallon of propane has a heating value of 91,500 Btu (use this to convert emission factors to an energy basis for propane)
(Source - AP-42 (Supplement B 10/96) page 1.5-1)
Potential Throughput (kgals/year) = Heat Input Capacity (MMBtu/hr) x 8,760 hrs/yr x 1kgal per 1000 gallon x 1 gal per 0.0915 MMBtu
Emission Factors are from AP42 (7/08), Table 1.5-1 (SCC #1-02-010-02)
Propane Emission Factors shown. Please see AP-42 for butane.
Emission (tons/yr) = Throughput (kgals/yr) x Emission Factor (lb/kgal) / 2,000 lb/ton
No Emission Factors listed for Hazardous Air Pollutants.

**Appendix A: Emission Calculations**
**Fugitive Dust Emissions - Paved Roads**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

**Paved Roads at Industrial Site**
The following calculations determine the amount of emissions created by paved roads, based on 8,760 hours of use and AP-42, Ch 13.2.1 (1/2011).

Vehicle Informtation (provided by source)

| Type | Maximum number of vehicles per day | Number of one way trips per day per vehicle | Maximum trips per day (trip/day) | Maximum Weight Loaded (tons/trip) | Total Weight driven per day (ton/day) | Maximum one-way distance (feet/trip) | Maximum one-way distance (mi/trip) | Maximum one-way miles (miles/day) | Maximum one-way miles (miles/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Coal semi truck | 100.0 | 1.0 | 100.0 | 25.0 | 2500.0 | 2640 | 0.500 | 50.0 | 18250.0 |
| Coal semi truck | 100.0 | 1.0 | 100.0 | 5.0 | 500.0 | 2640 | 0.500 | 50.0 | 18250.0 |
| Ash semi truck | 25.0 | 1.0 | 25.0 | 25.0 | 625.0 | 2640 | 0.500 | 12.5 | 4562.5 |
| Ash semi truck | 25.0 | 1.0 | 25.0 | 5.0 | 125.0 | 2640 | 0.500 | 12.5 | 4562.5 |
| Small vehicles | 30.0 | 1.0 | 30.0 | 2.0 | 60.0 | 2640 | 0.500 | 15.0 | 5475.0 |
| Small vehicles | 30.0 | 1.0 | 30.0 | 2.0 | 60.0 | 2640 | 0.500 | 15.0 | 5475.0 |
| Limestone Delivery Truck (Full) | 1.0 | 11.0 | 11.0 | 39.0 | 429.0 | 682 | 0.129 | 1.4 | 518.6 |
| Limestone Delivery Truck (Empty) | 1.0 | 11.0 | 11.0 | 14.0 | 154.0 | 682 | 0.129 | 1.4 | 518.6 |
| Internal Limestone Truck (Full) | 1.0 | 14.0 | 14.0 | 40.0 | 560.0 | 2469 | 0.468 | 6.5 | 2389.5 |
| Internal Limestone Truck (Empty) | 1.0 | 14.0 | 14.0 | 20.0 | 280.0 | 2469 | 0.468 | 6.5 | 2389.5 |
| | | **Totals** | **360.0** | **177.0** | **5293.0** | **22142.0** | **4.2** | **170.9** | **62391.2** |

Average Vehicle Weight Per Trip = 14.7 tons/trip
Average Miles Per Trip = 0.47 miles/trip

Unmitigated Emission Factor, Ef = [k * (sL)^0.91 * (W)^1.02] (Equation 1 from AP-42 13.2.1)

| | PM | PM10 | PM2.5 | |
|---|---|---|---|---|
| where k = | 0.011 | 0.0022 | 0.00054 | lb/VMT = particle size multiplier (AP-42 Table 13.2.1-1) |
| W = | 14.7 | 14.7 | 14.7 | tons = average vehicle weight (provided by source) |
| sL = | 9.7 | 9.7 | 9.7 | |

Taking natural mitigation due to precipitation into consideration, Mitigated Emission Factor, Eext = E * [1 - (p/4N)] (Equation 2 from AP-42 13.2.1)
Mitigated Emission Factor, Eext = Ef * [1 - (p/4N)]
where p = 125 days of rain greater than or equal to 0.01 inches (see Fig. 13.2.1-2)
N = 365 days per year

| | PM | PM10 | PM2.5 | |
|---|---|---|---|---|
| Unmitigated Emission Factor, Ef = | 1.349 | 0.270 | 0.0662 | lb/mile |
| Mitigated Emission Factor, Eext = | 1.234 | 0.247 | 0.0606 | lb/mile |
| Dust Control Efficiency = | 90% | 90% | 90% | |

| Process | Mitigated PTE of PM (tons/yr) | Mitigated PTE of PM10 (tons/yr) | Mitigated PTE of PM2.5 (tons/yr) | Controlled PTE of PM (tons/yr) | Controlled PTE of PM10 (tons/yr) | Controlled PTE of PM2.5 (tons/yr) |
|---|---|---|---|---|---|---|
| Coal semi truck | 11.26 | 2.25 | 0.55 | 1.13 | 0.23 | 0.06 |
| Coal semi truck | 11.26 | 2.25 | 0.55 | 1.13 | 0.23 | 0.06 |
| Ash semi truck | 2.81 | 0.56 | 0.14 | 0.28 | 0.06 | 0.01 |
| Ash semi truck | 2.81 | 0.56 | 0.14 | 0.28 | 0.06 | 0.01 |
| Small vehicles | 3.38 | 0.68 | 0.17 | 0.34 | 0.07 | 0.02 |
| Small vehicles | 3.38 | 0.68 | 0.17 | 0.34 | 0.07 | 0.02 |
| Limestone Delivery Truck (Full) | 0.32 | 0.06 | 0.02 | 0.03 | 0.01 | 0.00 |
| Limestone Delivery Truck (Empty) | 0.32 | 0.06 | 0.02 | 0.03 | 0.01 | 0.00 |
| Internal Limestone Truck (Full) | 1.47 | 0.29 | 0.07 | 0.15 | 0.03 | 0.01 |
| Internal Limestone Truck (Empty) | 1.47 | 0.29 | 0.07 | 0.15 | 0.03 | 0.01 |
| **Totals** | **38.49** | **7.70** | **1.89** | **3.85** | **0.77** | **0.19** |

**Methodology**
Total Weight driven per day (ton/day) = [Maximum Weight Loaded (tons/trip)] * [Maximum trips per day (trip/day)]
Maximum one-way distance (mi/trip) = [Maximum one-way distance (feet/trip) / [5280 ft/mile]
Maximum one-way miles (miles/day) = [Maximum trips per year (trip/day)] * [Maximum one-way distance (mi/trip)]
Average Vehicle Weight Per Trip (ton/trip) = SUM[Total Weight driven per day (ton/day)] / SUM[Maximum trips per day (trip/day)]
Average Miles Per Trip (miles/trip) = SUM[Maximum one-way miles (miles/day)] / SUM[Maximum trips per year (trip/day)]
Unmitigated PTE (tons/yr) = [Maximum one-way miles (miles/yr)] * [Unmitigated Emission Factor (lb/mile)] * (ton/2000 lbs)
Mitigated PTE (tons/yr) = [Maximum one-way miles (miles/yr)] * [Mitigated Emission Factor (lb/mile)] * (ton/2000 lbs)
Controlled PTE (tons/yr) = [Mitigated PTE (tons/yr)] * [1 - Dust Control Efficiency]

**Abbreviations**
PM = Particulate Matter
PM10 = Particulate Matter (<10 um)
PM2.5 = Particle Matter (<2.5 um)
PTE = Potential to Emit

**Appendix A: Emission Calculations**
**Fugitive Dust Emissions - Unpaved Roads**

**Company Name:** Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Station
**Address City IN Zip:** 3711 Darlington Road, Newburgh, Indiana 47630
**Minor Source Modification:** 173-48924-00001
**Minor Permit Modification:** 173-48980-00001
**Reviewer:** Hachem Ismaili Alaoui

**Unpaved Roads at Industrial Site**
The following calculations determine the amount of emissions created by unpaved roads, based on 8,760 hours of use and AP-42, Ch 13.2.2 (11/2006).

Vehicle Information (provided by source)

| Type | Maximum number of vehicles | Number of one-way trips per day per vehicle | Maximum trips per day (trip/day) | Maximum Weight of Loaded Vehicle (tons/trip) | Total Weight driven per day (ton/day) | Maximum one-way distance (feet/trip) | Maximum one-way distance (mi/trip) | Maximum one-way miles (miles/day) | Maximum one-way miles (miles/yr) |
|---|---|---|---|---|---|---|---|---|---|
| Ash Pond Transfer - Empty Truck | 1.0 | 1.1 | 1.1 | 15.0 | 16.0 | 1994 | 0.378 | 0.4 | 147.3 |
| Ash Pond Transfer - Loaded Truck | 1.0 | 1.1 | 1.1 | 40.0 | 42.7 | 1994 | 0.378 | 0.4 | 147.3 |
| Limestone Delivery Truck (Full) | 1.0 | 11.0 | 11.0 | 39.0 | 429.0 | 664 | 0.126 | 1.4 | 504.9 |
| Limestone Delivery Truck (Empty) | 1.0 | 11.0 | 11.0 | 14.0 | 154.0 | 464 | 0.088 | 1.0 | 352.8 |
| Internal Limestone Truck (Full) | 1.0 | 14.0 | 14.0 | 40.0 | 560.0 | 845 | 0.160 | 2.2 | 817.8 |
| Internal Limestone Truck (Empty) | 1.0 | 14.0 | 14.0 | 20.0 | 280.0 | 845 | 0.160 | 2.2 | 817.8 |
| | | **Totals** | **52.1** | **168.0** | **1481.8** | **6806.0** | **1.3** | **7.6** | **2787.9** |

Average Vehicle Weight Per Trip = 28.4 tons/trip
Average Miles Per Trip = 0.15 miles/trip

Unmitigated Emission Factor, Ef = k*[(s/12)^a]*[(W/3)^b] (Equation 1a from AP-42 13.2.2)

| | PM | PM10 | PM2.5 | |
|---|---|---|---|---|
| where k = | 4.9 | 1.5 | 0.15 | lb/mi = particle size multiplier (AP-42 Table 13.2.2-2 for Industrial Roads) |
| s = | 6.0 | 6.0 | 6.0 | % = mean % silt content of unpaved roads (AP-42 Table 13.2.2-1 Iron and Steel Production) |
| a = | 0.7 | 0.9 | 0.9 | = constant (AP-42 Table 13.2.2-2 for Industrial Roads) |
| W = | 28.4 | 28.4 | 28.4 | tons = average vehicle weight |
| b = | 0.45 | 0.45 | 0.45 | = constant (AP-42 Table 13.2.2-2 for Industrial Roads) |

Taking natural mitigation due to precipitation into consideration, Mitigated Emission Factor, Eext = E * [(365 - P)/365] (Equation 2 from AP-42 13.2.2)
Mitigated Emission Factor, Eext = E * [(365 - P)/365]
where P = 125 days of rain greater than or equal to 0.01 inches (see Fig. 13.2.2-1)

| | PM | PM10 | PM2.5 | |
|---|---|---|---|---|
| Unmitigated Emission Factor, Ef = | 8.30 | 2.21 | 0.22 | lb/mile |
| Mitigated Emission Factor, Eext = | 5.46 | 1.45 | 0.15 | lb/mile |
| Dust Control Efficiency = | 90% | 90% | 90% | (pursuant to control measures outlined in fugitive dust control plan) |

| Process | Mitigated PTE of PM (Before Control) (tons/yr) | Mitigated PTE of PM10 (Before Control) (tons/yr) | Mitigated PTE of PM2.5 (Before Control) (tons/yr) | Mitigated PTE of PM (After Control) (tons/yr) | Mitigated PTE of PM10 (After Control) (tons/yr) | Mitigated PTE of PM2.5 (After Control) (tons/yr) |
|---|---|---|---|---|---|---|
| Vehicle (entering plant) (one-way trip) | 0.40 | 0.11 | 0.01 | 0.04 | 0.01 | 0.00 |
| Vehicle (leaving plant) (one-way trip) | 0.40 | 0.11 | 0.01 | 0.04 | 0.01 | 0.00 |
| Limestone Delivery Truck (Full) | 1.38 | 0.37 | 0.04 | 0.14 | 0.04 | 0.00 |
| Limestone Delivery Truck (Empty) | 0.96 | 0.26 | 0.03 | 0.10 | 0.03 | 0.00 |
| Internal Limestone Truck (Full) | 2.23 | 0.59 | 0.06 | 0.22 | 0.06 | 0.01 |
| Internal Limestone Truck (Empty) | 2.23 | 0.59 | 0.06 | 0.22 | 0.06 | 0.01 |
| **Totals** | **7.60** | **2.03** | **0.20** | **0.76** | **0.20** | **0.02** |

**Methodology**
Total Weight driven per day (ton/day) = [Maximum Weight of Loaded Vehicle (tons/trip)] * [Maximum trips per day (trip/day)]
Maximum one-way distance (mi/trip) = [Maximum one-way distance (feet/trip) / [5280 ft/mile]
Maximum one-way miles (miles/day) = [Maximum trips per year (trip/day)] * [Maximum one-way distance (mi/trip)]
Average Vehicle Weight Per Trip (ton/tr = SUM[Total Weight driven per day (ton/day)] / SUM[Maximum trips per day (trip/day)]
Average Miles Per Trip (miles/trip) = SUM[Maximum one-way miles (m les/day)] / SUM[Maximum trips per year (trip/day)]
Mitigated PTE (Before Control) (tons/yr) = (Maximum one-way miles (miles/yr)) * (Mitigated Emission Factor (lb/mile)) * (ton/2000 lbs)
Mitigated PTE (After Control) (tons/yr) = (Mitigated PTE (Before Control) (tons/yr)) * (1 - Dust Control Efficiency)

**Abbreviations**
PM = Particulate Matter
PM10 = Particulate Matter (<10 um)
PM2.5 = Particulate Matter (<2.5 um)
PTE = Potential to Emit

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

**Mike Braun**
*Governor*

**Clint Woods**
*Commissioner*

**SENT VIA U.S. MAIL: CONFIRMED DELIVERY AND SIGNATURE REQUESTED**

TO: Greg Dick
Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station
PO Box 209
Evansville, IN 47702

DATE: July 7, 2025

FROM: Jenny Acker, Branch Chief
Permits Branch
Office of Air Quality

SUBJECT: Final Decision
TV Minor Permit Modification
173-48980-00001

This notice is to inform you that a final decision has been issued for the air permit application referenced above.

Our records indicate that you are the contact person for this application. However, if you are not the appropriate person within your company to receive this document, please forward it to the correct person. In addition, the Notice of Decision has been sent to the OAQ Permits Branch Interested Parties List and, if applicable, the Consultant/Agent and/or Responsible Official/Authorized Individual.

**The final decision and supporting materials are available electronically**; the original signature page is enclosed for your convenience. The final decision and supporting materials available electronically at:

**IDEM's online searchable database:** https://www.in.gov/apps/idem/caats/ . Choose Search Option **by Permit Number**, then enter permit 48980

and

**IDEM's Virtual File Cabinet (VFC):** https://www.in.gov/idem. Enter VFC in the search box, then search for permit documents using a variety of criteria, such as Program area, date range, permit #, Agency Interest Number, or Source ID.

If you have technical questions regarding the enclosed documents, please contact the Office of Air Quality, Permits Branch at (317) 233-0178, or toll-free at 1-800-451-6027 (ext. 3-0178), and ask to speak to the permit reviewer who prepared the permit. If you think you have received this document in error, or have difficulty accessing the documents online, please contact Joanne Smiddie-Brush of my staff at 1-800-451-6027 (ext 3-0185), or via e-mail at jbrush@idem.IN.gov.



Visit on.IN.gov/survey or scan the QR code to provide feedback.
*We appreciate your input!*

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100 N. Senate Avenue • Indianapolis, IN 46204
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**Mike Braun**
*Governor*

**Clint Woods**
*Commissioner*

July 7, 2025

TO: Newburgh Chandler Public Library Bell Road Library

From: Jenny Acker, Branch Chief
Permits Branch
Office of Air Quality

Subject: **Important Information for Display Regarding a Final Determination**

**Applicant Name:** **Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station**
**Permit Number:** **173-48980-00001**

You previously received information to make available to the public during the public comment period of a draft permit. Enclosed is a copy of the final decision and supporting materials for the same project. Please place the enclosed information along with the information you previously received. To ensure that your patrons have ample opportunity to review the enclosed permit, **we ask that you retain this document for at least 60 days.**

The applicant is responsible for placing a copy of the application in your library. If the permit application is not on file, or if you have any questions concerning this public review process, please contact Joanne Smiddie-Brush, OAQ Permits Administration Section at 1-800-451-6027, extension 3-0185.

Enclosures
Final Library 1/13/2025

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • Fax (317) 233-6647 • www.idem.IN.gov

**Mike Braun**
*Governor*

**Clint Woods**
*Commissioner*

**July 7, 2025**
**Southern Indiana Gas and Electric Company (SIGECO) F.B. Culley Generating Station**
**173-48980-00001**

To: Interested Parties

This notice is to inform you that a final decision has been issued for the air permit application referenced above. This notice is for informational purposes only. You are not required to take any action.

You are receiving this notice because you asked to be on IDEM's notification list for this company and/or county; or because your property is nearby the company being permitted; or because you represent a local/regional government entity.

The enclosed Notice of Decision Letter provides additional information about the final permit decision.

The final decision and supporting materials are available electronically at:

IDEM's online searchable database: https://www.in.gov/apps/idem/caats/. Choose Search Option by Permit Number, then enter permit 48980

and

IDEM's Virtual File Cabinet (VFC): https://www.in.gov/idem. Enter VFC in the search box, then search for permit documents using a variety of criteria, such as Program area, date range, permit #, Agency Interest Number, or Source ID.

If you have technical questions regarding the enclosed documents, please contact the Office of Air Quality, Permits Branch at (317) 233-0178, or toll-free at 1-800-451-6027 (ext. 3-0178), and ask to speak to the permit reviewer who prepared the permit.

**Please Note:** *If you would like to be removed from the Air Permits mailing list, please contact Joanne Smiddie-Brush with the Air Permits Administration Section at 1-800-451-6027, ext. 3-0185 or via e-mail at JBRUSH@IDEM.IN.GOV. If you have recently moved and this Notice has been forwarded to you, please notify us of your new address and if you wish to remain on the mailing list. Mail that is returned to IDEM by the Post Office with a forwarding address in a different county will be removed from our list unless otherwise requested.*

Enclosure

Final Interested Parties Cover Letter 1/13/2025

# Mail Code 61-53

| | | | |
|---|---|---|---|
| IDEM Staff | JLSCOTT 7/7/2025<br>SIGECO - FB Culley Generating Station 173-48980-00001 Final | | AFFIX STAMP HERE IF USED AS CERTIFICATE OF MAILING |
| Name and address of Sender | ▶ | Indiana Department of Environmental Management<br>Office of Air Quality – Permits Branch<br>100 N. Senate<br>Indianapolis, IN 46204 | Type of Mail:<br>**CERTIFICATE OF MAILING ONLY** |

| Line | Article Number | Name, Address, Street and Post Office Address | Postage | Handing Charges | Act. Value (If Registered) | Insured Value | Due Send if COD | R.R. Fee | S.D. Fee | S.H. Fee | Rest. Del. Fee / Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | Greg Dick SIGECO - FB Culley Generating Station PO Box 209 Evansville IN 47702 (Source CAATS) via EMS | | | | | | | | | |
| 2 | | F Shane Bradford Vice President SIGECO - FB Culley Generating Station PO Box 209 Evansville IN 47702 *(RO CAATS)* | | | | | | | | | |
| 3 | | Warrick County Board of Commissioners 107 W Locust St, Ste 301 Boonville IN 47601-0585 *(Local Official)* | | | | | | | | | |
| 4 | | Warrick County Health Department 107 W Locust St, Ste 204 Boonville IN 47601-1701 *(Health Department)* | | | | | | | | | |
| 5 | | Newburgh Town Council and Town Manager PO Box 6 Newburgh IN 47630 *(Local Official)* | | | | | | | | | |
| 6 | | Mr. Mark Wilson Evansville Courier & Press PO Box 268 Evansville IN 47702-0268 *(Affected Party)* | | | | | | | | | |
| 7 | | Newburgh Chandler Public Library - Bell Road 4111 Lakeshore Dr, PO Box 850 Newburgh IN 47630 *(Library)* | | | | | | | | | |
| 8 | | David Boggs 216 Western Hills Dr Mount Vernon IN 47620 *(Affected Party)* | | | | | | | | | |
| 9 | | Tony Schroeder Trinity Consultants 29425 Chagrin Blvd Ste 360 Pepper Pike OH 44124 *(Consultant)* | | | | | | | | | |
| 10 | | Tony Mendoza Sierra Club Environmental Law Program 2101 Webster St, Ste 1300 Oakland CA 94612 *(Affected Party)* | | | | | | | | | |
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FACSIMILIE OF PS Form 3877

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

| | | |
|---|---|---|
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 27
CenterPoint Fuel Cost Order

ORIGINAL

| Commissioner | Yes | No | Not Participating |
|---|---|---|---|
| Huston | | | √ |
| Bennett | √ | | |
| Freeman | √ | | |
| Veleta | √ | | |
| Ziegner | √ | | |

**STATE OF INDIANA**

**INDIANA UTILITY REGULATORY COMMISSION**

**PETITION OF SOUTHERN INDIANA GAS AND ELECTRIC COMPANY D/B/A CENTERPOINT ENERGY INDIANA SOUTH ("CEI SOUTH") FOR APPROVAL OF A CHANGE IN ITS FUEL COST ADJUSTMENT FOR ELECTRIC SERVICE IN ACCORDANCE WITH THE ORDER OF THE COMMISSION IN CAUSE NO. 37712 EFFECTIVE JUNE 18, 1986, AND SENATE BILL NO. 529 EFFECTIVE APRIL 11, 1979, AND FOR RECOVERY OF NATURAL GAS POWER PLANT PIPELINE SERVICE RATES IN ACCORDANCE WITH THE ORDER OF THE COMMISSION IN CAUSE NO. 45564 S1 EFFECTIVE AUGUST 7, 2024.**

**CAUSE NO. 38708 FAC 146**

**APPROVED: APR 30 2025**

## ORDER OF THE COMMISSION

**Presiding Officer:**
**Ann S. Pagonis, Administrative Law Judge**

On February 18, 2025, in accordance with Ind. Code § 8-1-2-42, Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("CEI South") filed its Verified Petition ("Petition") with the Indiana Utility Regulatory Commission ("Commission") in this Cause for approval of a change in its fuel adjustment charge ("FAC"). In support of its Petition, CEI South contemporaneously filed testimony.

On March 25, 2025, the OUCC filed the testimony of Gregory Guerrettaz, a Certified Public Accountant and President of Financial Solutions Group, Inc., and Michael D. Eckert, Chief Technical Advisor in the OUCC's Electric Division. The OUCC filed revisions on April 1, 2025.

The Commission held an evidentiary hearing at 9:30 a.m. on April 8, 2025, in Room 224 of the PNC Center, 101 West Washington Street, Indianapolis, Indiana. CEI South and the OUCC appeared by counsel at the hearing, during which each party's evidence was admitted into the record without objection.

Based on the applicable law and the evidence presented, the Commission finds:

1. **Statutory Notice and Jurisdiction.** Notice of the hearing in this Cause was given and published as required by law. CEI South is a public utility as defined in Ind. Code § 8-1-2-1. Under Ind. Code § 8-1-2-42, the Commission has jurisdiction over changes to CEI South's rates and charges related to adjustments in fuel costs. Therefore, the Commission has jurisdiction over CEI South and the subject matter of this proceeding.

**2. CEI South's Characteristics.** CEI South is a corporation organized and existing under the laws of the State of Indiana with its principal office located at 211 NW Riverside Drive in Evansville, Indiana. CEI South renders electric utility service to the public and owns and operates electric generating, transmission, and distribution plant, property, and equipment and related facilities for the production, storage, transmission, delivery, and furnishing of this service.

**3. Efforts to Acquire Fuel and Generate or Purchase Power to Provide Electricity at the Lowest Reasonable Cost.** As a condition of receiving its requested fuel adjustment cost, Petitioner must demonstrate it complied with the statutory requirements of Ind. Code § 8-1-2-42(d)(1) by making every reasonable effort to acquire fuel and generate or purchase power, or both, so as to provide electricity to its retail customers at the lowest fuel cost reasonably possible.

**A. Efforts to Acquire Fuel.** F. Shane Bradford, Petitioner's Vice President, Indiana Electric, testified that CEI South utilizes coal and natural gas for its electric generation and incurs the costs of purchasing those fuels, including fuel related transportation and storage costs. He said CEI South's generating units are offered into the Midcontinent Independent System Operator's ("MISO") Day Ahead and Real Time markets and are dispatched by MISO on an economic basis. He noted CEI South has contracted through competitive processes to purchase its coal requirements from nearby mines, which helps minimize transportation costs. Mr. Bradford added that CEI South utilizes Indiana coal as its primary fuel source for electric generation. He further testified that CEI South has one coal supply contract currently in place that supports re-pricing opportunities for CEI South's supply, which, given the volume flexibility provided under this contract, leaves opportunities for spot purchases as needed. CEI South has made specific data concerning its coal purchases available to the auditors for the OUCC.

Mr. Bradford described CEI South's coal inventory position and the on-going steps it has taken to manage its coal inventory. Mr. Bradford testified that CEI South has a coal inventory reserve target to ensure reliability. He then testified regarding CEI South's 2024 and 2025 coal plans, including an update on its projected coal burn, coal purchases, and coal inventory. Mr. Bradford also provided a detailed calculation of CEI South's expected coal inventory.

Mr. Bradford additionally described the details of the four new Texas Gas Transmission ("TGT") capacity contracts starting December 1, 2024, and April 1, 2025, respectively. Mr. Bradford testified that these four capacity contracts are consistent with the Commission's June 28, 2022 Order in Cause No. 45564, in which the Commission was satisfied with CEI South's decision to secure transportation capacity pursuant to a Precedent Agreement with TGT rather than pursuing alternatives.[1] Mr. Bradford explained that the Precedent Agreement comprises four executed firm service agreements and their associated negotiated rate letter agreements. He stated once construction of the TGT pipeline is completed and in service, firm service will commence and continue for a term of 20 years.

Mr. Bradford testified that, as detailed in Petitioner's Exhibit No. 1, Confidential Attachment FSB-3, of the four total new contracts with TGT, two provide firm capacity for winter

[1] *Southern Indiana Gas & Electric Co.*, Cause No. 45564 (IURC June 28, 2022), p. 28.

and two provide firm capacity for summer. Mr. Bradford stated the daily capacity for each season will be split, with one-half of the volume originating from the southern supply region (Zone SL), and the other half originating from a northern supply point (Zone 3). He explained that this receipt point split was included for supply diversification to both maximize reliability and mitigate the impact of elevated natural gas prices in specific geographical locations. Mr. Bradford noted information regarding the reservation cost derived rates for these new interstate capacity agreements can be found in Petitioner's Exhibit No. 2, Attachment BKA-3.

Brian K. Ankenbrand, Manager of Regulatory and Rates for CEI South, testified that CEI South received approval to recover the TGT-related costs through the FAC mechanism in the Commission's August 7, 2024 Order in Cause No. 45564 S1, which approved CEI South's request to recover the TGT costs using the then in effect 4CP allocation through its FAC mechanism. Specifically, Mr. Ankenbrand stated the Commission authorized CEI South to recover TGT fixed costs through the Natural Gas Power Plant Pipeline Service Rate. He noted CEI South will recover the variable commodity costs as part of its fuel charges through the FAC mechanism. The Natural Gas Power Plant Pipeline Service Rates requested for recovery in this FAC can be found in Petitioner's Exhibit No. 2, Attachment BKA-1.

Michael D. Eckert, Chief Technical Advisor in the OUCC's Electric Division, testified that as of January 31, 2025, CEI South's coal inventory was 226,197 tons, which is approximately 76,410 tons lower than what was reported in Cause No. 38708 FAC 145. He added that CEI South has taken actions to increase its coal inventory. Mr. Eckert recommended CEI South continue to provide inputs to its calculation of the coal inventory, as well as update the Commission on its 2025 projected coal burn, coal purchases, and coal inventory.

Mr. Eckert testified that CEI South is not currently using coal decrement pricing. He stated that the OUCC recommends CEI South file testimony, schedules, and workpapers to justify any coal decrement pricing (or any other type of pricing) in future FAC filings. Mr. Eckert noted CEI South is requesting recovery of firm TGT interstate pipeline capacity costs in this proceeding. Mr. Eckert determined CEI South's proposed treatment of the TGT interstate pipeline capacity costs complies with the Commission's August 7, 2024 Order in Cause No. 45564 S1. He added that CEI South's steam generation costs and monthly fuel costs are comparable or lower than its Indiana peer utilities.

Mr. Eckert testified that during its review, the OUCC was made aware of an outage at Culley Unit 3. He stated that Culley Unit 3's transformer failed on February 15, 2025, possibly due to a lightning strike. He further testified that CEI South anticipates the unit to be back online by April 4, 2025. Additionally, he noted that due to the environmental parameters associated with the Culley Unit 3 outage, Culley Unit 2's availability will be limited until Unit 3 comes back online. Mr. Eckert stated that CEI South may need to purchase power from the MISO market to replace lost power as a result of the outage, subjecting CEI South's fuel cost to market volatility, possibly impacting CEI South's FAC 147 and FAC 148. The OUCC recommended CEI South provide an update to the Commission on the Culley Unit 3 forced outage in FAC 147.

Based on the evidence presented, the Commission finds that CEI South has made every reasonable effort to acquire fuel so as to provide electricity to its retail customers at the lowest fuel

cost reasonably possible. We also find Mr. Eckert's recommendations regarding CEI South's coal inventory reasonable and appropriate. As such, we direct CEI South to continue providing inputs to its coal inventory calculation and to update the Commission on its 2025 projected coal burn, coal purchases, and coal inventory. Additionally, CEI South is directed to file testimony, schedules, and workpapers to justify any coal decrement pricing or other type of pricing in future FAC filings. Finally, CEI South is directed to provide an update to the Commission on the Culley Unit 3 forced outage in its FAC 147 filing.

**B. Purchased Power Costs for September, October, and November 2024 ("Reconciliation Period").** In Cause No. 43414, the Commission established daily benchmarks to assess the reasonableness of purchased power costs. Mr. Bradford explained that the benchmark consists of using a generic gas-fired turbine heat rate of 12,500 BTU/kWh and the NYMEX Henry Hub Gas day-ahead price plus $0.60/MMBTU gas transport charge. Petitioner's Exhibit No. 1, Attachment FSB-1, Schedule 2 illustrates the calculation of the daily benchmarks. Applying the daily benchmarks to individual power purchase transactions in this proceeding, CEI South requests the recovery of certain purchased power costs in excess of the Daily Benchmarks for the Reconciliation Period. As the Commission previously noted, the standard to evaluate a utility's purchase that exceeds the benchmark is the "reasonableness of the decisions under the circumstances which were known (or which reasonably should have been known) at the time the purchases were made, not an after the fact focus using hindsight judgment . . . ." *Treatment of Purchased Power Costs*, Cause No. 41363 (IURC Aug. 18, 1999).

Mr. Bradford stated that CEI South incurred purchased power costs in excess of the daily benchmarks totaling $1,672,025.14 ($992,912.57 in September 2024, $357,711.82 in October 2024, and $321,400.75 in November 2024). He stated that $50,883.04 of this total is not recoverable because it did not meet the criteria established by a benchmark settlement, but the remaining over-benchmark purchases in the amount of $1,621,142.10 are recoverable. He stated the $1,621,142.10 in benchmark purchases were incurred pursuant to MISO's security constrained economic dispatch across its footprint because MISO elected to utilize other generation when CEI South needed additional power. Petitioner's Exhibit No. 1, Attachment FSB-1, Schedule 3 provided evidence regarding CEI South's purchased power that included purchased power volumes, costs, the reasons for the purchases, and the sum of hourly purchased power costs in excess of the applicable benchmarks for the Reconciliation Period. CEI South also provided support for its position that over-benchmark costs of $1,621,142.10 included in this proceeding are recoverable. The schedule indicates these power purchases were made due to generation facilities being on outage or reserve shutdown. Mr. Bradford testified that without the purchased power, Petitioner could not have met its retail customers' demand while complying with MISO dispatch instructions. OUCC witness Eckert agreed with CEI South's determination that the utility should be allowed to recover $1,621,142.10 of purchased power costs that exceeded the benchmark.

Based on this evidence, we find CEI South's identified purchased power costs were reasonable under the circumstances at the time of the purchases. As such, these purchased power costs are properly included in the fuel cost reconciliation.

**4. Fuel Cost and Other Operating Expenses.** To recover its requested fuel adjustment cost, Ind. Code § 8-1-2-42(d)(2) requires Petitioner to establish that "the actual increases in fuel cost through the latest month for which actual fuel costs are available since the last order of the commission approving basic rates and charges of the electric utility have not been offset by actual decreases in other operating expenses." Actual increases in Petitioner's fuel cost in the current case for the Reconciliation Period have not been offset by actual decreases in other operating expenses.

At the time of filing this Petition, the latest month for which CEI South's actual fuel costs were available was November 2024, and the latest three months for which such figures were available were September, October, and November 2024.

The Order in CEI South's most recent electric base rate case, Cause No. 43839, was issued on April 27, 2011, and approved the cost of fuel per kWh sold to be determined for the various voltage-level sales groups based on the line loss characteristics of each voltage group. These changes were effective May 3, 2011. The average cost of fuel per kWh supplied for the Reconciliation Period was $0.030945 as reflected in Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 5, Page 4, Line 32. The fuel cost at approved rates in Cause No. 43839 totaled $222,189,000 and the actual fuel costs were $197,501,000, a difference of $24,688,000, as shown on Petitioner's Exhibit No. 3, Attachment CMB-1, Page 1, Line 17.

As shown in Petitioner's Exhibit No. 3, Attachment CMB-1, Page 1, Line 16, the authorized operation and maintenance expense, excluding fuel cost, for the 12 months ended November 30, 2024, was $271,038,000, while the actual operating and maintenance expense, excluding fuel, amounted to $305,879,000, a difference of $34,841,000.

Based on the evidence, the Commission finds CEI South has met the requirement of Ind. Code § 8-1-2-42(d)(2) that increases in fuel costs have not been offset by decreases in other operating expenses.

**5. Return Earned.** Ind. Code § 8-1-2-42(d)(3), subject to the provisions of Ind. Code § 8-1-2-42.3, generally prohibits an FAC that would result in CEI South earning a return in excess of the applicable authorized return. Should the FAC result in CEI South earning a return in excess of the applicable authorized return, CEI South must, in accordance with the provisions of Ind. Code § 8-1-2-42.3, determine if the sum of the differentials between the actual earned return and the authorized return for each of the 12-month periods considered during the relevant period is greater than zero. If the sum is greater than zero, the Commission shall reduce the FAC. Ind. Code § 8-1-2-42.3(b).

The authorized return from Cause No. 43839 applicable in this Cause is $94,450,297. The Commission's Orders in Cause Nos. 44910, 45052, and 44909, including sub-dockets, authorized a total of $40,357,805. The proration for purposes of this FAC is determined on a daily basis as shown in Petitioner's Exhibit No. 3, Attachment CMB-3 (Cause No. 44910 TDSIC 13 of $11,129,213, Cause No. 44910 TDSIC 14 of $15,178,497, Cause No. 44910 TDSIC 1 of $251,133, Cause No. 45052 ECA 3 of $1,871,652, Cause No. 45052 ECA 4 of $7,053,254, Cause No. 45052 ECA 5 of $4,113,313, Cause No. 44909 CECA 5 of $382,997, and Cause No. 44909 CECA 6 of

$377,747). Therefore, CEI South's authorized return for this FAC proceeding is $134,808,102. Petitioner's Exhibit No. 3, Attachment CMB-1, Page 1, Line 15 shows net electric operating income applicable to retail customers for the 12 months ended November 30, 2024, of $99,099,000. CEI South based its net operating income on its actual financial statements for this period.

CEI South did not exceed its authorized return in the current period as reflected in Petitioner's Exhibit No. 3, Attachment CMB-2, Line 1. The sum of the differentials (both positive and negative) between the determined return and the authorized return during the relevant period is negative $727,200,862. As such, no refund is appropriate.

**6. Estimation of Fuel Cost.** Ind. Code § 8-1-2-42(d)(4) sets forth an additional requirement that must be found for an electric utility to recover its requested FAC. Specifically, it requires a finding that a utility's estimate of its prospective average fuel costs for each month of the estimated three calendar months is reasonable after taking into consideration the actual fuel costs experienced and the estimated fuel costs for the three calendar months for which actual fuel costs are available.

Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 1, Line 26, Column E indicates CEI South's prospective average monthly fuel cost for May, June and July 2025 ("Estimation Period") is $17,131,374. Mr. Ankenbrand explained that this prospective average fuel cost estimate was calculated by determining the amount of generation that would be required from each generating unit, the amount of fuel required for the generation, and the price of fuel for each generating unit, assuming a normal weather supply plan. The price used for each coal-fired generation unit is the estimated average price of all coal in inventory for each unit. CEI South has included projections for solar generation within this FAC proceeding.

Mr. Ankenbrand sponsored Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 5, Page 4, which indicates CEI South estimated its weighted average fuel cost for the Reconciliation Period would be $0.032014 per kWh supply. This exhibit further shows the actual weighted average fuel cost experienced for this three-month period was $0.030945 per kWh supply, resulting in a difference between estimated and actual weighted average cost in the amount of $0.001069 per kWh or 3.45% as reflected in Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 5, Page 4, Line 33. He said the estimating deviation was 5.69% in September 2024, 3.40% in October 2024, and 0.94% in November 2024.

Based on the evidence presented, the Commission finds CEI South's estimating techniques are reasonable, and its estimates for the Estimation Period should be accepted.

**7. Actual Incremental Fuel Cost/Actual Incremental Fuel Clause Revenue.** During the Reconciliation Period, CEI South's actual incremental cost of fuel incurred was negative $6,304,465, but its actual incremental fuel adjustment clause revenues to be reconciled with this amount equaled negative $1,698,901, resulting in an over-recovery for the Reconciliation Period in the amount of $4,605,564 as reflected on Petitioner's Exhibit No. 2, Attachment BKA-

2, Schedule 4, Pages 1-3, Line 6.[2] CEI South's reconciliation of the actual incremental fuel cost and the collected fuel costs for the Reconciliation Period is proper and when combined with the Estimation Period, assures CEI South is reconciling actual fuel costs applicable to kWh sales.

**8. Resulting Fuel Cost Adjustment.** The estimated cost of fuel supplied for the Estimation Period in this filing, $0.037597 per kWh as reflected on Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 1, Line 27, plus the variance of negative $0.003566 per kWh (*Id.* at Line 31), results in the cost of fuel supplied of $0.034031 per kWh (*Id.* at Line 32). Adjustments for system losses are applied to the rate schedules based on voltage-level losses, as approved in Cause No. 43839. Mr. Ankenbrand stated that CEI South updated its base cost of fuel included in rates in its FAC rate derivation calculation, as approved in Cause No. 45990 (*Id.* at Line 37). The following table illustrates the calculation of the FACs for the voltage-level groups based on their estimated loss percentages.

| | RS, B, SGS, OSS, SL, OL | DGS | LP | HLF | Special Contracts |
|---|---|---|---|---|---|
| **Cost of Fuel Supplied** | 34.031 | 34.031 | 34.031 | 34.031 | 37.690 |
| **Estimated Loss %** | 6.964451% | 6.932541% | 4.510571% | 1.779189% | 1.179325% |
| **Fuel Cost Adjusted for Losses** | 36.578 | 36.566 | 35.638 | 34.647 | 38.140 |
| **Estimated Cost of Company Use** | 0.099 | 0.099 | 0.099 | 0.099 | 0.099 |
| **Total Estimated Cost of Fuel (mills/kWh Sold)** | 36.677 | 36.665 | 35.737 | 34.746 | 38.239 |
| **Less Base Cost of Fuel Included in Rates (mills/kWh Sold)[3]** | 44.338 | 44.326 | 43.299 | 42.133 | |
| **Fuel Cost Charge per kWh sold (mills/kWh Sold)** | (7.661) | (7.661) | (7.562) | (7.387) | 38.239 |

The OUCC recommended the Commission approve the factors set forth above. The FACs shown above, if approved, will be applied to the usage billed by CEI South during the Estimation Period.

[2] These figures are not inclusive of the special contract variance included on Petitioner's Exhibit No. 2, Attachment BKA-2, Schedule 4, Pages 1-3, Line 7, as the special contract variance does not contribute to the rate derivation for the other rate classes.

[3] Pursuant to the February 3, 2025, Final Order in Cause No. 45990

CEI South additionally requested approval of Natural Gas Power Plant Pipeline Service Rates for the recovery of costs incurred during the FAC period, including the reconciliation of prior period variances and the offset of costs with any used capacity sales from the TGT pipeline, as approved in Cause No. 45564 S1. As noted above, in Cause No. 45564 S1 we authorized CEI South to recover its TGT costs using the then in effect 4CP allocation factors approved in Cause No. 43354 MCRA 21 S1. As explained by Mr. Ankenbrand, CEI South updated its allocation percentages used in its natural gas power plant pipeline service ("NGPPPS") rate derivation calculation, as approved in Cause No. 45990. This table illustrates the Natural Gas Power Plant Pipeline Service Rates to be charged by rate schedule.

| | **Allocation Percentage[4]** | **Charge Adjusted** | **Rate ($ per kW or kVa)** | **Rate ($ per kWh)** |
|---|---|---|---|---|
| **RS** | 38.3107% | Energy | - | $0.006905 |
| **B** | 0.1295% | Energy | - | $0.004437 |
| **SGS** | 1.4210% | Energy | - | $0.005757 |
| **DGS/MLA** | 23.7110% | Energy | - | $0.005850 |
| **OSS** | 1.4935% | Energy | - | $0.004642 |
| **LP** | 32.6662% | Demand | $1.733 | - |
| **BAMP – Base** | 1.4112% | Demand | $0.893 | - |
| **HLF** | 0.8569% | Demand | $2.221 | - |

The Natural Gas Power Plant Pipeline Service Rates shown above will be applied to the usage billed by CEI South during the Estimation Period.

**9. Effect on Customers.** Based on CEI South's filing, a residential customer using 1,000 kWh per month will experience an increase of $1.33 per month on his or her electric bill for the Estimation Period compared to the factors presently approved (excluding various tracking mechanisms and sales tax).

**10. Confidential Information.** On February 18, 2025, Petitioner filed its Motion for Protection of Confidential and Proprietary Information with a supporting affidavit asserting that certain information to be submitted to the Commission was trade secret information as defined in Ind. Code § 24-2-3-2 and should be treated as confidential in accordance with Ind. Code §§ 5-14-3-4 and 8-1-2-29. A Docket Entry was issued on March 4, 2025, in which the Presiding Officers determined the information should be held confidential on a preliminary basis, after which the information was submitted under seal. After reviewing the information and consideration of the affidavit, we find the information is trade secret information as defined in Ind. Code § 24-2-3-2, is exempt from public access and disclosure under Ind. Code §§ 5-14-3-4 and 8-1-2-29, and shall be held confidential and protected from public access and disclosure by the Commission.

[4] Pursuant to the February 3, 2025 Final Order in Cause No. 45990

**IT IS THEREFORE ORDERED BY THE INDIANA UTILITY REGULATORY COMMISSION that:**

1. CEI South's fuel cost factors set forth above in Finding 8 are approved.

2. Prior to implementing the authorized rates, CEI South shall file the tariff and applicable rate schedules under this Cause for approval by the Commission's Energy Division. Such rates shall be effective on or after the date of approval, subject to Division review and agreement with the amounts reflected.

3. Consistent with the OUCC's recommendations, CEI South shall continue to provide inputs to its coal inventory calculation; update the Commission regarding Petitioner's 2025 projected coal burn, coal purchases, and coal inventory; update the OUCC with detailed information on any potential coal or transport contract amendments or price changes; and provide testimony describing the impact Petitioner's fuel inventory strategy may have on its customers. CEI South shall continue to provide testimony regarding its natural gas hedges for the forecast period and how the strategy evolves. CEI South shall also file testimony, schedules, and workpapers to justify any actual or anticipated need for coal decrement pricing in future FAC filings. CEI South shall provide testimony in FAC 147 regarding the February 15, 2025, Culley Unit 3 forced outage.

4. The information submitted under seal in this Cause pursuant to Petitioner's request for confidential treatment is determined to be confidential trade secret information as defined in Ind. Code § 24-2-3-2 and shall continue to be held as confidential and exempt from public access and disclosure pursuant to Ind. Code §§ 5-14-3-4 and 8-1-2-29.

5. This Order shall be effective on and after the date of its approval.

**BENNETT, FREEMAN, VELETA, AND ZIEGNER CONCUR; HUSTON ABSENT:**

**APPROVED: APR 30 2025**

**I hereby certify that the above is a true and correct copy of the Order as approved.**

Dana Kosco

Digitally signed by Dana Kosco
Date: 2025.04.30 10:20:12 -04'00'

**Dana Kosco**
**Secretary of the Commission**

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

| | | |
|---|---|---|
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 28
Culley 2024 NPDES Permit

**INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**
*We Protect Hoosiers and Our Environment.*
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

**Eric J. Holcomb**
*Governor*

**Brian C. Rockensuess**
*Commissioner*

May 3, 2024

VIA ELECTRONIC MAIL - shane.bradford@centerpointenergy.com

Mr. Shane Bradford, Vice-President, Power Generation Operations
CenterPoint Energy
P.O. Box 209
Evansville, IN 47702

Dear Mr. Bradford:

Re: NPDES Permit No. IN0002259
Permit Modification
SIGECO F.B. Culley Generating Station
Newburgh, IN – Warrick County

Your request for modification of the above-referenced discharge permit has been processed in accordance with Section 402 and 405 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251, et seq.), and IDEM's permitting authority under IC 13-15.

The enclosed Pages 1 through 21 of 79 are intended to replace the corresponding pages of your existing NPDES Permit No. IN0002259. An accompanying Fact Sheet itemizes and explains the rationale for the revisions. All discharges from the referenced facility shall be consistent with the terms and conditions of this permit, as modified.

The draft NPDES permit for the SIGECO F.B. Culley Generating Station was made available for public comment from March 19, 2024, through April 19, 2024, as part of Public Notice No. 20240319 – IN0002259– D on IDEM's website at https://www.in.gov/idem/public-notices/public-notices-all-regions/. During this comment period, no comment letters were received.

Pursuant to IC 4-21.5-3-5(f), the determination of modification in this letter becomes effective fifteen (15) days after it has been served; however, pursuant to IC 4-21.5-3-2(e), if it is served by mail it becomes effective eighteen (18) days after issued. It should also be noted that any appeal must be filed under procedures outlined in IC 13-15-6, IC 4-21.5, and the enclosed Public Notice.

The appeal must be initiated by filing a petition for administrative review with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the emailing of an electronic copy of this letter or within eighteen (18) days of the mailing of this letter by filing at the following addresses:

Director
Office of Environmental Adjudication
Indiana Government Center North
Room N103
100 North Senate Avenue
Indianapolis, Indiana 46204

Commissioner
Indiana Department of Environmental Management
Indiana Government Center North
Room 1301
100 North Senate Avenue
Indianapolis, Indiana 46204

Any appeal request must be filed in accordance with IC 4-21.5-3-7, IC 13-15-7, and the enclosed Public Notice. The appeal request must include facts demonstrating that the party requesting appeal is the applicant, a person aggrieved or adversely affected by this modification or otherwise entitled to review by law. Pursuant to IC 13-15-7-3, the permit shall remain in force pending a decision on any appeal that has been timely requested under the provisions of IC 4-21.5 and IC 13-15-7.

One condition of your permit requires periodic reporting of several effluent parameters. You are required to submit both federal discharge monitoring reports (DMRs) and state Monthly Monitoring Reports (MMRs) on a routine basis. The MMR form is available on the internet at the following web site: https://www.in.gov/idem/cleanwater/wastewater-compliance/wastewater-reporting-forms-notices-and-instructions/.

Once you are on this page, select the “IDEM Forms” page and locate the “Monthly Monitoring Report (MMR) for Industrial Discharge Permits-30530” under the Wastewater Facilities heading. We recommend selecting the “XLS” version because it will complete all of the calculations when you enter the data.

All NPDES permit holders are required to submit their monitoring data to IDEM using NetDMR. Information on NetDMR is available on the IDEM website at https://www.in.gov/idem/cleanwater/resources/netdmr/.

If you have questions concerning this modification, please contact Nikki Gardner at 317/232-8707 or ngardner@idem.in.gov. More information on the appeal review process is available at the website for the Office of Environmental Adjudication at http://www.in.gov/oea.

Sincerely,



Jerry Dittmer, Chief
Permits Branch
Office of Water Quality

Enclosure

cc: Chief, Permits Section, U.S. EPA, Region 5
Warrick County Health Department
Angela Casbon-Scheller, CenterPoint Energy
Jeremy Ferguson, IDEM
Helen Demmings, IDEM
Stacey Cochran, ORSANCO
Shyamala Raman, IDEM OLQ
Troy Weaver, IDEM OLQ

STATE OF INDIANA

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

AMENDED AUTHORIZATION TO DISCHARGE UNDER THE

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

In compliance with the provisions of the Federal Water Pollution Control Act, as amended, (33 U.S.C. 1251 et seq., the "Clean Water Act" or “CWA”), and IDEM’s permitting authority under IC 13-15,

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY (SIGECO)

is authorized to discharge from the F.B. Culley Generating Station, a coal-fired steam electric generating plant, that is located at 3711 Darlington Road, Newburgh, Indiana, to receiving waters identified as the Ohio River and Little Pigeon Creek near its confluence with the Ohio River in accordance with effluent limitations, monitoring requirements, and other conditions set forth in Parts I, II, and III hereof.

The permit, as issued on February 1, 2023, and subsequently modified on July 6, 2023, and August 30, 2023, is hereby amended, as contained herein. The amended provisions shall become effective __May 1, 2024_____. All terms and conditions of the permit not modified at this time remain in effect. Further, any existing condition or term affected by the amendments will remain in effect until the amended provisions become effective. This permit may be revoked for the nonpayment of applicable fees in accordance with IC 13-18-20.

This permit and the authorization to discharge, as amended, shall expire at midnight February 29, 2028. In order to receive authorization to discharge beyond the date of expiration, the permittee shall submit such information and forms as are required by the Indiana Department of Environmental Management no later than 180 days prior to the date of expiration.

Issued on _____May 3, 2024_____ for the Indiana Department of Environmental Management.



Jerry Dittmer, Chief
Permits Branch
Office of Water Quality

# PART I

## A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

1. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 001[21], located at Latitude 37° 54' 35.39", Longitude -87° 19' 37.99". The discharge is limited to condenser cooling unit wastewater, contact stormwater pond discharge (internal Outfall 101 - low volume wastewater, coal pile run-off, treated metal cleaning wastewater from internal outfall 401, bottom ash transport water filtrate, East Ash Pond water (filtrate), and stormwater), and East Ash Pond perimeter gradient control wells (internal Outfall 201). Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][12][13][16][17]
Outfall 001

Table 1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|---|
| | Monthly | Daily | | Monthly | Daily | | Measurement | Sample |
| Parameter | Average | Maximum | Units | Average | Maximum | Units | Frequency | Type |
| Flow[18] | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| Plant Capacity Factor | ---- | ---- | ---- | Report | ---- | %daily average | 1 X Daily | Report |
| Temperature | | | | | | | | |
| Intake | ---- | ---- | ---- | Report | Report | °F | 1 X Hourly[11] | Grab |
| Effluent[22] | ---- | ---- | ---- | Report | Report | °F | 1 X Hourly[11] | Grab |
| Mixed River[9][10][22] | ---- | ---- | ---- | Report | Report | °F | 1 X Daily[23] | Grab |
| ORSANCO[25] | | | | | | | | |
| Interim | ---- | ---- | ---- | ---- | Report | °F | 1 X Daily | Report |
| Final | ---- | ---- | ---- | ---- | 110 | °F | 1 X Daily | Report |
| Total Residual Oxidants (Bromine)[5][6] | | | ---- | 0.75 | 2 | µg/l | 1 X Daily | Grab |
| TRC-Continuous [5][6][14] | ---- | ---- | ---- | 0.02 | 0.04 | mg/l | 1 X Daily | Grab |
| Duration/Day | ---- | ---- | ---- | ---- | 120 | minutes/day | 1 X Daily | Report |
| TRC - Intermittent[15][19] | | ---- | ---- | Report | 0.2 | mg/l | 1 X Daily | Grab |
| Frequency | ---- | ---- | ---- | ---- | 4 | times/day | 1 X Daily | Report |
| Dose Duration | ---- | ---- | ---- | ---- | 40 | minutes/dose | 1 X Daily | Report |
| Duration/Day | ---- | ---- | ---- | ---- | 120 | minutes/day | 1 X Daily | Report |
| Cadmium[4] | ---- | ---- | ---- | 2.1 | 3.9 | µg/l | 2 X Monthly | 24 Hr. Comp. |
| Mercury[4][6] | ---- | ---- | ---- | 12 | 20 | ng/l | 6 X Annually[7] | Grab |
| Copper[4] | ---- | ---- | ---- | 31 | 63 | µg/l | 2 X Monthly | 24 Hr. Comp. |
| Iron[4] | ---- | ---- | ---- | Report | Report | µg/l | 2 X Monthly | 24 Hr. Comp. |
| Silver[4][6][24] | | | | | | | | |
| Interim | ---- | ---- | ---- | Report | Report | µg/l | 2 X Monthly | 24 Hr. Comp. |
| Final | ---- | ---- | ---- | 3.8 | 6.6 | µg/l | 2 X Monthly | 24 Hr. Comp. |
| Nickel[4] | ---- | ---- | ---- | Report | Report | µg/l | 1 X Monthly | 24 Hr. Comp. |
| Aluminum[4] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Arsenic[4][6] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Selenium[4][6] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Zinc[4] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Free Cyanide[6] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | Grab |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Sulfate | ---- | ---- | ---- | Report | Report | mg/l | 1 X Quarterly[8] 24 Hr. Comp. |
| Boron | ---- | ---- | ---- | Report | Report | mg/l | 1 X Quarterly[8] 24 Hr. Comp. |
| Chloride | ---- | ---- | ---- | Report | Report | mg/l | 1 X Quarterly[8] 24 Hr. Comp. |
| Fluoride | ---- | ---- | ---- | Report | Report | mg/l | 1 X Quarterly[8] 24 Hr. Comp. |
| Bromide | ---- | ---- | ---- | Report | Report | mg/l | 1 X Quarterly[8] 24 Hr. Comp. |
| Whole Effluent Toxicity Testing[20] | | | | | | | |

Table 2

| | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|
| | Daily | Daily | | Measurement | Sample |
| Parameter | Minimum | Maximum | Units | Frequency | Type |
| pH[3] | 6.0 | 9.0 | s.u. | 1 X Monthly | Grab |

[1] See Part I.B. of the permit for the minimum narrative limitations.

[2] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[3] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[4] The permittee shall measure and report the identified metal as total recoverable metal.

[5] The water quality-based effluent limits (WQBEL) for bromine and TRC are less than the limit of quantitation (LOQ) as specified in footnote [6]. Compliance with this permit will be demonstrated if the effluent concentrations measured are less than the respective LOQ. If the measured concentration of bromine or TRC is greater than the water quality-based effluent limitations and above the respective LOD specified in footnote [6] in any three (3) consecutive analyses, or any five (5) out of nine (9) analyses, then the discharger shall:

(1) Determine the source of the parameter through an evaluation of sampling techniques, analytical/laboratory procedures, and waste streams (including internal waste streams). Re-examine the chlorination /dechlorination procedures or re-examine the bromination /de-bromination procedures, as applicable.

(2) The sampling and analysis for bromine or TRC shall be increased to 2 X Daily and remain at this increased sampling frequency until:

(a) The increased sampling frequency for bromine or TRC has been in place for at least five (5) days;
(b) At least nine (9) samples have been taken under this increased sampling frequency; and
(c) The measured concentration of bromine or TRC is less than the LOD specified in footnote [6] in at least seven (7) out of the nine (9) most recent analyses.

[6] The following EPA approved test methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM and EPA, if applicable.

| Parameter | Test Method | LOD | LOQ |
|---|---|---|---|
| Mercury | 1631E | 0.2 ng/l | 0.5 ng/l |
| Arsenic | 3113 B-2004 | 1 µg/l | 3.2 µg/l |
| Arsenic | 200.9, Rev. 2.2 (1994) | 0.5 µg/l | 1.6 µg/l |
| Arsenic | 200.8, Rev. 5.4 (1994) | 0.4 µg/l | 1.3 µg/l |
| Selenium | 3113 B-2004 or 3114 B-2009 | 2 µg/l | 6.4 µg/l |
| Selenium | 200.8, Rev. 5.4 (1994) | 2.1 µg/l | 6.7 µg/l |
| Selenium | 200.9, Rev. 2.2 (1994) | 0.6 µg/l | 1.9 µg/l |
| Silver | 200.8, Rev 5.4 (1994) Selection Ion Monitoring | 0.005 µg/l | 0.016 µg/l |
| Chlorine, Total residual | 4500-Cl D-2000, E-2000 or G-2000 | 0.02 mg/l | 0.06 mg/l |
| Cyanide, Available** | 4500-CN-G-1999 | 5 µg/l | 16 µg/l |
| Cyanide, Available** | OIA-1677-09 (available) | 0.5 µg/l | 1.6 µg/l |
| Cyanide, Available** | Kelada-01 (available) | 0.5 µg/l | 1.6 µg/l |
| Oxidants, Total Residual (Bromine) | 4500-Cl D-2000, E-2000 or G-2000 | 0.02 mg/l | 0.06 mg/l |
| **Free cyanide shall be reported as free cyanide but measured using one of the EPA approved test methods above for available cyanide. | | | |

Case-Specific LOD/LOQ

The permittee may determine and use a case-specific LOD or LOQ using the analytical method specified above, or any other analytical method which is approved by the Commissioner, and EPA if applicable, prior to use. The LOD shall be derived by the procedure specified for method detection limits contained in 40 CFR Part 136, Appendix B, and the LOQ shall be set equal to 3.18 times the LOD. Other methods may be used if first approved by the Commissioner.

[7] Mercury monitoring shall be conducted 6 X annually in the months of February, April, June, August, October, and December of each year for the term of the permit using EPA Test Method 1631, Revision E.

[8] Samples shall be taken once at any time during each of the four annual quarters:

(A) January-February-March;
(B) April-May-June;
(C) July-August-September; and
(D) October-November-December.

For quarterly monitoring, in the first quarter for example, the permittee may conduct sampling within the month of January, February or March. The result from this reporting timeframe shall be reported on the March DMR, regardless of which of the months within the quarter the sample was taken.

[9] At no time shall the water temperature of the discharge from Outfall 001, as determined at the edge of the mixing zone described in 327 IAC 2-1-4, exceed the maximum limits in the following table during more than one percent (1%) of the hours in the twelve (12) month period ending with any month and by more than three degrees Fahrenheit (3ºF) (one and seven-tenths degrees Celsius (1.7ºC)). Water temperatures shall not exceed the following average temperature limitations (these are averages of the daily maximums for each day in the period).

| Month | Average °F(°C) | Maximum °F(°C) |
|---|---|---|
| January | 49.3 (9.6) | 50 (10.0) |
| February | 48.6 (9.2) | 50 (10.0) |
| March | 55.0 (12.8) | 60 (15.6) |
| April | 63.2 (17.3) | 70 (21.1) |
| May | 71.4 (21.9) | 80 (26.7) |
| June 1-15 | 77.6 (25.3) | 87 (30.6) |
| June 16-30 | 87.0 (30.6) | |
| July | 89.0 (31.7) | 89 (31.7) |
| August | 89.0 (31.7) | 89 (31.7) |
| September 1-15 | 87.0 (30.6) | 87 (30.7) |
| September 16-30 | 82.6 (28.1) | |
| October | 75.5 (24.2) | 78 (25.6) |
| November | 66.1 (19.0) | 70 (21.1) |
| December | 56.7 (13.7) | 57 (14.0) |

[10] The permittee will have the option of either meeting the above limits at the end of pipe, or by meeting the limits with a mixed river temperature that takes into account the mixing zone allowed by 327 IAC 2-1-6(b). The mixed river temperature is to be determined by employing the following mathematical model:

$$TMR = TU + \frac{QE * (TE - TU)}{0.5 * (Q7{,}10 - QI) + QE}$$

where:

TMR = mixed river temperature (ºF)
TU = upstream river temperature (ºF)
TE = effluent temperature (ºF)
QE = effluent flow (MGD)
QI = intake flow (MGD)
Q7,10 = 5,920 MGD

[11] Temperature shall be monitored and measurements recorded every hour. The highest single recorded measurement for each day shall be reported on the state monthly monitoring report for each day. The highest single recorded daily measurement shall be reported on the federal discharge monitoring report as the maximum daily temperature for that month. The monthly average shall be reported on the state monthly monitoring and the federal discharge monitoring report as the average of all measured values for the calendar month.

[12] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

[13] The Stormwater Monitoring and Non-Numeric Effluent Limits and the Stormwater Pollution Prevention Plan (SWPPP) requirements can be found in Part I.D. and I.E. of this permit.

[14] Continuous chlorination is considered as all occurrences that do not meet the definition of intermittent chlorination, as described in 327 IAC 2-1-6 Table 1, Footnote [a]. These water quality based effluent limits (WQBELs) are applicable any time that the discharge of chlorine does not meet this intermittent definition.

[15] This daily maximum limit for total residual chlorine is only applicable if the discharge of chlorine is intermittent. As required by 327 IAC 2-1-6 Table 1, Footnote [a], to be considered an intermittent discharge, total residual chlorine shall not be detected in the discharge for a period of more than forty (40) minutes in duration, and such periods shall be separated by at least five (5) hours. Simultaneous multi-unit chlorination is permitted.

[16] Beginning December 31, 2025, there shall be no discharge of bottom ash transport water from Unit 2. The discharge of bottom ash transport water from Unit 3 was prohibited as of December 31, 2020.

[17] There shall be no discharge of polychlorinated biphenyl (PCB) compounds attributable to facility operations such as those historically used in transformer fluids. In order to determine compliance with the PCB discharge prohibition, the permittee shall provide the following PCB data with the next NPDES permit renewal application for at least one sample taken from Outfall 001. The corresponding facility water intake(s) shall be monitored at the same time as the final outfall.

| Parameter | Test Method | LOD | LOQ |
|---|---|---|---|
| *Total PCBs | 608 | 0.1 µg/l | 0.3 µg/l |
| *Total PCBs is the sum of the following aroclors: PCB-1016, PCB-1221, PCB-1232, PCB-1242, PCB-1248, PCB-1254, and PCB-1260. | | | |

[18] Flow is to be measured continuously using a flow measuring device. The permittee may use engineering calculations to measure flow as approved by the commissioner.

[19] Chlorination reporting requirements for frequency and dose duration apply only when the facility is chlorinating intermittently.

[20] See Part I.F. of the permit for Whole Effluent Toxicity Testing requirements.

[21] The facility must submit a new comprehensive facility-wide water balance diagram with the next permit modification application or permit renewal application, whichever occurs first.

[22] The following conditions apply for Temperature outside the mixing zone:

(1) There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.
(2) The normal daily and seasonal temperature fluctuations that existed before the addition of heat due to other than natural causes shall be maintained.
(3) The maximum temperature rise at any time or place above natural shall not exceed five (5) degrees Fahrenheit (two and eight-tenths (2.8) degrees Celsius) in streams.

[23] The mixed river temperature shall be calculated each hour (or more frequently if temperature is recorded more frequently than hourly). The highest single calculated result for each day shall be reported on the state monthly monitoring report for each day. The highest single calculated daily result for a month shall be reported on the federal discharge monitoring report as the mixed river temperature maximum daily temperature for that month. The monthly average shall be reported on the state monthly monitoring and the federal discharge monitoring report as the average of all calculated daily maximums for the calendar month.

[24] This limit will become effective nine months after the effective date of the permit. Prior to the limit becoming effective, silver data shall be reported at a minimum of 2 X Monthly.

[25] The limit will become effective nine (9) months after the effective date of the permit. The limit is applicable at a location where public access is possible. The permittee must submit a report within six (6) months of the permit effective date that delineates in-river where public contact is possible and provides accompanying modeling and calculations that will be used to support reporting of temperatures at that location.

2. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 101, located at Latitude 37° 54' 44.36", Longitude -87° 19' 50.81". The discharge is limited to contact stormwater pond discharge (low volume wastewater, coal pile run-off, treated metal cleaning wastewater from new internal outfall 401, bottom ash transport water filtrate[3], East Ash Pond water (filtrate), and stormwater). Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to mixing with any other wastestreams. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][3][4]
Outfall 101

Table 1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Measurement Frequency | Sample Type |
| Flow | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| TSS[6] | ---- | ---- | ---- | 23 | 74 | mg/l | 1 X Weekly | 24 Hr. Comp. |
| O&G[6] | ---- | ---- | ---- | 8[5] | 11[5] | mg/l | 1 X Weekly | Grab |
| COD | ---- | ---- | ---- | ---- | Report | mg/l | Semi-Annually | Grab |
| $CBOD_5$ | ---- | ---- | ---- | ---- | Report | mg/l | Semi-Annually | Grab |
| Total Kjeldahl Nitrogen | | ---- | ---- | ---- | Report | mg/l | Semi-Annually | Grab |
| Nitrate + Nitrite Nitrogen | | ---- | ---- | ---- | Report | mg/l | Semi-Annually | Grab |
| Total Phosphorus | | ---- | ---- | ---- | Report | mg/l | Semi-Annually | Grab |

Table 2

| | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|
| Parameter | Daily Minimum | Daily Maximum | Units | Measurement Frequency | Sample Type |
| pH[2] | 6.0 | 9.0 | s.u. | 1 X Daily | Grab |

[1] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[2] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[3] Fly ash and FGD wastewater are prohibited from being discharged.

Bottom ash transport water from Unit 3 is prohibited from being discharged.

Beginning December 31, 2025, bottom ash transport water from Unit 2 will be prohibited from being discharged.

[4] Monitoring at Internal Outfall 101 is only required when the outfall is discharging to the discharge tunnel which leads to Outfall 001.

[5] Footnote removed (July 2023 permit modification).

[6] The TSS and O&G limits must be reevaluated during the next permit renewal. If the permittee wants TSS and/or O&G allocations for unregulated wastestreams, the following must be submitted with the next permit renewal application:

(a) Average flow rates for each regulated, unregulated and dilution wastestream before combining with a wastestream of a different category (regulated, unregulated and dilution),

(b) Beginning at least 24 months prior to the next permit renewal application due date, collect analytical data at least 1 x Month for the parameter contributed by each unregulated wastestream prior to combining with a wastestream of a different category for which the permittee wants an allocation, and

(c) Analytical data for the parameter for each wastestream which discharges directly to the Contact Stormwater Pond shall be collected prior to entering the Contact Stormwater Pond.

The permittee should submit a sampling plan to IDEM for review and approval prior to initiating the monitoring described above.

3. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 201, located at Latitude 37° 54' 34.49", Longitude -87° 19' 27.59". The discharge is limited to East Ash Pond perimeter gradient control well discharge. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to mixing with any other wastestreams. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][3][4]
Outfall 201

Table 1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Measurement Frequency | Sample Type |
| Flow | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| O&G | ---- | ---- | ---- | 15 | 20 | mg/l | 1 X Weekly | Grab |
| TSS | ---- | ---- | ---- | 30 | 70 | mg/l | 1 X Weekly | 24 Hr. Comp. |

Table 2

| | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|
| Parameter | Daily Minimum | Daily Maximum | Units | Measurement Frequency | Sample Type |
| pH[2] | 6.0 | 9.0 | s.u. | 1 X Daily | Grab |

[1] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[2] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[3] Monitoring at Internal Outfall 201 is only required when the outfall is discharging to the discharge tunnel which leads to Outfall 001.

[4] Bottom ash, fly ash, and FGD wastewater are prohibited from being discharged.

4. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 401, located at Latitude 37° 54' 34.78", Longitude -87° 19' 28.98". The discharge is limited to metal cleaning wastewater. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to mixing with any other wastestreams. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][3]
Outfall 401

Table 1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Measurement Frequency | Sample Type |
| Flow | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| O&G | ---- | ---- | ---- | 15 | 20 | mg/l | 1 X Weekly | Grab |
| TSS | ---- | ---- | ---- | 30 | 100 | mg/l | 1 X Weekly | 24 Hr. Comp. |
| Copper[4] | ---- | ---- | ---- | 1.0 | 1.0 | mg/l | 1 X Daily | 24 Hr. Comp. |
| Iron[4] | ---- | ---- | ---- | 1.0 | 1.0 | mg/l | 1 X Daily | 24 Hr. Comp. |

Table 2

| | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|
| Parameter | Daily Minimum | Daily Maximum | Units | Measurement Frequency | Sample Type |
| pH[2] | 6.0 | 9.0 | s.u. | 1 X Daily | Grab |

[1] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[2] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[3] Monitoring at Internal Outfall 401 is only required when metal cleaning wastewater is being discharged to a yard drain or other conveyance that eventually discharges to the Ohio River. Samples should be collected after treatment, if any, and prior to entering a yard drain or other conveyance.

[4] The permittee shall measure and report the identified metal as total recoverable metal.

5. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 004, located at Latitude 37° 54' 38.36", Longitude -87° 19' 35.09". The discharge is limited to sanitary wastewater package plant discharge. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][4]
Outfall 004

Table 1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Measurement Frequency | Sample Type |
| Flow | Report | Report | MGD | ---- | ---- | ---- | 2 X Monthly | 24-Hour Total |
| TSS | ---- | ---- | ---- | 30 | 45 | mg/l | 2 X Monthly | 24 Hr. Comp. |
| $TBOD_5$ | ---- | ---- | ---- | 30 | 45 | mg/l | 2 X Monthly | 24 Hr. Comp. |
| E. coli[5] | ---- | ---- | ---- | 125[6] | 235[7] | count/100 ml | 2 X Monthly | Grab |
| Fecal Coliform[8][9] | | | | | | | | |
| Interim | ---- | ---- | ---- | Report | ---- | count/100 ml | 2 X Monthly | Grab |
| Final | ---- | ---- | ---- | 2000 | ---- | count/100 ml | 2 X Monthly | Grab |

Table 2

| | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|
| Parameter | Daily Minimum | Daily Maximum | Units | Measurement Frequency | Sample Type |
| pH[3] | 6.0 | 9.0 | s.u. | 2 X Monthly | Grab |

[1] See Part I.B. of the permit for the minimum narrative limitations.

[2] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[3] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[4] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

[5] The limits and monitoring requirements for *E. coli* apply from April 1 through October 31. The effluent shall be disinfected on a continuous basis such that violations of the applicable bacteriological limitations do not occur from April 1 through October 31 annually.

[6] The monthly average *E. coli* value shall be calculated as a geometric mean. Per 327 IAC 5-10-6, the concentration of *E. coli* shall not exceed one hundred twenty-five (125) cfu or mpn per 100 milliliters as a geometric mean of the effluent samples taken in a calendar month. No samples may be excluded when calculating the monthly geometric mean.

[7] If less than ten samples are taken and analyzed for *E. coli* in a calendar month, no samples may exceed two hundred thirty-five (235) cfu or mpn as a daily maximum. However, when ten (10) or more samples are taken and analyzed for *E. coli* in a calendar month, not more than ten percent (10%) of those samples may exceed two hundred thirty-five (235) cfu or mpn as a daily maximum. When calculating ten percent, the result must not be rounded up. In reporting for compliance purposes on the Discharge Monitoring Report (DMR) form, the permittee shall record the highest non-excluded value for the daily maximum.

[8] In order to comply with ORSANCO requirements, in accordance with 327 IAC 5-10-6(b), fecal coliform is limited to a monthly average of 2,000 count per 100 ml from November 1 through March 31. The monthly average for fecal coliform shall be calculated using a geometric mean.

[9] This limit will become effective nine months after the effective date of the permit. Prior to the limit becoming effective, Fecal coliform results shall be reported as a geometric mean from November 1 through March 31.

6. The permittee is authorized to discharge stormwater from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 005, located at Latitude 37° 54' 42.40", Longitude -87° 19' 51.49". Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][4][5]

Outfall 005

| | | | Monitoring Requirements | |
|---|---|---|---|---|
| Parameter | Daily Maximum | Units | Measurement Frequency[3] | Sample Type |
| Flow | Report | MGD | Semi-Annually | Estimate Total |
| Total Suspended Solids | Report | mg/l | Semi-Annually | Grab |
| pH | Report | s.u. | Semi-Annually | Grab |
| O&G | Report | mg/l | Semi-Annually | Grab |
| COD | Report | mg/l | Semi-Annually | Grab |
| $CBOD_5$ | Report | mg/l | Semi-Annually | Grab |
| Total Kjeldahl Nitrogen | Report | mg/l | Semi-Annually | Grab |
| Nitrate plus Nitrite Nitrogen | Report | mg/l | Semi-Annually | Grab |
| Total Phosphorus | Report | mg/l | Semi-Annually | Grab |

[1] The Stormwater Monitoring and Non-Numeric Effluent Limits and the Stormwater Pollution Prevention Plan (SWPPP) requirements can be found in Part I.D. and I.E. of this permit.

[2] All samples shall be collected from the discharge resulting from a storm event that is greater than 0.1 inches and at least 72 hours from the previously measurable (greater than 0.1 inch rainfall) storm event. There shall be a minimum of three (3) months between reported sampling events.

For each sample taken, the permittee shall record the duration and total rainfall of the storm event, the number of hours between beginning of the storm measured and the end of the previous measurable rain event, and the outside temperature at the time of sampling. A grab sample shall be taken during the first thirty (30) minutes of the discharge (or as soon thereafter as practicable).

[3] The first sampling event is to occur between January and June and the associated DMR / MMR submitted no later than July 28th. The second sampling event is to occur between July and December and the associated DMR / MMR submitted no later than January 28th.

[4] See Part I.B. of the permit for the minimum narrative limitations.

[5] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

7. The permittee is authorized to discharge from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 006 [10], located at Latitude 37° 54' 29.01", Longitude -87° 19' 20.66". The discharge is limited to East Ash Pond perimeter gradient control wells and noncontact stormwater. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the discharge but prior to entry into the Little Pigeon Creek near its confluence with the Ohio River. Such discharge shall be limited and monitored by the permittee as specified below:

DISCHARGE LIMITATIONS [1][2][3][4]
Outfall 006

Table 1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|---|
| | Monthly | Daily | | Monthly | Daily | | Measurement | Sample |
| Parameter | Average | Maximum | Units | Average | Maximum | Units | Frequency | Type |
| Flow | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| Total Dissolved Solids (TDS) | ---- | ---- | | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Total Suspended Solids (TSS) | ---- | ---- | | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Antimony [5][9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Arsenic [5][9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Barium [5][9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Boron | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Cadmium [5] | ---- | ---- | ---- | Report | Report | µg/l | 2 X Monthly | 24 Hr. Comp. |
| Chloride | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Chromium, Hexavalent [7][9] | | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Chromium, Total [5]---- | | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Cobalt [5][9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Fluoride [9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Lithium [5][9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Lead [5] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Mercury [5][6][9]---- | | ---- | ---- | Report | Report | ng/l | 6 X Annually | Grab |
| Molybdenum [5][9]---- | | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Selenium [5][9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Sulfate | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Thallium [5][9] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |
| Zinc [5] | ---- | ---- | ---- | Report | Report | mg/l | 2 X Monthly | 24 Hr. Comp. |

Table 2

| | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|
| | Daily | Daily | | Measurement | Sample |
| Parameter | Minimum | Maximum | Units | Frequency | Type |
| pH[8] | 6.0 | 9.0 | s.u. | 2 X Monthly | Grab |

[1] See Part I.B. of the permit for the minimum narrative limitations.

[2] In the event that a new water treatment additive is to be used that will contribute to this Outfall, or changes are to be made in the use of water treatment additives, including dosage, the permittee must apply for and receive approval from IDEM prior to such discharge. Discharges of any such additives must meet Indiana water quality standards. The permittee must apply for permission to use water treatment additives by completing and submitting State Form 50000 (Application for Approval to Use Water Treatment Additives) currently available at: https://www.in.gov/idem/forms/idem-agency-forms/.

[3] The permittee shall post a permanent marker on the stream bank at each outfall discharging directly to the Ohio River. The marker shall consist at a minimum of the name of the establishment to which the permit was issued, the permit number, and the outfall number. The information shall be printed in letters not less than two inches in height. The marker shall be a minimum of 2 feet by 2 feet and shall be a minimum of 3 feet above the ground.

[4] The Stormwater Monitoring and Non-Numeric Effluent Limits and the Stormwater Pollution Prevention Plan (SWPPP) requirements can be found in Parts I.D. and I.E. of this permit.

[5] The permittee shall measure and report the identified metal as total recoverable metal.

[6] Mercury monitoring shall be conducted 6 X annually in the months of February, April, June, August, October, and December of each year for the term of the permit using EPA Test Method 1631, Revision E.

[7] Hexavalent chromium shall be measured and reported as dissolved metal. The hexavalent chromium sample type shall be by grab method. The maximum holding time for a hexavalent chromium sample is 28 days under 40 CFR 136.3(e), Table II. However, as noted in footnote 20 of Table II, to achieve the 28-day holding time, the ammonium sulfate buffer solution specified in EPA Method 218.6 must be used. This holding time allowance of 28-days supersedes the preservation and holding time requirements in the approved hexavalent chromium methods, unless this supersession would compromise the measurement, in which case the preservation and holding time requirements [the sample must be analyzed within 24 hours of collection] in the method must be followed.

[8] If the permittee collects more than one grab sample on a given day for pH, the values shall not be averaged for reporting daily maximums or daily minimums. The permittee must report the individual minimum and the individual maximum pH value of any sample during the month on the Monthly Monitoring Report form.

[9] The following EPA approved test methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM and EPA, if applicable.

| Parameter | Test Method | LOD | LOQ |
|---|---|---|---|
| Antimony | 200.8 | 0.13 µg/l | 1.0 µg/l |
| Antimony | 200.7 | 3 µg/l | 6 µg/l |
| Arsenic | 3113 B-2004 | 1 µg/l | 3.2 µg/l |
| Arsenic | 200.9, Rev. 2.2 (1994) | 0.5 µg/l | 1.6 µg/l |
| Arsenic | 200.8, Rev. 5.4 (1994) | 0.4 µg/l | 1.3 µg/l |
| Barium | 200.8 | 4.9 µg/l | 15.6 µg/l |
| Barium | 200.7 | 25 µg/l | 50 µg/l |
| Cobalt | 200.8 | 0.086 µg/l | 1.0 µg/l |
| Cobalt | 200.7 | 5 µg/l | 10 µg/l |
| Fluoride | SM 4500F/C | 0.021 mg/l | 0.10 mg/l |
| Fluoride | 300.0 | 0.05 mg/l | 0.1 mg/l |
| Hexavalent Chromium | 218.6 | 0.04 µg/l | 0.1 µg/l |
| Lithium | 200.7 | 4.1 µg/l | 20.0 µg/l |
| Mercury | 1631E | 0.2 ng/l | 0.5 ng/l |
| Molybdenum | 200.8 | 0.48 µg/l | 5.0 µg/l |
| Molybdenum | 200.7 | 25 µg/l | 50 µg/l |
| Selenium | 3113 B-2004 or 3114 B-2009 | 2 µg/l | 6.4 µg/l |
| Selenium | 200.8, Rev. 5.4 (1994) | 0.35 µg/l | 1.0 µg/l |
| Selenium | 200.9, Rev. 2.2 (1994) | 0.6 µg/l | 1.9 µg/l |
| Thallium | 200.8 | 0.073 µg/l | 1.0 µg/l |
| Thallium | 200.7 | 5 µg/l | 10 µg/l |

Case-Specific LOD/LOQ

The permittee may determine and use a case-specific LOD or LOQ using the analytical method specified above, or any other analytical method which is approved by the Commissioner, and EPA if applicable, prior to use. The LOD shall be derived by the procedure specified for method detection limits contained in 40 CFR Part 136, Appendix B, and the LOQ shall be set equal to 3.18 times the LOD. Other methods may be used if first approved by the Commissioner.

[10] This outfall will discharge from the perimeter gradient control system located outside the perimeter of the East Ash Pond. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact stormwater from the former East Ash Pond and adjacent green areas surrounding the pond.

8. The permittee is required to collect intake water samples in conjunction with certain discharge samples. The intake structure is designated as 000 on the Discharge Monitoring Report (DMR) forms. Samples taken in compliance with the monitoring requirements below shall be taken at a point representative of the intake water characteristics. Such samples shall be monitored by the permittee as specified below:

## DISCHARGE LIMITATIONS

Intake Structures 000

Table 1

| | Quantity or Loading | | | Quality or Concentration | | | Monitoring Requirements | |
|---|---|---|---|---|---|---|---|---|
| Parameter | Monthly Average | Daily Maximum | Units | Monthly Average | Daily Maximum | Units | Measurement Frequency | Sample Type |
| Flow Intake 1[3] | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| Flow Intake 2[3] | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| Flow Intake 3[3] | Report | Report | MGD | ---- | ---- | ---- | 1 X Daily | 24-Hour Total |
| Mercury[1][2] | ---- | ---- | ---- | Report | Report | ng/l | 1 X Monthly | Grab |
| Arsenic[2] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Cadmium[1] | ---- | ---- | ---- | Report | Report | ug/l | 1 X Monthly | 24 Hr. Comp. |
| Selenium[1][2] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Nickel[1] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Aluminum[1] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Silver[1][2] | ---- | ---- | ---- | Report | Report | ug/l | 1 X Monthly | 24 Hr. Comp. |
| Zinc[1] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |
| Copper[1] | ---- | ---- | ---- | Report | Report | ug/l | 1 X Monthly | 24 Hr. Comp. |
| Iron[1] | ---- | ---- | ---- | Report | Report | mg/l | 1 X Monthly | 24 Hr. Comp. |

[1] The permittee shall measure and report the identified metal as total recoverable metal.

[2] The following EPA approved test methods and associated LODs and LOQs are to be used in the analysis of the effluent samples. Alternative methods may be used if first approved by IDEM and EPA, if applicable.

| Parameter | Test Method | LOD | LOQ |
|---|---|---|---|
| Mercury | 1631E | 0.2 ng/l | 0.5 ng/l |
| Arsenic | 3113 B-2004 | 1 µg/l | 3.2 µg/l |
| Arsenic | 200.9, Rev. 2.2 (1994) | 0.5 µg/l | 1.6 µg/l |
| Arsenic | 200.8, Rev. 5.4 (1994) | 0.4 µg/l | 1.3 µg/l |
| Selenium | 3113 B-2004 or 3114 B-2009 | 2 µg/l | 6.4 µg/l |
| Selenium | 200.8, Rev. 5.4 (1994) | 0.35 µg/l | 1.0 µg/l |
| Selenium | 200.9, Rev. 2.2 (1994) | 0.6 µg/l | 1.9 µg/l |
| Silver | 200.8, Rev 5.4 (1994) Selection Ion Monitoring | 0.005 µg/l | 0.016 µg/l |

Case-Specific LOD/LOQ

The permittee may determine and use a case-specific LOD or LOQ using the analytical method specified above, or any other analytical method which is approved by the Commissioner, and EPA if applicable, prior to use. The LOD shall be derived by the procedure specified for method detection limits contained in 40 CFR Part 136, Appendix B, and the LOQ shall be set equal to 3.18 times the LOD. Other methods may be used if first approved by the Commissioner.

[3] The permittee shall report 24-hour total intake flow as an estimated flow using pump hours of operation. Within 24 months of the effective date of the permit, the permittee shall report the 24-hour total intake flow as measured from a flow meter or other IDEM approved methodology.

B. MINIMUM NARRATIVE LIMITATIONS

At all times the discharge from any and all point sources specified within this permit shall not cause receiving waters:

1. including waters within the mixing zone, to contain substances, materials, floating debris, oil, scum attributable to municipal, industrial, agricultural, and other land use practices, or other discharges that do any of the following:

   a. will settle to form putrescent or otherwise objectionable deposits;

   b. are in amounts sufficient to be unsightly or deleterious;

   c. produce color, visible oil sheen, odor, or other conditions in such degree as to create a nuisance;

   d. are in amounts sufficient to be acutely toxic to , or to otherwise severely injure or kill aquatic life, other animals, plants, or humans;

   e. are in concentrations or combinations that will cause or contribute to the growth of aquatic plants or algae to such a degree as to create a nuisance, be unsightly, or otherwise impair the designated uses.

2. outside the mixing zone, to contain substances in concentrations that on the basis of available scientific data are believed to be sufficient to injure, be chronically toxic to, or be carcinogenic, mutagenic, or teratogenic to humans, animals, aquatic life, or plants.

C. MONITORING AND REPORTING

1. Representative Sampling

   Samples and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge flow and shall be taken at times which reflect the full range and concentration of effluent parameters normally expected to be present. Samples shall not be taken at times to avoid showing elevated levels of any parameters.

2. Monthly Reporting

   The permittee shall submit monitoring reports to the Indiana Department of Environmental Management (IDEM) containing results obtained during the previous month and shall be submitted no later than the 28th day of the month following each completed monitoring period. The first report shall be submitted by the 28th day of the month following the month in which the permit becomes effective.

# National Pollutant Discharge Elimination System
**Fact Sheet for**

**SIGECO F.B. Culley Generating Station**

**Draft modification: March 2024**
**Final modification: April 2024**


## Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, Indiana 46204
(317) 232-8603
Toll Free (800) 451-6027
www.idem.IN.gov


| | |
|---|---|
| **Permittee:** | Southern Indiana Gas and Electric Company (SIGECO)<br>d/b/a CenterPoint Energy Indiana South (CEIS)<br>P.O. Box 209<br>Evansville, IN 47702 |
| **Existing Permit Information:** | Permit Number: IN0002259<br>Expiration Date: February 29, 2028 |
| **Facility Contact:** | Angela Casbon-Scheller<br>(812) 491-4787; Angela.Casbon-Scheller@centerpointenergy.com |
| **Facility Location:** | F.B. Culley Generating Station<br>3711 Darlington Road<br>Newburgh, IN 47630<br>Warrick County |
| **Receiving Stream:** | Ohio River, Little Pigeon Creek near its confluence with the Ohio River |
| **GLI/Non-GLI:** | Non-GLI |
| **Proposed Permit Action:** | Modify |
| **Date Application Received:** | February 9, 2024 |
| **Source Category** | NPDES Major – Industrial |
| **Permit Writer:** | Nikki Gardner<br>(317) 232-8707;ngardner@idem.in.gov |

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## 1.0 INTRODUCTION

The Indiana Department of Environmental Management (IDEM) received a request from the permittee on February 9, 2024, to modify National Pollutant Discharge Elimination System (NPDES) Permit IN0002259. The current five-year permit was issued with an effective date of March 1, 2023, in accordance with 327 IAC 5-2-6(a). The permit was subsequently modified on July 6, 2023, and August 30, 2023.

The Federal Water Pollution Control Act (more commonly known as the Clean Water Act), as amended, (Title 33 of the United States Code (U.S.C.) Section 1251 et seq.), requires an NPDES permit for the discharge of pollutants into surface waters. Furthermore, Indiana law requires a permit to control or limit the discharge of any contaminants into state waters or into a publicly owned treatment works. This proposed permit action by IDEM complies with and implements these federal and state requirements.

In accordance with Title 40 of the Code of Federal Regulations (CFR) Sections 124.8 and 124.56, as well as Title 327 of the Indiana Administrative Code (IAC) Article 5-3-8, a Fact Sheet is required for certain NPDES permits. This document fulfills the requirements established in these regulations. This Fact Sheet was prepared in order to document the factors considered in the development of NPDES Permit effluent limitations. The technical basis for the Fact Sheet may consist of evaluations of promulgated effluent guidelines, existing effluent quality, receiving water conditions, Indiana water quality standards-based wasteload allocations, and other information available to IDEM. Decisions to award variances to Water Quality Standards or promulgated effluent guidelines are justified in the Fact Sheet where necessary. This Fact Sheet also identifies the modified pages of the permit as issued on February 1, 2023, and subsequently modified on July 6, 2023, and August 30, 2023.

## 2.0 FACILITY DESCRIPTION

### 2.1 General

The SIGECO F.B. Culley Generating Station is classified under Standard Industrial Classification (SIC) Code 4911 - Electric Services.

The facility is a coal-fired steam electric generating plant with two (2) generating units; Unit 2 (100 MW) and Unit 3 (270 MW). The permittee has proposed to retire Unit 2 by the end of 2025. The design flow (highest monthly average) based on the most recent 2 years of data is 295 MGD.

The Ohio River accounts for approximately 99% of the facility's intake water with groundwater accounting for the remainder. The design intake flow is 360 MGD.

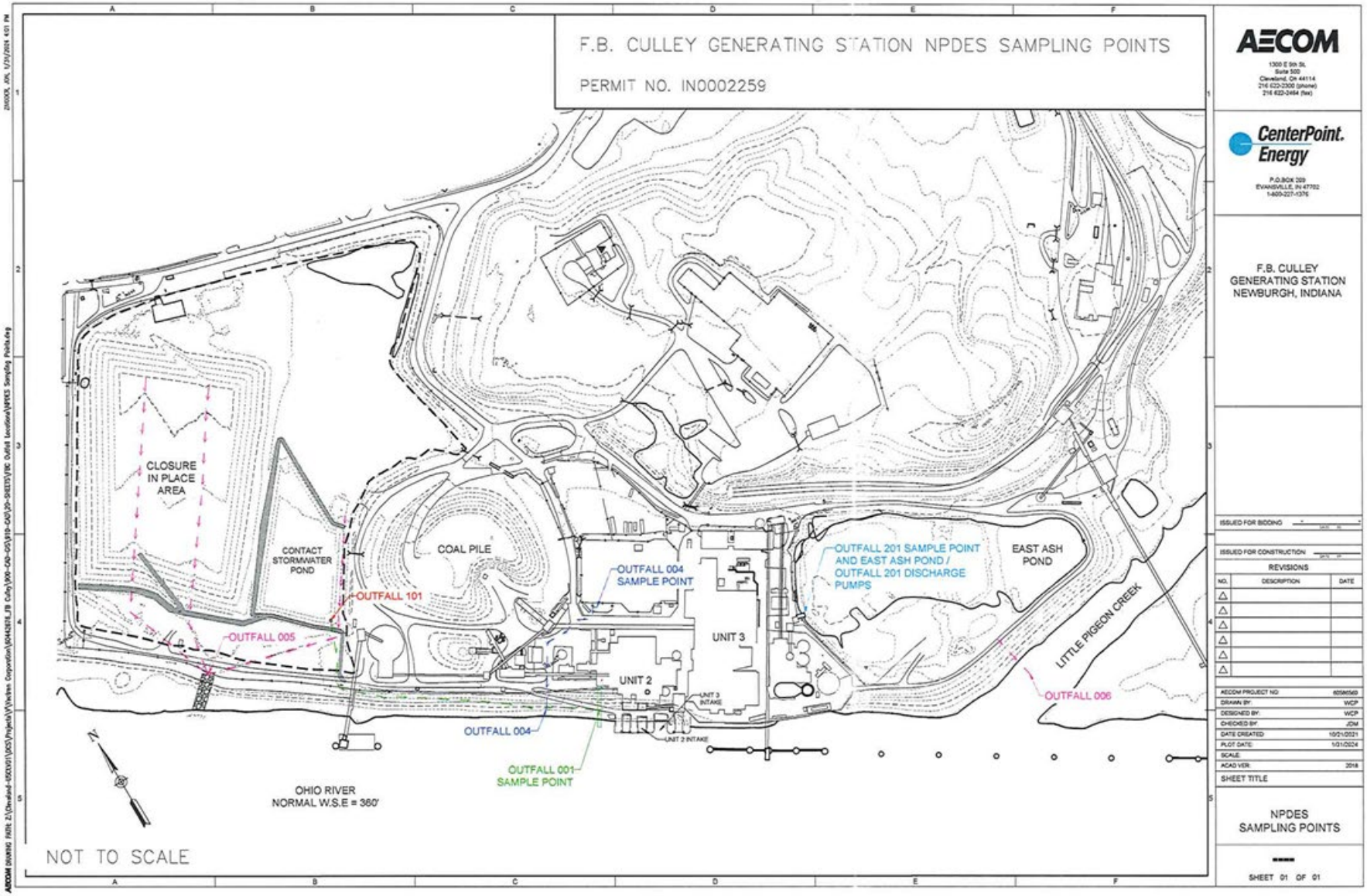
A map showing the location of the facility is included as Figure 1. A map showing locations of the outfalls/sampling locations is included as Figure 2.

**Figure 1: Facility Location**




3711 Darlington Road
Newburgh, IN 47630
Warrick County

**Figure 2: Outfalls/Sampling Location Map**



## 2.2 Outfall Locations

All outfalls are listed here, with the new outfall in **BOLD**. Only the new outfall is affected by the proposed permit modification.

| Outfall # | Location | | Corresponding Permit Table |
|---|---|---|---|
| Outfall 001 | Latitude | 37º 54' 35.39" | Part I.A.1 |
| | Longitude | -87º 19' 37.99" | |
| Outfall 101 | Latitude | 37º 54' 44.36" | Part I.A.2 |
| | Longitude | -87º 19' 50.81" | |
| Outfall 201 | Latitude | 37º 54' 34.49" | Part I.A.3 |
| | Longitude | -87º 19' 27.59" | |
| Outfall 401 | Latitude | 37º 54' 34.78" | Part I.A.4 |
| | Longitude | -87º 19' 28.98" | |
| Outfall 004 | Latitude | 37º 54' 38.36" | Part I.A.5 |
| | Longitude | -87º 19' 35.09" | |
| Outfall 005 | Latitude | 37º 54' 42.40" | Part I.A.6 |
| | Longitude | -87º 19' 51.49" | |
| **Outfall 006** | **Latitude** | **37˚ 54' 29.01"** | **Part I.A.7** |
| | **Longitude** | **-87º 19' 20.66"** | |
| Outfall 000 | Administrative Outfall | | Part I.A.8 |

## 3.0 PERMIT MODIFICATION

## 3.1 Modification Request

Southern Indiana Gas and Electric Company (SIGECO) is requesting permit language modifications to the F.B. Culley Generating Station NPDES Permit (No. IN0002259) for activities and changes related to future water management and the temporary perimeter gradient control wells that were added to the facility NPDES permit during a prior modification. The East Ash Pond is currently in the closure process to comply with the Coal Combustion Residuals (CCR) Part A Final Rule. Closure of the East Ash Pond will include removal of the CCR material, verification of the removal of the CCR material, stabilization of disturbed areas (topsoil and vegetative cover), and the installation of a storm water discharge channel that will discharge to the Little Pigeon Creek near its confluence with the Ohio River. The water discharge channel will serve two purposes, as follows:

1. To enable safe construction activities during the closure of the East Ash Pond, a temporary perimeter gradient control well system will be installed outside the limits of the pond. The perimeter gradient control well system will consist of a series of wells which will function for approximately 18-months during construction activities to limit intrusion of Ohio River water into the sides and base of the East Ash Pond. The lower portion of the discharge channel will first be constructed to manage discharge of water collected from the perimeter gradient control well system. The lower portion of the discharge channel will extend from the current Ohio River water surface elevation to a point up the existing embankment to an elevation higher than the seasonal high-water of the Ohio River to allow for the perimeter gradient control well system outlet pipes to remain above the Ohio River during construction activities.

2. The remaining portions of the discharge channel will be constructed following completion of pond excavation activities. The ultimate function of the discharge channel will be to manage noncontact stormwater collected in the former footprint of the East Ash Pond as well as any river water that may enter this area during seasonal high river levels.

A new Outfall 006 is requested for discharge of temporary flows from the perimeter gradient control well system during the ash pond closure process and to manage post-closure noncontact storm and river water flows.

In addition to the request to add a new Outfall 006, a modification of the description to Internal Outfall 201 is requested. In the previous permit modification dated June 21, 2023, the description of Internal Outfall 201 was modified for re-routing of flows away from Internal Outfall 201. These modifications included ceasing discharges from the East Ash Pond, while Internal Outfall 201 would remain in the permit for discharging water from the perimeter gradient control system. Further development of the perimeter gradient control system has identified the need to temporarily discharge higher flows to Internal Outfall 201 than provided in the previous modification request. In addition to the increased flow rate to Internal Outfall 201, flows in excess of Internal Outfall 201's system capacity are anticipated and will be diverted to the new Outfall 006 described previously.

An updated facility water balance diagram is included as Figure 3.

Outfall 201 and proposed Outfall 006 are shown in Figure 4.

## Figure 3: Facility Water Balance Diagram

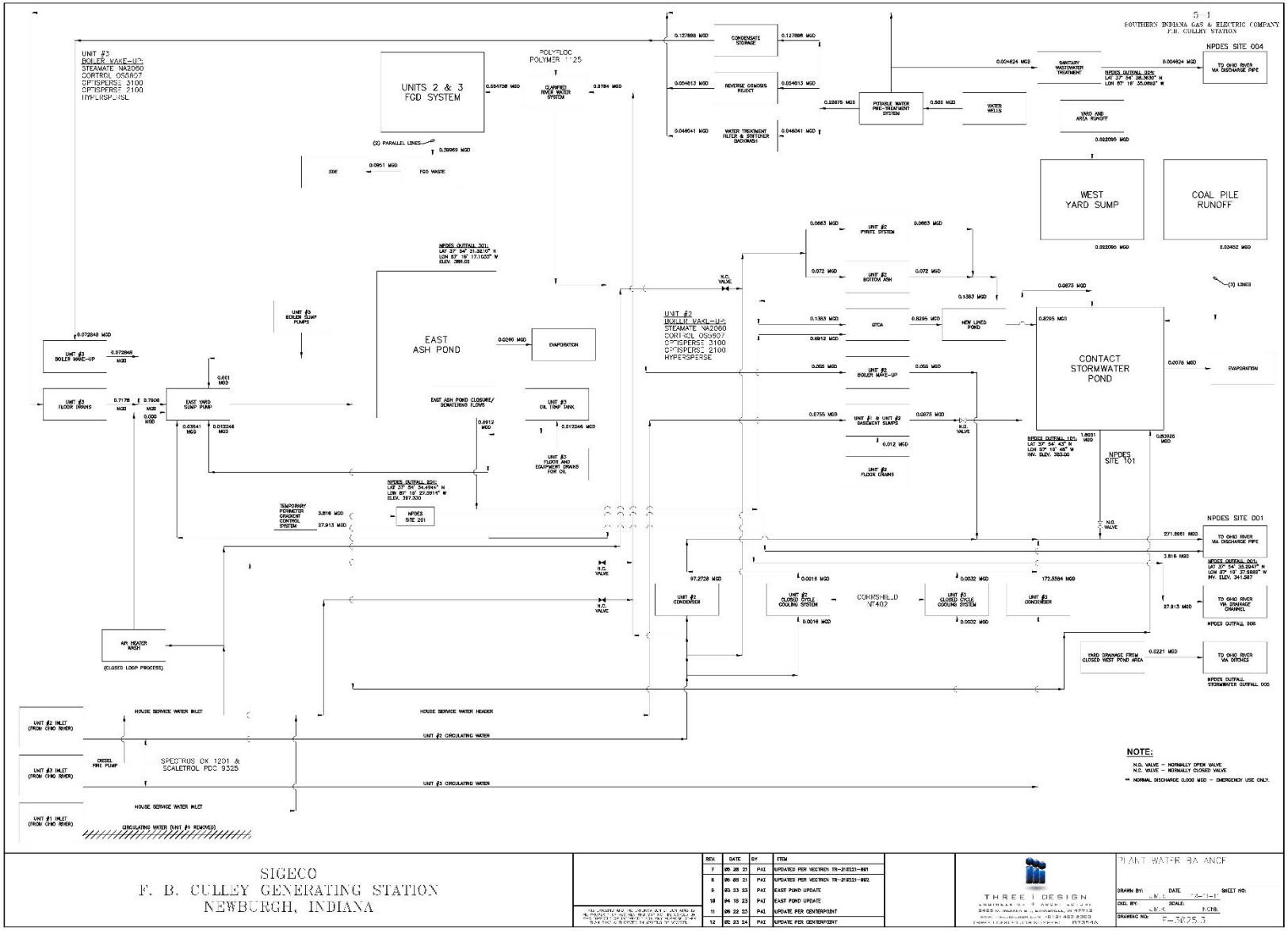
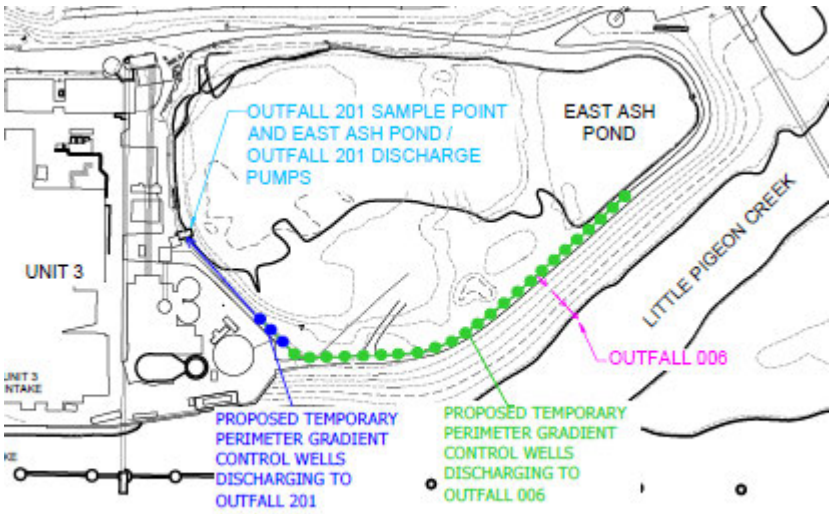


**Figure 4: Outfall 201 and proposed Outfall 006**




## 3.2 IDEM's Proposed Modification

The requested permit modification is approved. The following changes have been made:

1. Outfall 006 (Permit Part I.A.6; pages 17-19 of 79)

   Outfall 006 is a new outfall proposed to regulate flows from the perimeter gradient control well system during the East ash pond closure process and to manage post-closure noncontact stormwater flows. This outfall will have sampling requirements consistent with similar NPDES permits issued in Indiana.

   ***Flow***

   The effluent flow is to be monitored in accordance with 327 IAC 5-2-13(a)(2).

   ***pH***

   Discharges to waters of the state are limited to the range of 6.0-9.0 s.u., in accordance with 327 IAC 2-1-6(b)(2).

   **Total Dissolved Solids, Total Suspended Solids (TSS), Antimony, Arsenic, Barium, Boron, Cadmium, Chloride, Chromium (Hexavalent), Chromium (Total), Cobalt, Fluoride, Lithium, Lead, Mercury, Molybdenum, Selenium, Sulfate, Thallium, and Zinc**

   This facility is a coal-fired steam electric generating plant which has historically used unlined ash ponds. The West Ash Pond was closed prior to the 2023 permit renewal and the East Ash Pond is currently being closed to comply with the Coal Combustion Residuals (CCR) Part A Final Rule.

Unlined ash ponds are potential sources of pollutants associated with coal ash, which could be present in groundwater. Monitoring is proposed to evaluate the presence of these pollutants, and data collected will be used to determine if any of the pollutants have reasonable potential to exceed (RPE) water quality criteria, where a water quality standard has been established and included in 327 IAC 2-1-6.

Fluoride, sulfate, and TDS were selected for monitoring based on the list of constituents for detection monitoring of CCR contaminants found in 40 CFR 257 Appendix III. Antimony, arsenic, barium, cadmium, cobalt, lead, lithium, molybdenum, selenium, and thallium were selected for monitoring based on the list of constituents for assessment monitoring of CCR contaminants found in 40 CFR 257 Appendix IV. Hexavalent chromium was selected for monitoring based on 329 IAC 10 under the discretion of IDEM OLQ.

TSS, total chromium, mercury and zinc were selected because they are pollutants of concern in 40 CFR 423. Boron and chloride were selected because these pollutants are known to be associated with coal ash.

2. While only pages 1, 17, 18, and 19 of the permit have been modified, pages 1 through 21 are being provided to remove the blank pages of the permit.

3. Descriptions of Outfalls 001, 201, and 006 have been updated and changes are in **BOLD**. All facility outfalls are included here for the record.

Outfall 001:

Final Outfall 001 discharges to the Ohio River near river mile 773. According to the renewal application, the long-term average flow from the outfall is 181.6 MGD. Using data obtained from EPA ECHO, the design flow (highest monthly average) based on the most recent 2 years of data is 293 MGD. Treatment of the condenser cooling water includes the use of chlorine and bromine. Operations contributing to the flow include:

- Two (2) Condenser Cooling units (178.3 MGD). Includes Unit #2 and Unit #3.
- Unit #2 Boiler Make-Up Water (0.055 MGD).
- Contact Stormwater Pond discharge (1.805 MGD). See Outfall 101 description below.
- Perimeter gradient control wells (**3.816 MGD**). See Outfall 201 description below.
- Treated metal cleaning wastewater (0.05 – 0.07 MGD). See Outfall 401 below.

Outfall 101:

Internal Outfall 101 is an internal outfall and is the discharge from the Contact Stormwater Pond. Using data obtained from EPA ECHO, the design flow (highest monthly average) based on the most recent 2 years of data is 3.78 MGD. Flow from Outfall 101 ultimately discharges through Outfall 001. Treatment of the contact stormwater pond water consists of sedimentation. The Contact Stormwater Pond receives water from:

- Coal pile run-off.
- New Lined Pond (Unit 2 Bottom Ash Transport water filtrate, East Ash Pond water filtrate from removal of legacy ash pond water and stormwater).
- West yard sump. Includes Unit #1 basement sump & Unit #2 basement sump (which includes the Unit #2 floor drains).
- East side yard sump. Includes Unit #3 Oil Trap Tank, floor drains, greensand water treatment filters regenerant and backwash, softener regenerant streams, RO rejects, Unit #3 Boiler make-up (source is condensate storage), Unit #3 boiler sump pumps, air heater & boiler washes, clarified river water system backwash, and potable water pre-treatment system.
- Metal cleaning wastewater. See Outfall 401.

**Outfall 201:**

Internal Outfall 201 is an internal outfall and will consist of discharge from the East Ash Pond perimeter gradient control wells. **As part of a previous permit modification issued August 30, 2023, the facility projected the flow from this outfall to be 1.0 MGD. As part of the current permit modification application, the facility has amended the projected flow to 3.816 MGD.** Current limits are being retained.

Outfall 401:

Internal Outfall 401 is an internal outfall which consists of metal cleaning wastewater. Metal cleaning occurs approximately once every 18 months. Metal cleaning wastewater is containerized and treated using pH adjustment, coagulation, and settling prior to commingling with other wastestreams. The treated metal cleaning wastewater will primarily be reused in the FGD process. However, treated metal cleaning wastewater may also be discharged to the closest yard drain, which would then go to the East Yard Sump where it would be combined with other discharges prior to entering the Contact Storm Water Pond, which discharges to Outfall 001 via internal Outfall 101. A single metal cleaning discharge event has an estimated total of 50,000 – 70,000 gallons. Internal Outfall 401 was established as the compliance point for discharging treated metal cleaning wastewater. Because the location of this activity is variable, yet the discharge always passes through the East Yard Sump, the latitude and longitude of the East Yard Sump will be used as Outfall 401 for data entry purposes. Samples should be collected after treatment and prior to entering a yard drain.

Outfall 004:

Final Outfall 004 consists of discharge from the sanitary wastewater package plant to the Ohio River. Treatment of the sanitary water consists of activated sludge and disinfection with ultraviolet light. Using data obtained from EPA ECHO, the design flow (highest monthly average) based on the most recent 2 years of data is 0.0249 MGD.

Outfall 005:

Final Outfall 005 consists of noncontact stormwater from the final cover system of the former West Ash Pond and adjacent green areas of the plant. The noncontact stormwater drains through a series of flow channels prior to discharging into the Ohio River via Outfall 005. The discharge from this outfall is not treated. Using data obtained from EPA ECHO, the maximum total flow reported during the most recent 2 years is 0.64 MGD. Flow will be variable due to the nature of the discharge.

**Outfall 006:**

**Final Outfall 006 is a proposed new outfall that will discharge from the perimeter gradient control wells (27.913 MGD) located outside the perimeter of the East Ash Pond to Little Pigeon Creek near its confluence with the Ohio River. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact storm water from the former footprint of the East Ash Pond and adjacent green areas surrounding the former footprint. The calculated peak discharge of noncontact stormwater is 3.364 MGD for the 100-yr design storm event.**

Outfall 000:

This is an administrative outfall for cooling water intake structure reporting.

## 3.3 Antibacksliding

Indiana's prohibitions on backsliding under 327 IAC 5-2-10(a)(11) are applicable to BPJ case-by-case technology-based effluent limitations, when proposed to be increased based on subsequently promulgated effluent guidelines under Section 304(b) of the CWA, and limitations based on Indiana water quality standards or treatment standards (327 IAC 5-10). Prohibitions on other types of backsliding (e.g., backsliding from limitations derived from effluent guidelines, from existing case-by-case limitations to new case-by-case limitations, and from conditions such as monitoring requirements that are not effluent limitations) are covered under federal regulation at 40 CFR 122.44(l)(1).

Under 327 IAC 5-2-10(a)(11), unless an exception under 327 IAC 5-2-10(a)(11)(B) applies, a permit may not be renewed, reissued or modified to contain effluent limitations that are less stringent than the comparable effluent limitations in the previous permit. For effluent limitations based on Indiana water quality or treatment standards, less stringent effluent limitations may also be allowed if they are in compliance with Section 303(d)(4) of the CWA. Under 40 CFR 122.44(l)(1), a permit may not be renewed or reissued to contain less stringent interim effluent limitations, standards or conditions than the final effluent limitations, standards or conditions in the previous permit unless the circumstances on which the previous permit was based have materially and substantially changed since the time the permit was issued and would constitute cause for permit modification or revocation and reissuance under 40 CFR 122.62.

None of the limits included in this permit are less stringent than the comparable effluent limitations in the previous permit, therefore, backsliding is not an issue in accordance with 327 IAC 5-2-10(a)(11) and 40 CFR 122.44(l)(1).

## 3.4 Antidegradation

Indiana's Antidegradation Standards and Implementation procedures are outlined in 327 IAC 2-1.3. The antidegradation standards established by 327 IAC 2-1.3-3 apply to all surface waters of the state. The permittee is prohibited from undertaking any deliberate action that would result in a new or increased discharge of a bioaccumulative chemical of concern (BCC) or a new or increased permit limit for a regulated pollutant that is not a BCC unless information is submitted to the commissioner demonstrating that the proposed new or increased discharge will not cause a significant lowering of water quality, or an antidegradation demonstration submitted and approved in accordance 327 IAC 2-1.3-5 and 2-1.3-6.

The NPDES permit does not propose to establish a new or increased loading of a regulated pollutant; therefore, the Antidegradation Implementation Procedures in 327 IAC 2-1.3-5 and 2-1.3-6 do not apply to the permitted discharge.

## 3.5 Spill Response and Reporting Requirement

Reporting requirements associated with the Spill Reporting, Containment, and Response requirements of 327 IAC 2-6.1 are included in Part II.B.2.(d), Part II.B.3.(c), and Part II.C.3. of the NPDES permit. Spills from the permitted facility meeting the definition of a spill under 327 IAC 2-6.1-4(15), the applicability requirements of 327 IAC 2-6.1-1, and the Reportable Spills requirements of 327 IAC 2-6.1-5 (other than those meeting an exclusion under 327 IAC 2-6.1-3 or the criteria outlined below) are subject to the Reporting Responsibilities of 327 IAC 2-6.1-7.

It should be noted that the reporting requirements of 327 IAC 2-6.1 do not apply to those discharges or exceedances that are under the jurisdiction of an applicable permit when the substance in question is covered by the permit and death or acute injury or illness to animals or humans does not occur. In order for a discharge or exceedance to be under the jurisdiction of this NPDES permit, the substance in question (a) must have been discharged in the normal course of operation from an outfall listed in this permit, and (b) must have been discharged from an outfall for which the permittee has authorization to discharge that substance.

## 3.6 Permit Processing/Public Comment

Pursuant to IC 13-15-5-1, IDEM will publish the draft permit document online at https://www.in.gov/idem/public-notices/. Additional information on public participation can be found in the "Citizens' Guide to IDEM", available at https://www.in.gov/idem/resources/citizens-guide-to-idem/. A 30-day comment period is available to solicit input from interested parties, including the public.

## 3.7 Post Public Notice Addendum

| Warrick | | | | |
|---|---|---|---|---|
| United Minerals Co LLC - Seven Hills Mine | NPDES General Permit Public Notice [PDF] | 03/27/2024 - 04/15/2024 | No | Permit Number: ING040290<br>Project Manager: Burget, Catherine A |
| Pigeon Township RSD WWTP | NPDES Final Permit Public Notice [PDF] | 03/26/2024 - 04/12/2024 | No | Permit Number: IN0062049<br>Project Manager: Eilerman, Nicholas |
| F.B. Culley Generating Station | NPDES Draft Permit Public Notice [PDF] | 03/19/2024 - 04/19/2024 | Yes | Permit Number: IN0002259<br>Project Manager: Gardner, Nicole |

The draft NPDES permit for the SIGECO F.B. Culley Generating Station was made available for public comment from March 19, 20224, through April 19, 2024, as part of Public Notice No. 20240319 – IN0002259– D on IDEM's website at https://www.in.gov/idem/public-notices/public-notices-all-regions/. During this comment period, no comment letters were received.

**STATE OF INDIANA**
**DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**
**PUBLIC NOTICE NO: 20240503 – IN0002259 – F**
**DATE OF NOTICE: May 03, 2024**

**The Office of Water Quality has issued the following FINAL NPDES PERMIT:**

**MAJOR MODIFICATION:**

**SIGECO F.B. CULLEY GENERATING STATION**, Permit No. IN0002259, WARRICK COUNTY, 3711 Darlington Road, Newburgh, IN. This facility is a coal-fired steam electric generating plant with two (2) generating units. The permittee has requested to add a new outfall to the permit, Outfall 006 and to modify the description of internal Outfall 201. IDEM has agreed to modify the above-named permit. Outfall 006 is located at 37º 54' 29.01" N, -87º 19' 20.66" W and will discharge non-contact stormwater at a rate of 3.364 MGD to the Ohio River. Permit Manager: Nikki Gardner, 317/232-8707, ngardner@idem.in.gov. Posted online at https://www.in.gov/idem/public-notices/.

## Notice of Right to Administrative Review

If you wish to challenge this Permit, you must file a Petition for Administrative Review with the Office of Adjudication (OEA) and serve a copy of the Petition upon IDEM. The requirements for filing a Petition for Administrative Review are found in IC 4-21.5-3-7, IC 13-15-6-1 and 315 IAC 1-3-2. A summary of the requirements of these laws is provided below.

A Petition for Administrative Review must be filed with the Office of Environmental Adjudication (OEA) within fifteen (15) days of the issuance of this notice (eighteen (18) days if you received this notice by U.S. Mail), and a copy must be served upon IDEM. Addresses are:

Director
Office of Environmental Adjudication
Indiana Government Center North
100 North Senate Avenue - Room N103
Indianapolis, Indiana 46204

Commissioner
Indiana Department of Environmental Management
Indiana Government Center North
100 North Senate Avenue - Room 1301
Indianapolis, Indiana 46204

The Petition must contain the following information:

1. The name, address and telephone number of each petitioner.
2. A description of each petitioner's interest in the Permit.
3. A statement of facts demonstrating that each petitioner is:
   a. a person to whom the order is directed.
   b. aggrieved or adversely affected by the Permit.
   c. entitled to administrative review under any law.

4. The reasons for the request for administrative review.
5. The particular legal issues proposed for review.
6. The alleged environmental concerns or technical deficiencies of the Permit.
7. The Permit terms and conditions that the petitioner believes would be appropriate and would comply with the law.
8. The identity of any persons represented by the petitioner.
9. The identity of the person against whom administrative review is sought.
10. A copy of the Permit that is the basis of the petition.
11. A statement identifying petitioner's attorney or other representative, if any.

Failure to meet the requirements of the law with respect to a Petition for Administrative Review may result in a waiver of your right to seek administrative review of the Permit. Examples are:

1. Failure to file a Petition by the applicable deadline.
2. Failure to serve a copy of the Petition upon IDEM when it is filed; or
3. Failure to include the information required by law.

If you seek to have a Permit stayed during the Administrative Review, you may need to file a Petition for a Stay of Effectiveness. The specific requirements for such a Petition can be found in 315 IAC 1-3-2 and 315 IAC 1-3-2.1.

Pursuant to IC 4-21.5-3-17, OEA will provide all parties with Notice of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action. If you are entitled to Notice under IC 4-21.5-3-5(b) and would like to obtain notices of any pre-hearing conferences, preliminary hearings, hearings, stays, or orders disposing of the review of this action without intervening in the proceeding you must submit a written request to OEA at the address above. More information on the appeal review process is available on the website for the Office of Environmental Adjudication at http://www.in.gov/oea.

**Angela Casbon-Scheller**
Director, Generation Compliance & Carbon Policy
Angela.Casbon-Scheller@CenterPointEnergy.com

P.O. Box 209
Evansville, IN 47702-0209
812-491-4787

February 8, 2024

Submitted via email:
NGardner@idem.IN.gov
OWQWWPer@idem.IN.gov

Ms. Nicole Gardner
Indiana Department of Environmental Management
Office of Water Quality – Industrial NPDES Permit Section
100 North Senate Ave
Indianapolis, IN 46204-2251

RE: NPDES Permit Modification Request
SIGECO F.B. Culley Generating Station
Permit No. IN0002259

Dear Ms. Gardner:

Southern Indiana Gas and Electric Company (SIGECO) is requesting permit language modifications to the F.B. Culley Generating Station NPDES Permit (No. IN0002259) for activities and changes related to future water management and the temporary perimeter gradient control wells that were added to the facility NPDES permit during a prior modification. The East Ash Pond is currently in the closure process to comply with the Coal Combustion Residuals (CCR) Part A Final Rule. Closure of the East Ash Pond will include removal of the CCR material, verification of the removal of the CCR material, stabilization of disturbed areas (topsoil and vegetative cover), and the installation of a storm water discharge channel that will discharge to the Ohio River. The water discharge channel will serve two purposes, as follows:

1. To enable safe construction activities during the closure of the East Ash Pond, a temporary perimeter gradient control well system will be installed outside the limits of the pond. The perimeter gradient control well system will consist of a series of wells which will function for approximately 18-months during construction activities to limit intrusion of Ohio River water into the sides and base of the East Ash Pond. The lower portion of the discharge channel will first be constructed to manage discharge of water collected from the perimeter gradient control well system. The lower portion of the discharge channel will extend from the current Ohio River water surface elevation to a point up the existing embankment to an elevation higher than the seasonal high-water of the Ohio River to allow for the perimeter gradient control well system outlet pipes to remain above the Ohio River during construction activities.
2. The remaining portions of the discharge channel will be constructed following completion of pond excavation activities. The ultimate function of the discharge channel will be to manage non-contact stormwater collected in the former footprint of the East Ash Pond as well as any river water that may enter this area during seasonal high river levels.

A new Outfall 006 is requested for discharge to the Ohio River of temporary flows from the perimeter gradient control well system during the ash pond closure process and to manage post-closure noncontact storm and river water flows.

In addition to the request to add a new Outfall 006, a modification of the description to Internal Outfall 201 is requested. In the previous permit modification dated June 21, 2023, the description of Internal Outfall 201 was modified for re-routing of flows away from Internal Outfall 201. These modifications included ceasing discharges from the East Ash Pond, while Internal Outfall 201 would remain in the permit for discharging water from the

CenterPoint Energy

**Angela Casbon-Scheller**
Director, Generation Compliance & Carbon Policy
Angela.Casbon-Scheller@CenterPointEnergy.com

P.O. Box 209
Evansville, IN 47702-0209
812-491-4787

perimeter gradient control system. Further development of the perimeter gradient control system has identified the need to temporarily discharge higher flows to Internal Outfall 201 than provided in the previous modification request. In addition to the increased flow rate to Internal Outfall 201, flows in excess of Internal Outfall 201's system capacity are anticipated and will be diverted to the new Outfall 006 described previously. These permit language modifications affect the description of Internal Outfall 201, and the addition of new Outfall 006.

We suggest the following language changes in the permit (proposed new language in **bold** text):

- **Part I.A.7**, new section

**The permittee is authorized to discharge water from the outfall listed below in accordance with the terms and conditions of this permit. The permittee is authorized to discharge from Outfall 006, located at Latitude 37° 54' 29.01", Longitude -87° 19' 20.66".**

- Permit Modification Fact Sheet Section 2.2, Outfall Locations:

| | | |
|---|---|---|
| **Outfall 006** | **Lattitude** | **37° 54' 29.01"** |
| | **Longitude** | **-87° 19' 20.66"** |

- Permit Modification Fact Sheet Section 3.2, **Outfall 006:**
  **006: Outfall 006 is an outfall that discharges flows from the perimeter gradient control system (27.913 MGD) located outside the perimeter of the East Ash Pond. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact storm water from the former East Ash Pond and adjacent green areas surrounding the pond. The calculated peak discharge of noncontact stormwater is 3.364 MGD for the 100-yr design storm event. The noncontact storm water drains through an outlet channel prior to discharging into the Ohio River via Outfall 006.**

Attached to this letter is the outfall descriptions document that was included in the renewal application packet, with proposed edits as they relate to this modification request. A copy of the updated water balance diagram will be provided once the modifications are deemed acceptable and upon request from IDEM.

If you have any questions about the enclosed information, please contact me at 812-491-4787 or Angela.Casbon-Scheller@centerpointenergy.com.

Sincerely,

Angela Casbon-Scheller
Director, Generation Compliance and Carbon Policy
Environmental Department

Cc: File

SIGECO F.B. Culley Generating Station
NPDES Permit IN0002259 Renewal Application
February 8, 2024

Outfall List

- 001: Outfall 001 discharges to the Ohio River near river mile 773. The average flow from the outfall is 181.6 MGD. Operations contributing to the flow include:
  - Condenser Cooling – two units (269.836 MGD). Treatment includes the use of chlorine (treatment code 2-F) and bromine (2-H)
  - Unit #2 Boiler Make-Up – 0.055 MGD
  - Contact Storm Water pond discharge (see Outfall 101 description below) – 1.805 MGD
  - Perimeter gradient control wells (see Outfall 201 description below) – **3.816 MGD**

- 004: Outfall 004 is an outfall regulating the discharge from the sanitary wastewater package plant. The average flow is 0.011 MGD and the outfall discharges to the Ohio River. Treatment for the sanitary water includes:
  - disinfection with ultra violet light (2-H)
  - activated sludge (3-A)

- 101: Outfall 101 is an internal outfall regulating the discharge from the contact storm water pond (1.805 MGD). The contact storm water pond receives water from the coal pile run-off, new lined pond, west yard sump, and Unit #1 & Unit #2 basement sumps (which includes the Unit #2 floor drains), oil separation tank, east side yard sump, boiler seal troughs, floor drains, greensand water treatment filters regenerant and backwash, softener regenerant streams, and RO rejects. Flow from Outfall 101 ultimately discharges through Outfall 001. Treatment for the contact storm water pond water includes:
  - Polymer addition
  - sedimentation (1-U)

- 201: Outfall 201 is an internal outfall regulating the discharge from the East ash pond perimeter gradient control wells **(3.816 MGD)**. The outfall combines with other plant waters and discharges through Outfall 001.

- 101AS: Semi-Annual monitoring requirements for standard stormwater parameters are included in Internal Outfall 101. Those parameters are reported on a separate Discharge Monitoring Report that is identified as Outfall 101AS.

- 005: Outfall 005S discharges noncontact storm water from the final cover system of the former West Ash Pond and adjacent green areas of the plant. The noncontact storm water drains through a series of flow channels prior to discharging into the Ohio River via Outfall 005.

- **006: Outfall 006 is an outfall that discharges flows from the perimeter gradient control wells (27.913 MGD) located outside the perimeter of the East Ash Pond. Following the cessation of pumping from the perimeter gradient control wells, Outfall 006 will discharge noncontact storm water from the former footprint of the East Ash Pond and adjacent green areas surrounding the former footprint. The calculated peak discharge of noncontact stormwater is 3.364 MGD for the 100-yr design storm event. The noncontact storm water drains through an outlet channel prior to discharging into the Ohio River via Outfall 006.**

- 000: This is the intake structure for water entering the plant.

Water Treatment Additives

The following water treatment additives are used in processes that contribute to Outfall 001 and have been previously approved by IDEM: Scaletrol PDC 9325, Sodium Bisulfite, Cortrol OS 5607, Steamate NA 0280, Optisperse HTP 3001, Optisperse HP 3100, Optisperse HP 2100, Spectrus OX 1201, Corrshield NT 402, Polyfloc AE 1125, 12.5% Bleach (Sodium Hypochlorite), Ferric Chloride, Potassium Permanganate, Metclear 2405, Klaraid PC1190 (polymer), Sodium Hydroxide, and Sodium Chloride.

Microbe-Lift is a water treatment additives that is used in the sanitary wastewater treatment process that discharges to Outfall 004.

Form 2C Data Explanation

Form 2C, part V data was obtained from monthly MMR data sheets (September 2018 – August 2021) previously submitted to the IDEM and two Form 2C specific sampling events on March 18, 2021 and July 20, 2021. The "Long Term Average Value" column is the average of the monthly averages reported on the MMRs during the past one-year period. The "Maximum 30-Day Values" column is the highest calendar month average that occurred during the data set. All supporting data has been summarized in spreadsheets which are included in tab 2 of this application.

Drawings in Tab 7

- Plant water balance diagram (full size and 11 x 17)
- Outfall Locations
- Google Earth view

## I. Identification of Potentially Affected Persons

Please list here any and all persons whom you have reason to believe have a substantial or proprietary interest in this matter, or could otherwise be considered to be potentially affected under the law. Failure to notify any person who is later determined to be potentially affected could result in voiding our decision on procedural grounds. To ensure conformance with AOPA and to avoid reversal of a decision, please list all such parties. The letter attached to this form will further explain the requirements under the AOPA. Attach additional names and addresses on a separate sheet of paper, as needed. Please indicate below the type of action you are requesting.

| | | |
|---|---|---|
| Name: Dan Saylor - Warrick County Commissioner | | Name: Terry Phillippe - Warrick County Commissioner |
| Street address: Old Courthouse 107 West Locust, Ste 301 | | Street address: Old Courthouse 107 West Locust, Ste 301 |
| City/State/ZIP code: Boonville, IN 46701 | | City/State/ZIP code: Boonville, IN 46701 |
| | | |
| Name: Robert Johnson - Warrick County Commissioner | | Name: Stacie Krieger - Newburgh Town Council President |
| Street address: Old Courhouse 107 West Locust, Ste 301 | | Street address: 23 W. Jennings Street |
| City/State/ZIP code: Boonville, IN 46701 | | City/State/ZIP code: Newburgh, IN 47630 |
| | | |
| Name: Christy L. Powell - Newburgh Town Manager | | Name: |
| Street address: 23 W. Jennings Street | | Street address: |
| City/State/ZIP code: Newburgh,, IN 47630 | | City/State/ZIP code: |
| | | |
| Name: | | Name: |
| Street address: | | Street address: |
| City/State/ZIP code: | | City/State/ZIP code: |
| | | |
| Name: | | Name: |
| Street address: | | Street address: |
| City/State/ZIP code: | | City/State/ZIP code: |
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| Name: | | Name: |
| Street address: | | Street address: |
| City/State/ZIP code: | | City/State/ZIP code: |
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| Street address: | | Street address: |
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| Street address: | | Street address: |
| City/State/ZIP code: | | City/State/ZIP code: |
| | | |
| Name: | | Name: |
| Street address: | | Street address: |
| City/State/ZIP code: | | City/State/ZIP code: |

## II. Please complete this form by signing the following statement.

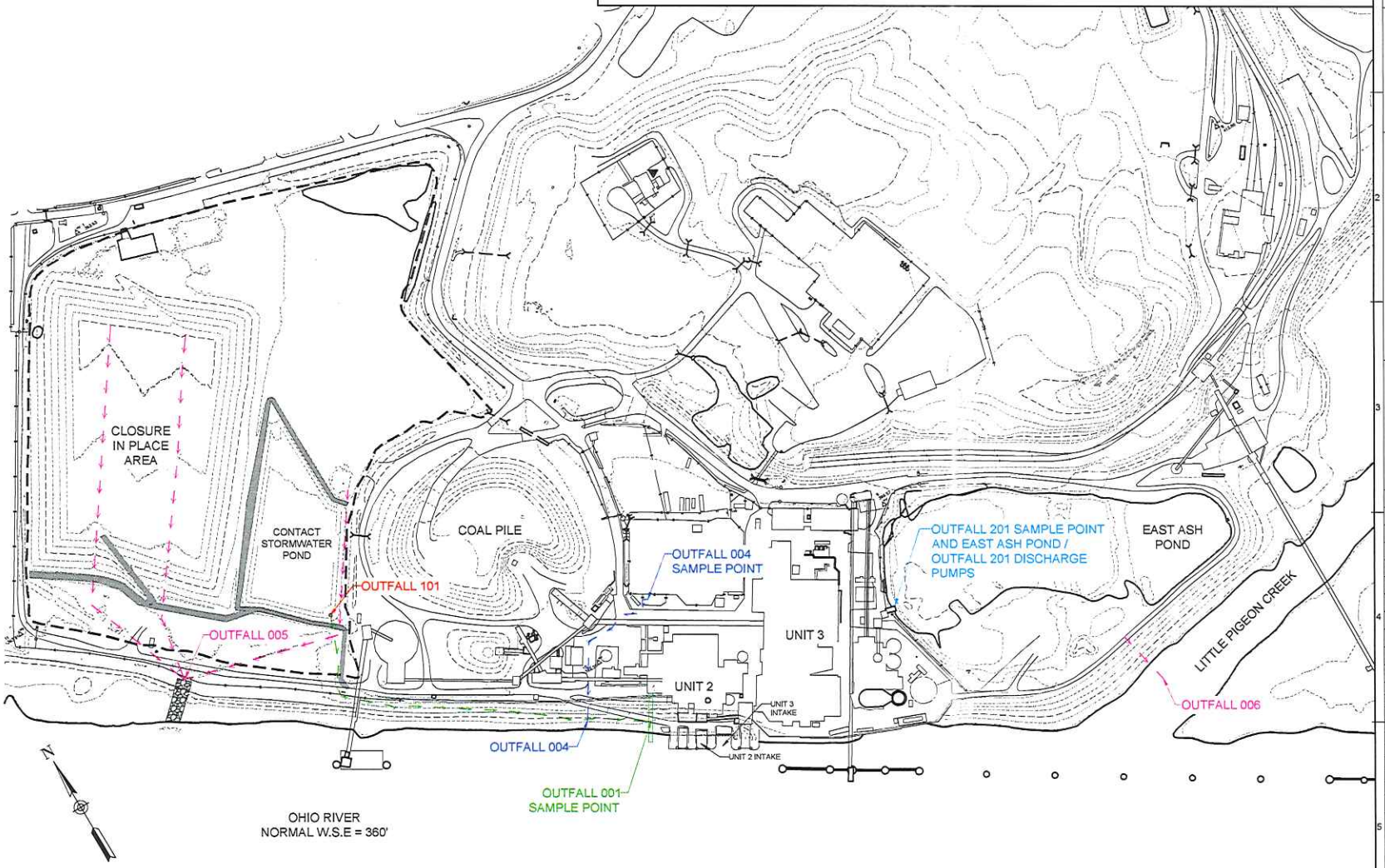
| | | |
|---|---|---|
| I certify to the best of my knowledge I have listed all potentially affected parties, as defined by IC 4-21.5. | | |
| Signature: F Shane Bradford | | |
| Printed name: F. Shane Bradford | | Date *(month, day, year)*: 2-8-2024 |
| Name of facility: Southern Indiana Gas and Electric Company, F.B. Culley Generating Station | | |
| Address of facility *(number and street)*: 3711 Darlington Road | | |
| City of facility: Newburgh | State of facility: IN | ZIP code: 47630 |

## III. Type of Action (check one)

- ☑ NPDES Permit-327 IAC 5
- ☐ Pretreatment Permit -327 IAC 5
- ☐ Construction Permit-327 IAC 3

# F.B. CULLEY GENERATING STATION NPDES SAMPLING POINTS

PERMIT NO. IN0002259




NOT TO SCALE


AECOM
1300 E 9th St.
Suite 500
Cleveland, Oh 44114
216 622-2300 (phone)
216 622-2464 (fax)

CenterPoint Energy
P.O.BOX 209
EVANSVILLE, IN 47702
1-800-227-1376


F.B. CULLEY
GENERATING STATION
NEWBURGH, INDIANA

ISSUED FOR BIDDING — DATE: - BY: -

ISSUED FOR CONSTRUCTION — DATE: BY:

REVISIONS

| NO. | DESCRIPTION | DATE |
|---|---|---|
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|---|---|
| AECOM PROJECT NO: | 60586560 |
| DRAWN BY: | WCP |
| DESIGNED BY: | WCP |
| CHECKED BY: | JDM |
| DATE CREATED: | 10/21/2021 |
| PLOT DATE: | 1/31/2024 |
| SCALE: | |
| ACAD VER: | 2018 |

SHEET TITLE

NPDES
SAMPLING POINTS

SHEET 01 OF 01


AECOM DRAWING PATH: Z:\Cleveland-USCLV01\DCS\Projects\VVVectren Corporation\60442876_FB Culley\900-CAD-GIS\910-CAD\20-SHEETS\FBC Outfall Locations\NPDES Sampling Points.dwg
ZIMMER, JON, 1/31/2024 4:01 PM

SOUTHERN INDIANA GAS & ELECTRIC COMPANY
F.B. CULLEY STATION

UNIT #3
BOILER MAKE-UP:
STEAMATE NA2060
CORTROL OS5607
OPTISPERSE 3100
OPTISPERSE 2100
HYPERSPERSE

POLYFLOC
POLYMER 1125

UNITS 2 & 3
FGD SYSTEM

0.654738 MGD

CLARIFIED
RIVER WATER
SYSTEM

0.9784 MGD

(2) PARALLEL LINES

0.39969 MGD

SDE

0.0951 MGD

FGD WASTE

0.127898 MGD

CONDENSATE
STORAGE

0.127898 MGD

0.054813 MGD

REVERSE OSMOSIS
REJECT

0.054813 MGD

0.046041 MGD

WATER TREATMENT
FILTER & SOFTENER
BACKWASH

0.046041 MGD

0.22875 MGD

POTABLE WATER
PRE-TREATMENT
SYSTEM

0.500 MGD

WATER
WELLS

0.004624 MGD

SANITARY
WASTEWATER
TREATMENT

0.004624 MGD

NPDES OUTFALL 004:
LAT 37° 54' 38.3630" N
LON 87° 19' 35.0892" W

NPDES SITE 004

TO OHIO RIVER
VIA DISCHARGE PIPE

YARD AND
AREA RUNOFF

0.022095 MGD

WEST
YARD SUMP

COAL PILE
RUNOFF

0.03452 MGD

(3) LINES

0.072848 MGD

UNIT #3
BOILER MAKE-UP

0.072848
MGD

UNIT #3
BOILER SUMP
PUMPS

NPDES OUTFALL 301:
LAT 37° 54' 31.3210" N
LON 87° 19' 17.1033" W
ELEV. 389.00

EAST
ASH POND

0.0260 MGD

EVAPORATION

UNIT #3
FLOOR DRAINS

0.7178
MGD

0.7906
MGD

0.000
MGD

EAST YARD
SUMP PUMP

0.001
MGD

0.03541
MGD

0.012246
MGD

EAST ASH POND CLOSURE/
DEWATERING FLOWS

0.6912
MGD

UNIT #3
OIL TRAP TANK

0.012246 MGD

UNIT #3
FLOOR AND
EQUIPMENT DRAINS
FOR OIL

NPDES OUTFALL 201:
LAT 37° 54' 34.4944" N
LON 87° 19' 27.5914" W
ELEV. 397.330

TEMPORARY
PERIMETER
GRADIENT
CONTROL
SYSTEM

3.816 MGD

27.913 MGD

NPDES
SITE 201

N.C.
VALVE

UNIT #2
PYRITE SYSTEM

0.0663 MGD

0.0663 MGD

UNIT #2
BOTTOM ASH

0.072 MGD

0.072 MGD

0.1383 MGD

UNIT #2
BOILER MAKE-UP

0.055 MGD

0.055 MGD

UNIT #2
FLOOR DRAINS

UNIT #2
MAKE-UP:
STEAMATE NA2060
CORTROL OS5607
OPTISPERSE 3100
OPTISPERSE 2100
HYPERSPERSE

0.1383 MGD

GTCA

0.8295 MGD

NEW LINED
POND

0.6912 MGD

0.0755 MGD

UNIT #1 & UNIT #2
BASEMENT SUMPS

0.0875 MGD

N.O.
VALVE

0.012 MGD

0.0875 MGD

0.8295 MGD

CONTACT
STORMWATER
POND

0.0078 MGD

EVAPORATION

NPDES OUTFALL 101:
LAT 37° 54' 43" N
LON 87° 19' 45" W
INV. ELEV. 383.00

1.8051
MGD

0.83926
MGD

NPDES
SITE 101

N.O.
VALVE

NPDES SITE 001

271.6961 MGD

TO OHIO RIVER
VIA DISCHARGE PIPE

3.816 MGD

NPDES OUTFALL 001:
LAT 37° 54' 35.2947" N
LON 87° 19' 37.9869" W
INV. ELEV. 341.587

27.913 MGD

TO OHIO RIVER
VIA DRAINAGE
CHANNEL

NPDES OUTFALL 006

N.C.
VALVE

N.C.
VALVE

97.2728 MGD

UNIT #2
CONDENSER

0.0016 MGD

UNIT #2
CLOSED CYCLE
COOLING SYSTEM

0.0016 MGD

CORRSHIELD
NT402

0.0032 MGD

UNIT #3
CLOSED CYCLE
COOLING SYSTEM

0.0032 MGD

172.5584 MGD

UNIT #3
CONDENSER

AIR HEATER
WASH

(CLOSED LOOP PROCESS)

YARD DRAINAGE FROM
CLOSED WEST POND AREA

0.0221 MGD

TO OHIO RIVER
VIA DITCHES

NPDES OUTFALL
STORMWATER OUTFALL 005

UNIT #2 INLET
(FROM OHIO RIVER)

HOUSE SERVICE WATER INLET

HOUSE SERVICE WATER HEADER

UNIT #2 CIRCULATING WATER

UNIT #3 INLET
(FROM OHIO RIVER)

DIESEL
FIRE PUMP

SPECTRUS OX 1201 &
SCALETROL PDC 9325

UNIT #3 CIRCULATING WATER

UNIT #1 INLET
(FROM OHIO RIVER)

HOUSE SERVICE WATER INLET

CIRCULATING WATER (UNIT #1 REMOVED)

**NOTE:**

N.O. VALVE – NORMALLY OPEN VALVE
N.C. VALVE – NORMALLY CLOSED VALVE

** NORMAL DISCHARGE 0.000 MGD – EMERGENCY USE ONLY.

# SIGECO
# F. B. CULLEY GENERATING STATION
# NEWBURGH, INDIANA

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| REV. | DATE | BY | ITEM |
|---|---|---|---|
| 7 | 05 20 21 | PAI | UPDATED PER VECTREN TR-210221-001 |
| 8 | 06 08 21 | PAI | UPDATED PER VECTREN TR-210221-002 |
| 9 | 03 23 23 | PAI | EAST POND UPDATE |
| 10 | 04 18 23 | PAI | EAST POND UPDATE |
| 11 | 06 22 23 | PAI | UPDATE PER CENTERPOINT |
| 12 | 02 23 24 | PAI | UPDATE PER CENTERPOINT |

THREE i DESIGN
ENGINEERING + ARCHITECTURE
2425 W. INDIANA ST., EVANSVILLE, IN 47712
WWW.THREEIDESIGN.COM (812) 423-6500
THREE I DESIGN JOB NUMBER: 07354A

PLANT WATER BALANCE

| | | |
|---|---|---|
| DRAWN BY: J.M.R. | DATE 10-11-11 | SHEET NO: |
| CKD. BY: J.M.R. | SCALE: NONE | |
| DRAWING NO: F-3025.3 | | |

# F.B. CULLEY GENERATING STATION NPDES SAMPLING POINTS

PERMIT NO. IN0002259

CLOSURE IN PLACE AREA

CONTACT STORMWATER POND

COAL PILE

OUTFALL 101

OUTFALL 005

OUTFALL 004 SAMPLE POINT

UNIT 3

UNIT 2

UNIT 3 INTAKE

UNIT 2 INTAKE

OUTFALL 004

OUTFALL 001 SAMPLE POINT

OUTFALL 201 SAMPLE POINT AND EAST ASH POND / OUTFALL 201 DISCHARGE PUMPS

EAST ASH POND

LITTLE PIGEON CREEK

OUTFALL 006

OHIO RIVER
NORMAL W.S.E = 360'

N

NOT TO SCALE


AECOM
1300 E 9th St.
Suite 500
Cleveland, Oh 44114
216 622-2300 (phone)
216 622-2464 (fax)

CenterPoint Energy
P.O.BOX 209
EVANSVILLE, IN 47702
1-800-227-1376


F.B. CULLEY
GENERATING STATION
NEWBURGH, INDIANA

| | | |
|---|---|---|
| ISSUED FOR BIDDING | - DATE | - BY |
| ISSUED FOR CONSTRUCTION | DATE | BY |

REVISIONS

| NO. | DESCRIPTION | DATE |
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| AECOM PROJECT NO: | 60586569 |
| DRAWN BY: | WCP |
| DESIGNED BY: | WCP |
| CHECKED BY: | JDM |
| DATE CREATED: | 10/21/2021 |
| PLOT DATE: | 1/31/2024 |
| SCALE: | |
| ACAD VER: | 2018 |

SHEET TITLE

NPDES
SAMPLING POINTS

SHEET 01 OF 01


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ZWODER, JON, 1/31/2024 4:01 PM

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

| | | |
|---|---|---|
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 29
Bradford 2025 CCR Testimony

**SOUTHERN INDIANA GAS AND ELECTRIC COMPANY**
**d/b/a CENTERPOINT ENERGY INDIANA SOUTH**
**(CEI SOUTH)**

**IURC CAUSE NO. 45052 ECA 6**

# DIRECT TESTIMONY
# OF
# F. SHANE BRADFORD

**VICE PRESIDENT, INDIANA ELECTRIC**

**ON**

**UPDATES ON A.B. BROWN ASH POND CLOSURE PROJECT, F.B. CULLEY 3 COMPLIANCE PROJECT, CCR COMPLIANCE PROJECTS, AND F.B. CULLEY EAST ASH POND CLOSURE PROJECT**

**SPONSORING PETITIONER'S EXHIBIT NO. 1,**
**ATTACHMENT FSB-1 (CONFIDENTIAL)**

**DIRECT TESTIMONY OF F. SHANE BRADFORD**

## INTRODUCTION

**Q. Please state your name and business address.**

A. My name is F. Shane Bradford. My business address is 211 NW Riverside Drive, Evansville, Indiana, 47708.

**Q. By whom are you employed?**

A. I am employed by Southern Indiana Gas and Electric Company d/b/a CenterPoint Energy Indiana South ("CEI South," "Petitioner," or "Company"), which is an indirect subsidiary of CenterPoint Energy, Inc.

**Q. On whose behalf are you submitting this direct testimony?**

A. I am submitting testimony on behalf of CEI South.

**Q. What is your role with respect to CEI South?**

A. I am the Vice President of Indiana Electric.

**Q. Please describe your educational background.**

A. I received a Bachelor of Science in Civil Engineering (1992) from the University of Dayton and a Master of Business Administration (2002) from Indiana State University.

**Q. Please describe your professional background.**

A. My career in the utility industry began at Dayton Power and Light Co., where I worked in maintenance and production roles within electric generation from 1992 to 1999. I then joined Cinergy's electric generation division until 2003, when I became a plant manager for one of Cinergy's subsidiaries, Trigen Cinergy Solutions LLC. In 2004, I

joined CEI South[1] as Power Plant Director, overseeing safe, reliable, and environmentally responsible electric generation. By 2021, I transitioned to Director of Power Supply Service, focusing on Wholesale Power Marketing, Market Settlements, and Market Development. In January 2023, I was promoted to Vice President of Power Generation Operations, managing budgeting, operations, maintenance, and personnel decisions for CEI South's generation fleet. In that role, I had responsibility for ensuring customer demand is met sustainably and affordably while complying with environmental regulations. I also oversaw cost inputs for the Integrated Resource Plan ("IRP") process and managed commercial negotiations with generation resources. I assumed my current position in July 2024.

**Q. What are present duties and responsibilities as Vice President of Indiana Electric?**

A. I am responsible for all operations within CEI South's electric utility sector in Indiana, alongside managing the Company's Generation Transition Plan, as outlined in the 2019/2020 IRP and the 2022/2023 IRP, the latter of which was submitted to the Indiana Utility Regulatory Commission (the "IURC" or "Commission") in May 2023. My responsibilities include the oversight of operations and maintenance ("O&M"), capital budgets, transmission and distribution operations, engineering, generation, development of new renewable projects, and construction of natural gas generation projects to complement renewables.

**Q. Have you previously testified before the Indiana Utility Regulatory Commission ("Commission")?**

A. Yes. I have testified before the Commission on behalf of CEI South for a certificate of public convenience and necessity ("CPCN") in Cause Nos. 45501, 45564, 45754, 45836, 45847, and 45903. Similarly, I've testified for approval of Power Purchase Agreements ("PPAs") in Cause Nos. 46058 and 46218. Additionally, I have testified

[1] For the sake of clarity, my testimony refers to CEI South, even though in certain situations, I may be referring to Southern Indiana Gas and Electric Company operating under a prior assumed business name.

on behalf of CEI South in its Fuel Adjustment Clause ("FAC") proceedings and the FAC 137 sub docket under Cause No. 38708; its Clean Energy Cost Adjustment ("CECA") under Cause No. 44909; its Environmental Cost Adjustment ("ECA") under Cause No. 45052; the Midcontinent Independent System Operator ("MISO") Cost and Revenue Adjustment ("MCRA") under Cause No. 43354; and Reliability Cost and Revenue Adjustment ("RCRA") under Cause No. 43406. I also provided testimony before the Commission in Cause No. 45990 in support of CEI South's electric rate case and in Cause No. 46140 in support of CEI South's request for approval of a disposal agreement to effectuate the sale of CEI South's interest in the Warrick Unit 4 Generating Unit.

**Q. What is the purpose of your testimony in this proceeding?**

A. My testimony will provide updates on the status of the A.B. Brown Ash Pond Closure Federal Mandate Compliance Project ("Brown Pond Project"), which was approved by the Commission in its May 13, 2020 Order in Cause No. 45280 ("45280 Order"); and the F.B. Culley Federal Mandate Compliance Project ("Culley 3 Project"), which was approved by the Commission in its April 24, 2019 Order in Cause No. 45052 ("45052 Order"). I provide updates on the status of the Federally Mandated Compliance Projects approved by the Commission in its June 28, 2022 Order in Cause No. 45564 ("45564 Order") including a dry fly ash loading facility ("Dry Ash Compliance Project") and federally mandated lined ponds at CEI South's A.B. Brown and F.B. Culley Generating Stations to handle coal-pile runoff, flue gas desulfurization wastewater, and other flows such as stormwater and landfill leachate in compliance with the EPA's Coal Combustion Residuals ("CCR") Rules and Regulations ("Pond Compliance Project") (collectively, "CCR Compliance Projects"). Lasty, I will provide updates of the status of the F.B. Culley East Ash Pond Closure By Removal ("CBR") Federal Mandate Compliance Project ("Culley East CBR Project"), which was approved by the Commission in its February 7, 2024 Order in Cause No. 45903 ("45903 Order"). My testimony also includes updates on costs incurred through December 31, 2024, for the Brown Pond Project, Culley 3 Project, CCR Compliance Projects, and Culley East CBR Project; in addition to providing specific justification to support CEI South's

request for approval of an updated approved federally mandated cost for the Culley East CBR Project.

**Q. Are you sponsoring any attachments in this proceeding?**

A. Yes. I am sponsoring Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)** - 45903 Approved Estimate vs. Revised Estimate.

**Q. Was this attachment prepared by you or under your supervision?**

A. Yes, it was.

**BROWN POND PROJECT**

**Q. Please summarize the Brown Pond Project approved in the 45280 Order.**

A. To comply with the CCR Rules and Regulations, the Brown Pond Project has three major components: (1) the construction of infrastructure required to transport excavated pond ash from the pond to the Ohio River in order to load the ash on barges for delivery to the ash re-user; (2) dewatering, excavation, blending, and conveying ("DEBC") of the ash for reuse; and (3) encapsulating non-conforming CCR material with an impermeable cap that meets environmental requirements.

**Q. Please provide an update on the status of the infrastructure construction.**

A. The infrastructure component to transport excavated pond ash from the storage area to the Ohio River to be loaded on barges was complete and placed in service in 2021; however, as explained in prior ECA filings and below, some additional investment has been necessary post in-service date to enhance safety and efficiency. Specifically, the river breasting lines, mentioned in my ECA 5 testimony, were completed in 2024 along with the addition of two monopiles and fairleaders. This combination of equipment enables CEI South to safely counteract eddy currents flowing around the river cells and also allows the A.B. Brown barge loading facility to stack/spread barge lids without the assistance of a tugboat and crew, thereby enhancing safety and increasing throughput efficiency. At the pond, dewatering wells were installed to remove pore

water to ensure a safe working distance between crews and the water table can be maintained. Additionally, hopper grate vibrators were installed to mitigate issues that caused the grates to blind during cold weather events or when the moisture specifications in the ash is too high, which required labor-intensive efforts to resolve and created delays in loading the barge. As such, the addition of the hopper grate vibrators increased efficiency throughput and reduced delays.

In addition, the following is scheduled for 2025 to further enhance the safety and efficiency: replace the telescopic barge loading chute; install additional pumping wells for pore water removal to further help maintain a safe water table; install an additional monopile and install a drift prevention fence in the Ohio River to prevent drift-wood from interfering with barge loading and assist with throughput efficiency; purchase equipment to safely access river cells and elevated conveyor points for maintenance; and design and install a maintenance platform to safely access the telescopic chute and boom arm to perform maintenance.

The total 2024 spend as of December 31, 2024, was $1.27 million with a life to date project spend of $59.96 million. As shown in **Table FSB-1** (below), the original infrastructure estimate of $69.0 million has increased to $77.7 million to address the additional investment described above, and the continued effect of higher than anticipated inflation of labor and materials costs. This revised infrastructure estimate of $77.7 million includes $62.8 million for the infrastructure to collect and transport ash to barges on the Ohio River as well as an additional $14.9 million to encapsulate any non-conforming material at the end of the Brown Pond Project.

**Q. Please provide an update on encapsulation of non-conforming material.**

A. There has been no change since ECA 5. The expected duration of the excavation and shipment of ash will continue for 10 or more years. As such, CEI South and AECOM will continue to evaluate this project as both parties learn more regarding the volume of ash that cannot be blended to meet the ash re-user's specifications.

**Q. Please provide an update on the dewatering, excavation, blending, and conveying ("DEBC").**

A. The dewatering of the pond, ash excavation, and shipments to the ash re-user continue. CEI South has shipped approximately 924,483 short tons of ash from the Brown ash pond to the ash re-user through 2024. Depending on volumes of conforming ash and the demand from the ash re-user, ash shipments are expected to continue for 10 or more years. CEI South spent $6.7 million on dewatering and excavation activities in 2024, with an overall life to date spend of $26.7 million. Currently, there is no change to the original estimate of $87.2 million for the DECB portion of the Brown Pond Project.

**Q. Please provide an update on the Brown Pond Project cost estimate.**

A. **Table FSB-1**, below, shows the updates to the Brown Pond Project cost estimate for the infrastructure construction and the dewatering, excavation, blending, and conveying. The ECA 6 revised estimate shows a $3.1 million increase compared to the ECA 5 estimate and a $8.7 million increase from the original estimate, resulting in a 5.6% total increase over the original estimate approved in the 45280 Order. Because the ECA 6 revised estimate for the Brown Pond Project is less than 25% over the original estimate approved in the 45280 Order, there is no need for additional approval under the Federal Mandate Statute (Ind. Code ch. 8-1-8.4).

**Table FSB-1 – Brown Pond Project Estimate**[2]

| Description | 45280 Approved Estimate | ECA 2 Estimate | ECA 3 Estimate | ECA 4 Estimate | ECA 5 Estimate | ECA 6 Estimate |
|---|---|---|---|---|---|---|
| Infrastructure Construction | $69.0M | $69.0M | $69.0M | $72.6M | $74.6M | $77.7M |
| DEBC | $87.2M | $87.2M | $87.2M | $87.2M | $87.2M | $87.2M |
| Total | $156.2M | $156.2M | $156.2M | $159.8M | $161.8M | $164.9M |
| Percent Change from 45280 Approved Estimate | | 0% | 0% | 2.3% | 3.5% | 5.6% |

**CULLEY 3 PROJECT**

**Q. Please summarize the Culley 3 Project approved in the 45052 Order.**

A. To achieve compliance with the CCR and Effluent Limitations Guidelines ("ELG") Rules and Regulations, the Culley 3 Project, approved in the 45052 Order, included (1) conversion of the Unit 3 wet bottom ash handling system to a dry bottom ash handling system; (2) installation of an FGD wastewater spray dryer evaporator ("SDE") system; and (3) closure of the West ash pond and construction of a new lined process and storm water retention pond in the footprint of the closed West ash pond.

**Q. Please provide an update on the status of the Culley 3 Project as well as its cost estimate.**

A. The Unit 3 dry bottom ash handling system conversion was placed in-service on November 23, 2020. The FGD Wastewater SDE was placed in-service on May 1, 2023, with a few remaining punch list items, such as the fire standpipe, being completed in 2024. The West ash pond closure was completed, and new lined retention pond placed in-service on December 17, 2020.

The 45052 Order approved an original cost estimate of $94.2 million; however, in its

[2] As discussed in CEI South Witness Chrissy M. Behme's Direct Testimony, capital investments from the Brown Pond Project completed and placed in service before December 31, 2024, have now been moved into CEI South's base rates.

October 28, 2020 Order in Cause No. 45052 ECA 1 ("ECA 1 Order"), the Commission found CEI South's revised cost estimate of $106.3 million for the Culley 3 Project to be reasonable and within the amount previously approved in the 45052 Order.[3] **Table FSB-2**, below, shows the total capital spend for each component.

**Table FSB-2 – Culley 3 Project Estimate**

| Description | 45052 Approved Estimate | ECA 1 Approved Estimate | ECA 2 Estimate | ECA 3 Estimate | ECA 4 Estimate | ECA 5 Estimate | ECA 6 Estimate |
|---|---|---|---|---|---|---|---|
| Unit 3 Dry Bottom Ash | $14.5M | $14.5M | $14.0M | $13.7M | $13.6M | 13.6M | 13.6M |
| FGD Wastewater SDE | $51.7M | $51.7M | $51.7M | $51.7M | $45.7M | $47.2M | $46.7M |
| West Ash Pond & New Lined Pond | $28.0M | $40.1M | $40.6M | $40.7M | $40.6M | $40.5M | $40.5M |
| Total Culley 3 Project | $94.2M | $106.3M | $106.3M | $106.1M | $99.9M | $101.3M | $100.8M |
| Percentage Change from Revised ECA 1 Approved Estimate | | | 0% | 0% | -6.0% | -4.7% | -5.7% |

**Q. Please describe any future changes in reporting related to the 45052 Culley 3 Projects.**

A. As discussed by CEI South Witness Chrissy M. Behme, capital investments from the components of the 45052 Culley 3 Project (i.e., Unit 3 Dry Bottom Ash, FGD Wastewater SDE, and West Ash Pond & New Lined Pond) that were placed in service before December 31, 2024, have been moved into CEI South's base rates[4] and, therefore, are not included within this ECA filing.

**CCR COMPLIANCE PROJECTS**

**Q. Please summarize the CCR Compliance Projects approved in the 45564 Order.**

A. The CCR Compliance Projects approved in the 45564 Order include (1) the Dry Ash Compliance Project; and (2) the Pond Compliance Project. The Dry Ash Compliance

[3] The revised cost estimate was less than a 25% increase over the estimate of $94.2 million approved for the Culley 3 Project in Cause No. 45052.
[4] *S. Ind. Gas and Elec. Co.*, Cause No. 45990 (IURC Feb. 3, 2025).

Project consists of the following three major components: (1) the construction of a silo for accepting ash from Culley,[5] (2) a facility to load ash onto barges for transport to Missouri for beneficial reuse, and (3) a new dry ash handling system since the previous conveyor system was converted for handling of ponded ash.

The Pond Compliance Project involves construction of: (1) a 2- to 3-acre lined CCR-compliant pond at the F.B. Culley Generating Station; and (2) two lined CCR-compliant ponds totaling approximately 10 acres at the A.B. Brown Generating Station.[6]

The Commission initially approved the CCR Compliance Projects with an original cost estimate of $31.0 million in the 45564 Order. In its February 7, 2024 Order in Cause No. 45052 ECA 4 ("ECA 4 Order"), the Commission found CEI South provided sufficient evidence to meet its burden in support of the overages tied to the CCR Compliance Projects; found the revised cost estimate of $50.8 million for the CCR Compliance Projects to be reasonable; and approved the revisions to the federally mandated cost estimate for the CCR Compliance Projects.[7]

**Q. Please update the status of the construction of the CCR Compliance Projects.**

A. The Dry Ash Compliance Project was placed into-service in August 2022; the total capital spend was $15.5 million. The CCR-compliant pond at the F.B. Culley Generating Station was placed in service on May 1, 2023; the total capital spend was $10.6 million.

Construction on the first of two CCR-compliant ponds at the A.B. Brown Generating

[5] As approved, the silo was designed to accept ash from both A.B. Brown and F.B. Culley Generating Stations; but with the retirement of A.B. Brown Units 1 & 2, the silo is only now accepting ash from the F.B. Culley Generating Station.

[6] The 45564 Order granted CEI South's a certificate of public convenience and necessity (CPCN) to construct a single 10-acre lined CCR-compliant pond at A.B. Brown; however, CEI South requested, and subsequently received, approval in Cause No. 45052 ECA 4 to modify the Pond Compliance Project and construct two separate CCR-compliant ponds at A.B. Brown Generating Station instead of one large CCR-compliant pond. *See* ECA 4 Order. *See also* Bradford testimony in Cause No. 45052 ECA 4, pp. 12-14.

[7] ECA 4 Order at 35 and 36 (Ordering ¶ 4).

Station has been completed and the first CCR-compliant pond was placed in service in October 2023. As of December 31, 2024, the total capital expenditure for the first CCR-compliant pond at the A.B. Brown Generating Station was $20.6 million. Construction on the second CCR-compliant pond has not yet started although the required record drawings and IDEM submittals have been completed.

**Q. Please provide an update on the CCR Compliance Projects cost estimate.**

A. The estimate in **Table FSB-3** below has been updated to reflect the total costs for completing the Dry Ash Compliance Project, the CCR-compliant pond at the F.B. Culley Generating Station, and one of the two CCR-compliant ponds at the A.B. Brown Generating Station; it also includes an estimate (of $23.6 million) for the second CCR-compliant pond to be constructed at the A.B. Brown Generating Station.[8]

**Table FSB-3 – CCR Compliance Projects Estimate**

| Description | 45564 Approved Estimate | ECA 4 Approved Estimate | ECA 5 Estimate | ECA 6 Estimate |
|---|---|---|---|---|
| Dry Ash Compliance Project | $12.0M | $15.6M | $15.6M | $15.5M |
| Pond Compliance Project | $19.0M | $35.2M | $34.3M | $34.2M |
| Total CCR Compliance Project | $31.0M | $50.8M | $49.9M | $49.7M |
| Percentage Change from Revised ECA 4 Approved Estimate | | | -1.8% | -2.2% |

**Q. Please describe any future changes in reporting related to the 45564 CCR Compliance Projects.**

A. As with the 45052 Culley 3 Project, certain capital investments related to the CCR Compliance Projects that were placed in service before December 31, 2024, were moved into CEI South's base rates[9] and, therefore, are not included within this ECA filing. Specifically, capital investment related to the Dry Ash Compliance Project; the CCR-compliant pond at the F.B. Culley Generating Station; and one of the two CCR-

[8] This estimate for the second CCR-compliant pond at A.B. Brown Generating Station remains unchanged from the estimate provided in ECA 5.
[9] Cause No. 45990.

compliant ponds at the A.B. Brown Generating Station has been included in CEI South's base rates and is not included in this ECA filing. Future ECA filings will continue to report on the second CCR-compliant pond to be constructed at the A.B. Brown Generating Station.

## CULLEY EAST CBR PROJECT

**Q. Please summarize the Culley East CBR Project approved in the 45903 Order.**

A. In the 45903 Order, the Commission approved closure by removal of the Culley East CBR Project to achieve compliance with the CCR Rules and Regulations. The Commission also approved CEI South's cost estimates for the Culley East CBR Project, including costs of removal, delay costs, and contingency; however, the Commission did not allow the recovery of expenses incurred by CEI South related to its filing in Cause No. 45795.

**Q. What cost estimates were approved for the Culley East CBR Project in Cause No. 45903?**

A. The Commission approved the following cost estimate related to the Culley East CBR Project:

> We find the federally mandated costs (both incurred and projected) of $52,044,328 in capital costs, plus an estimated $133,000 in annual O&M expenses, as set forth in Petitioner's case-in-chief are just and reasonable and are approved for recovery.

45903 Order at 11.[10] The Commission noted that under Ind. Code § 8-1-8.4-7(c)(3), "[a]ctual costs that exceed the projected federally mandated costs of the approved compliance project by more than twenty-five percent (25%) shall require specific

[10] Ultimately, the cost estimate approved in the 45903 Order was reduced to remove costs incurred in relation to Cause No. 45795. 45903 Order, p.12 (finding "that CEI South is not entitled to recover the costs it incurred in Cause No. 45795." For additional language related to the amount of federally mandated costs approved in Cause No. 45903, s*ee* 45903 Order at 10 ("Based on the evidence of record, we find that CEI South has identified federally mandated costs and reasonably described those costs. The total capital costs are estimated at $52,044,328 and annual O&M costs are estimated at $133,000, and are approved.")

justification by the energy utility and specific approval by the commission before being authorized in the next general rate case filed by the energy utility with the commission."[11]

**Q. Please update the status of the Culley East CBR Project.**

A. Following testing of the dewatering well along the river embankment, CEI South installed an additional twelve dewatering wells (i.e., deep well pumps) and necessary auxiliary equipment along the dam between the ash pond and the Ohio River to allow employees to safely enter the ash pond to perform excavation. In addition, following a heavy rain event in May 2024, the ash pond exit road required structural repairs. Ash transportation was suspended while repairs were performed. The amount of ash shipped in 2024 to the Blackfoot Landfill was approximately 200,000 tons of ash. The back haul transportation, however, was stopped because the wetness of the material was sticking in the trucks, causing comingling issues with the coal direct haul, necessitating higher cost direct haul transportation. In addition to additional costs being borne because the material can no longer be back hauled, the wetness of the ash is also causing increased labor and equipment costs at the Blackfoot Landfill to offload and handle the material. In addition, starting in 2025, CEI South will begin stability work in the slope area around the ash pond to address slope stability issues encountered in 2024 wherein ash excavation activities created safety hazards in the outer ash pond area making it unsafe to work adjacent and below these areas.

**Q. Please provide an update on the Culley East CBR Project cost estimate.**

A. The total 2024 spend as of December 31, 2024, was $27.8 million with a life to date project spend of $39.6 million. **Table FSB-4** (below) shows the estimate for the Culley East CBR Project has been increased from the $51.8 million estimate approved in the 45903 Order to $64.8 million. As explained earlier in my testimony, the main drivers for the increase are additional engineering and installation of deep well pumps; required structural repairs to the exit road following the heavy rain event in May 2024;

[11] 45903 Order, p. 13.

increased ash transportation cost due to wet ash material preventing the use of the back haul agreement; and necessary stability work in 2025 – 2026 to address slope stability issues.

**Table FSB-4 – Culley East CBR Project Estimate**

| Description | 45903 Approved Estimate | ECA 5 Estimate | ECA 6 Estimate |
|---|---|---|---|
| Culley East CBR Project | $51.8M | $51.8M | $64.8M |
| Percentage Change from 45903 Approved Estimate | | 0% | 25.1% |

**Q. Please summarize the relief requested for the Culley East CBR Project.**

A. As shown in **Table FSB-4** above, the revised ECA 6 cost estimate is more than 25% of the original estimate approved in Cause No. 45903. Therefore, pursuant to Ind. Code § 8-1-8.4-7(c)(3), CEI South is providing specific justification and seeking specific approval by the Commission of an updated estimate for approved federally mandated costs for the Culley East CBR Project. Since the increased ECA 6 estimate for Culley East CBR Project relates to capital investment to be incurred in calendar year 2025, this request for approval of an updated federally mandated cost estimate for the Culley East CBR Project does not affect the rates in this ECA 6 filing.

**Q. Please provide a comparison of the cost estimate approved in Cause 45903 to the revised cost estimate in this ECA 6.**

A. Petitioner's Exhibit No. 1, **Attachment FSB-1 (CONFIDENTIAL)** provides a detailed comparison of the 45903 approved estimate to the revised ECA 6 estimate.

**Q. Please provide a breakdown for the increase in the revised ECA 6 estimate.**

A. Below is a summary of the cost increases:

**Table FSB-5 – Cost Increases Culley CBR Project**

| Cost Increase Driver | Estimated Cost Increase |
|---|---|
| Increased Engineering and Installation of Deep Well Pumps | $4,460,520 |
| Structural Repairs to Exit Road Following May 2024 Rain Event | $540,000 |
| Increased Ash Transportation and Landfill Cost Due to Wet Ash Material | $2,891,246 |
| Stability Work to Address Slope Stability Work Due to Ash Excavation | $10,448,234 |
| **Total Estimated Cost Increase** | $18,340,000 |

**Q. Please elaborate on why the deep well pumps were necessary.**

A. During excavation plan development for the East Ash Pond, the engineering design calculated fifteen deep well pumps located along the dam area between the Ohio River and the East Ash Pond were necessary to address the influence that the Ohio River has on the East Ash Pond. This excavation plan however was developed utilizing existing monitoring well level readings. During the installation of the fifteen initial deep well pumps, the flow readings showed higher water flow than expected, requiring twelve additional deep well pumps and auxiliary power equipment to address the influence the Ohio River has on the East Ash Pond. To reduce costs, CEI South reused and relocated electrical equipment from the A.B. Brown Generation Station for use at the F.B. Culley Generating Station. The additional deep well pumps were commissioned in 2024 and will operate until pond excavation is completed. The increased cost due to additional deep well pumps and auxiliary electrical equipment is included in the revised Construction cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**; and shown in **Table FSB-5**, above.

**Q. Please describe the impact of the heavy rain event on the exit road and the necessity of these repairs for project access.**

A. In May 2024, F.B. Culley experienced approximately 6" of heavy rain in under an hour. This unforeseen weather event created structural issues to the exit road used by the loaded trucks and required a temporary suspension of ash excavation and

transportation (i.e., ash loading and removal) until critical repairs could be completed. The location of the East Ash Pond does not allow for an alternative exit route. As such, these repairs had to be performed before ash excavation, loading, and transportation could continue, thereby, creating a five-week delay in excavating, loading, and removing the ash from the project site. The road repair and delay cost are included in the revised Construction cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL);** and shown in **Table FSB-5**, above.

**Q. Please explain the impact of the wet ash on transportation and landfill logistics and costs.**

A. As explained in my Direct Testimony in Cause No. 45903, to get a better transportation rate, CEI South leveraged its existing coal transportation and delivery relationship with Buchta Trucking to negotiate a backhaul agreement. Specifically, for the Culley East CBR Project, CEI South planned to utilize a backhaul agreement where some of the trucks used to deliver coal would haul coal to FB Culley; load the trucks with CCR material; and then backhaul or return to the landfill loaded with East Ash Pond CCR material. As explained earlier in my testimony, however, due to the wet ash sticking to the trucks and not completely dumping at the landfill, to prevent contamination of return coal deliveries, CEI South is unable to utilize the back haul option with the trucks and was required to have dedicated trucks to load and transport the East Ash Pond CCR material to the landfill. The inability to leverage the prior coal delivery/transport relationship and discontinuation of the back haul option caused an increased transportation rate for the transport of the CCR material. In addition to having to use dedicated trucks, the wetness of the pond ash caused increased labor and equipment costs at the landfill to offload and handle the material. The increased transportation and landfill cost are included in the revised Transportation and Landfill cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**; and shown in **Table FSB-5**, above.

**Q. Please describe the slope stability issues encountered and why it necessitates the additional work.**

A. The excavation of ash from the perimeter area of the landfill has left the slope area around the ash pond at an angle that is unsafe to work adjacent to and below these areas. To remedy this issue, the Contractor will be required to excavate these areas in stages. The ash will be removed in sections and cover material will be installed to make the area safe for work. This causes the Contractor to alternate between ash removal and installing cover material decreasing efficiency and increasing project timeline and cost. The slope stabilization and project delay cost are included in the revised Construction cost shown in the Cost Comparison Table provided within Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**; and shown in **Table FSB-5**, above.

**O&M EXPENSE - 2024 ACTUAL AND 2025 PROJECTION**

**Q. Please describe the actual 2024 O&M expense and the projected 2025 O&M expense related to the Brown Ash Pond Project and included in this ECA 6.**

A. **Table FSB-6** (below) reflects the actual 2024 O&M, and the projected 2025 projected O&M spend for the Brown Ash Pond Project. 2024 O&M expense includes all costs associated with the excavation of ash from the ash pond, temporary storage for additional drying and blending activity to ensure the ash meets specifications and maximizing the volume of ash to be beneficially reused, loading ash into the ash hopper to be placed on the tube belt for transporting and loading into barges on the Ohio River, testing and reporting of ash quality, and operation and maintenance of all systems. CEI South Witness Chrissy M. Behme discusses the accounting treatment related to Brown Pond Project costs and offsetting ash sales and insurance proceeds pursuant to the Settlement Agreement approved in the 45280 Order.

**Table FSB-6 – Brown Ash Pond O&M**

| Description | 2024 Actual O&M | 2025 Projected O&M |
|---|---|---|
| Brown Ash Pond | $6.7 million | $6.4 million |

**Q. What are the actual 2024 O&M expense for the Culley 3 Project?**

A. **Table FSB-7** (below) reflects the actual 2024 O&M spend for each component of the Culley Unit 3 Project.

**Table FSB-7 – Culley 3 Projects: 2024 Actual O&M**

| Culley 3 Project | 2024 Actual O&M |
|---|---|
| West Ash Pond & Lined Retention Pond | $197,139 |
| Dry Bottom Ash | $78,053 |
| FGD Wastewater SDE | $41,062 |

**Q. What are the actual 2024 O&M expense and the projected 2025 O&M expense for the CCR Compliance Projects?**

A. **Table FSB-8** (below) identifies the actual 2024 O&M and the projected 2025 O&M spend for each component of the CCR Compliance Projects.

**Table FSB-8 – CCR Compliance Projects O&M**

| CCR Compliance Projects | 2024 Actual O&M | 2025 Projected O&M |
|---|---|---|
| Dry Ash Compliance Project | $640,935 | $508,332 |
| Pond Compliance Project | $189,944 | $220,704 |

**CONCLUSION**

**Q. Does this conclude your direct testimony?**

A. Yes, at the present time**.**

**VERIFICATION**

I affirm under penalties for perjury that the foregoing representations are true to the best of my knowledge, information, and belief.

SOUTHERN INDIANA GAS AND ELECTRIC COMPANY D/B/A CENTERPOINT ENERGY INDIANA SOUTH

F. Shane Bradford
Vice President, Power Generation Operations

5/6/2025
Date

Petitioner's Exhibit 1, **Attachment FSB-1 (CONFIDENTIAL)**

is confidential and will be provided under seal to the Commission.

BEFORE THE UNITED STATES DEPARTMENT OF ENERGY

| | | |
|---|---|---|
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and Northern Indiana Public Service Company LLC | ) ) ) ) ) | Order No. 202-26-29 |
| Federal Power Act Section 202(c) Emergency Order: Midcontinent Independent System Operator and CenterPoint Energy Indiana South | ) ) ) ) | Order No. 202-26-30 |

Exhibit to
Motion to Intervene and Request for Rehearing and Stay of
Public Interest Organizations

Exhibit 30
DOE Rehearing Procedures

An official website of the United States government Here's how you know

U.S. DEPARTMENT of ENERGY



# DOE 202(c) Order Rehearing Procedures

DOE may revise these procedures through advance written notification to the parties and posting here.

*Intervention*. Any person seeking to intervene to become a party must file a written motion to intervene by emailing AskCR@hq.doe.gov. A motion to intervene must state the movant's interest in sufficient factual detail to demonstrate that the movant has or represents an interest which may be directly and substantially affected by the outcome of the proceeding. A motion to intervene must be filed within 30 days after the

issuance of a section 202(c) order, which includes an original order or a renewal order. No grant of late intervention is permitted unless DOE finds good cause. The grant of party status will be expressly stated by DOE order within thirty days of filing. A motion to intervene may be combined with a motion for rehearing, answer, or other motion.

*Rehearing*. Pursuant to 16 U.S. Code § 825*l*, any party applying for rehearing must file a written motion for rehearing by emailing AskCR@hq.doe.gov within 30 days after the issuance of a section 202(c) order. The motion for rehearing must set forth specifically the ground or grounds upon which such motion is based and must contain a clear and concise statement of the facts and law which support the motion and the specific relief or ruling requested. Any grounds not specifically identified in such motion shall be waived. All motions for rehearing will be addressed in a consolidated proceeding and order on rehearing. Unless DOE acts upon the motion for rehearing within 30 days of filing, such motion may be deemed to have been denied.

*Answers*. Any party may file an answer to another party's motion by emailing AskCR@hq.doe.gov within 7 days after the motion is filed. An answer must contain a clear and concise statement of any disputed factual allegations and any law upon which the answer relies. An answer to an answer is not permitted.

*Timing and Service*. DOE will use best efforts to post filings here within 24 hours of receipt. Such posting constitutes service to all parties. Filing or posting due dates that fall on a federal holiday or weekend shall be extended to the next business day. Documents received after 4:30 p.m. Eastern Time are deemed filed on the next business day.

*Confidentiality*. DOE strongly encourages that all filings be limited to information suitable for public release. If procedures to maintain confidentiality are requested, DOE will provide them as needed at the discretion of DOE.

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