2019 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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1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company LLC (NIPSCO LLC), Golder Associates Inc. (Golder) prepared this 2019 Annual Groundwater Monitoring and Corrective Action Report (2019 Annual Report) for the Rollin M. Schahfer Generating Station (RMSGS, Schahfer) Waste Disposal Area (WDA, the CCR Unit) located at 2723 E 1500 N Road, 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 2019 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.

Routine monitoring activities performed during the reporting period include inspection of wells for integrity and security, measurement of groundwater levels prior to sample collection in order 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 2019 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 2019
- Includes CCR Rule groundwater monitoring data obtained in calendar year 2019
- 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 MEASURES PROGRAM STATUS

Starting in 2016 following the installation of a groundwater monitoring system 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, 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. Based upon groundwater monitoring results collected pursuant to the CCR Rule to date, corrective measures program requirements have neither been triggered nor implemented at this CCR Unit.

2.1 Key Actions Completed - 2019

NIPSCO LLC completed the following key actions relative to CCR Rule groundwater monitoring at the WDA during calendar year 2019:

- Preparation of the of 2018 Groundwater Monitoring and Corrective Action Annual Report in January 2019 (2018 Annual Report, 40 CFR §257.90(e))
- Evaluation of the results of the second Assessment Monitoring event in February 2019 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the groundwater protection standard (GWPS) in March 2019 (40 CFR §257.95(g))
- Performance of the third Assessment Monitoring event in April 2019 (40 CFR §257.95)
- Preparation of the second ASD in May 2019 (40 CFR §257.95(g))
- Evaluation of the results of the third Assessment Monitoring event in August 2019 (40 CFR §257.95)
- Notification that constituents in 40 CFR Part 257 Appendix IV exceeded the GWPS in September 2018 (40 CFR §257.95(g))
- Recertification of the second ASD in November 2019 (40 CFR §257.95(g))
- Performance of the fourth Assessment Monitoring event in November 2019 (40 CFR §257.95)

2.2 Monitoring System Modifications

Consistent with the requirements of 40 CFR §257.90 and 257.91, NIPSCO LLC modified the groundwater monitoring well network to include new deep well GAMW-42C and four assessment monitoring well pairs (GAMW-57/57B, GAMW-58/58B, GAMW-59/59B, and GAMW-60/60B) in June 2019 at the locations shown in Figure 2. Golder installed GAMW-42C to monitor groundwater in bedrock immediately underlying the primary focus of groundwater monitoring, the unconsolidated material, adjacent to existing well pair (GAMW-42/42B) near the property boundary. Two of the new well pairs (GAMW59/59B and GAMW60/60B) were installed downgradient of existing well pair GAMW-51/51B and the additional two new well pairs (GAMW57/57B and GAMW58/58B) were installed on the northern side of the existing property boundary wells. The four new well pairs were located to provide additional data on groundwater quality and flow direction, supplementing prior Assessment Monitoring (see Figure 2). 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-03 and GAMW-03B	GAMW-01, GAMW-01B, GAMW-12, GAMW-12B, GAMW-13, GAMW-13B, GAMW-14, and GAMW-14B	GAMW42, GAMW42B, GAMW42C*, GAMW43, GAMW43B, GAMW44, GAMW44B, GAMW51, GAMW51B, GAMW57*, GAMW57B*, GAMW58*, GAMW58B*, GAMW59*, GAMW59B*, GAMW60*, and GAMW60B*

*Monitoring well installed in 2019

Attached Table 1 provides a summary of the well rationale/purpose and date of installation. Golder installed, developed, and surveyed the wells in accordance with the CCR Groundwater Monitoring Program Implementation Manual prepared by Golder in October 2017.

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).

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 statistically significant increases (SSIs). Due to the identification of SSIs, NIPSCO LLC 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. Golder collected groundwater samples from each background and downgradient monitoring well for analysis of Appendix IV constituents per 40 CFR §257.95 in March 2018. 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 use as a comparison 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). Results from the downgradient monitoring wells were evaluated 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 a statistically significant level (SSL). Golder determined that SSLs existed for the WDA 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 Annual Report).

Golder performed the second Assessment Monitoring event in October 2018 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 second Assessment Monitoring sampling event in February 2019. 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 levels observed in the downgradient monitoring wells were due to natural variation and not to a release from the WDA (see Appendix A).

Golder performed the third Assessment Monitoring event in April 2019 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 third Assessment Monitoring sampling event in August 2019. The results were consistent with the previous Assessment Monitoring event, therefore a qualified Indiana-licensed professional engineer recertified the ASD in November 2019 (see Appendix B).

Golder performed the fourth Assessment Monitoring event in November 2019 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 of the fourth Assessment Monitoring sampling event in February 2020.

Assessment monitoring wells GAMW-42/42B, GAMW-43/43B, and GAMW-44/44B installed near the property boundary (see Figure 2), were sampled in March, April, June, July, August, October, and November 2019. Assessment monitoring wells GAMW-42C, GAMW-57/57B, and GAMW-58/58B installed near the property boundary in June 2019 (see Figure 2), were sampled in July, August, October, and November 2019. No SSLs were identified in these wells.

The sampling dates, number of groundwater samples collected from each background and downgradient well, and the purpose of sampling are provided in Table 2. The analytical results are presented in Table 3.

2.6 Statistical Evaluation

Subsequent to 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 as a result 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 2018 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 GWPSs. 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, however, all 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 GAMW-03 and GAMW-03B show a decreasing trend, however, beryllium has never been detected above the laboratory reporting limit in these wells. No detrending routines are required.

- Lithium concentrations detected in groundwater samples collected from GAMW-03B show a decreasing trend, however, lithium has never been detected above the laboratory reporting limit in this well. No detrending routines are required.
- Molybdenum concentrations detected in groundwater samples collected from GAMW-03B show an increasing trend, however, all 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

During the third Assessment Monitoring event (April 2019), groundwater samples were collected from monitoring wells GAMW-12 and GAMW-42 at turbidity levels greater than 5 nephelometric turbidity units (NTUs). In the fourth Assessment Monitoring event (October 2019), groundwater was sampled from GAMW-42C at a turbidity level of approximately 10 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, wells were 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. Moving forward, wells will be purged for two hours or five well volumes, whichever is shorter. Professional judgement will then be used to determine when the purge water is representative of groundwater for sampling. In the event that 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 2020

During calendar year 2020, NIPSCO LLC 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 monitoring system including wells, pumps, and equipment.

4.0 REFERENCES

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

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

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

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	-	
	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.
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.

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Checked by: KMC
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	Resample Event	Supplemental Sampling Event	Sample Event #12	Supplemental Sampling Event	Supplemental Sampling Event	Supplemental Sampling Event	Supplemental Sampling Event	Sample Event #13	Total Number of Samples
Purpose of Sample		Confirmation of previous sample results	Nature and Extent Characterization Sampling	Annual Assessment Monitoring	Nature and Extent Characterization Sampling	Nature and Extent Characterization Sampling	Nature and Extent Characterization Sampling	Nature and Extent Characterization Sampling	Semi-Annual Assessment Monitoring	
Sample Parameters		Appendix III and detected Appendix IV	Appendix III and Appendix IV	Appendix III and Appendix IV	Metals Only	Appendix III and Appendix IV	Appendix III and Appendix IV	Appendix III and Appendix IV	Appendix III and Appendix IV	
Background Monitoring Well	GAMW03	NS	NS	4/25/2019	NS	NS	NS	NS	11/6/2019	2
	GAMW03B	NS	NS	4/26/2019	NS	NS	NS	NS	11/6/2019	2
Downgradient Monitoring Well	GAMW01	NS	NS	4/23/2019	NS	NS	NS	NS	11/6/2019	2
	GAMW01B	NS	NS	4/23/2019	NS	NS	NS	NS	11/6/2019	2
	GAMW12	NS	NS	4/24/2019	NS	NS	NS	NS	11/7/2019	2
	GAMW12B	NS	NS	4/25/2019	NS	NS	NS	NS	11/7/2019	2
	GAMW13	NS	NS	4/24/2019	NS	NS	NS	NS	11/6/2019	2
	GAMW13B	NS	NS	4/24/2019	NS	NS	NS	NS	11/6/2019	2
	GAMW14	3/1/2019	NS	4/22/2019	NS	NS	NS	NS	11/6/2019	3
	GAMW14B	NS	NS	4/22/2019	NS	NS	NS	NS	11/6/2019	2
	GAMW42	NS	3/4/2019	4/18/2019	6/5/2019	7/17/2019	8/26/2019	10/2/2019	11/5/2019	7
	GAMW42B	NS	3/4/2019	4/18/2019	6/5/2019	7/17/2019	8/27/2019	10/2/2019	11/5/2019	7
	GAMW42C	NI	NI	NI	NI	7/18/2019	8/28/2019	10/3/2019	11/5/2019	4
	GAMW43	NS	3/5/2019	4/19/2019	6/5/2019	7/17/2019	8/27/2019	10/2/2019	11/19/2019	7
	GAMW43B	NS	3/5/2019	4/19/2019	6/6/2019	7/17/2019	8/27/2019	10/2/2019	11/19/2019	7
	GAMW44	NS	3/5/2019	4/22/2019	6/6/2019	7/24/2019	8/27/2019	10/1/2019	11/20/2019	7
	GAMW44B	NS	3/5/2019	4/22/2019	6/6/2019	7/24/2019	8/27/2019	10/2/2019	11/20/2019	7
	GAMW51	NS	NS	4/26/2019	NS	NS	NS	NS	11/12/2019	2
	GAMW51B	NS	NS	4/26/2019	NS	NS	NS	NS	11/12/2019	2
	GAMW57	NI	NI	NI	NI	7/23/2019	8/29/2019	10/1/2019	11/19/2019	4
	GAMW57B	NI	NI	NI	NI	7/23/2019	8/29/2019	10/1/2019	11/19/2019	4
	GAMW58	NI	NI	NI	NI	7/22/2019	8/29/2019	10/1/2019	11/20/2019	4
	GAMW58B	NI	NI	NI	NI	7/22/2019	8/29/2019	10/1/2019	11/20/2019	4
	GAMW59	NI	NI	NI	NI	7/19/2019	NS	NS	11/11/2019	2
	GAMW59B	NI	NI	NI	NI	7/19/2019	NS	NS	11/11/2019	2
	GAMW60	NI	NI	NI	NI	7/22/2019	NS	NS	11/11/2019	2
	GAMW60B	NI	NI	NI	NI	7/19/2019	NS	NS	11/11/2019	2
Total Number of Samples		1	6	18	6	15	11	11	27	95

Notes:
(1) Sample events #1-#11 were completed prior to 2019. The purpose, sample parameters, and sample dates are included in the 2017 Annual Report and the 2018 Annual Report.
(2) Semi-annual assessment monitoring parameters did not include radium
Sample counts do not include QC/QA samples.
NI= not installed
NS= not sampled

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GOLDER

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

Analyte	Unit	GAMW01			GAMW01B		GAMW03		GAMW03B		GAMW12			GAMW12B			GAMW13		GAMW13B		GAMW14			GAMW14B		
		2019-04-23		2019-11-06	2019-04-23	2019-11-06	2019-04-25	2019-11-06	2019-04-26	2019-11-06	2019-04-24	2019-11-07		2019-04-25		2019-11-07	2019-04-24	2019-11-06	2019-04-24	2019-11-06	2019-03-01	2019-04-22	2019-11-06	2019-04-22	2019-11-06	
		FD	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	N	N	N	FD	N
CCR Appendix III																										
Boron	mg/L	1.1	1.1	1.6	0.35	0.38	0.16	0.35	0.25	0.31	0.073 J	0.071 J	0.069 J	0.31	0.3	0.33	0.18	0.13	0.71	0.7	0.2	0.22	0.16	2.9	3.4	3.3
Calcium	mg/L	110	110	94 J-	110	94 J-	84	110 J-	90	89 J-	88	76	76	100	100	88	75	71 J-	72	66 J-	38	38	59 J-	140	130 J-	130 J-
Chloride	mg/L	20	20	13	21	19	2.4	6.5	24	24	2.9	2.8	2.8	23	23	24	7.9	3.9	27	27	2.8	2.7	2.1	99	120	120
Fluoride	mg/L	0.31 J+	0.31 J+	0.41	0.14 J+	0.15	0.2	0.17	0.22	0.26	0.21	0.23	0.24	0.11	0.11	0.11	0.24	0.31	0.35	0.34	0.21	0.18	0.23	0.31	0.4	0.39
pH	SU		6.89	7.2	6.98	6.94	6.94	6.74	7.15	7.08	7.06		7.32		7	7.63	6.79	7.15	7.3	7.81	7.01	7.27	7.14	7.75		7.93
Sulfate	mg/L	220	230	180	73	67	86	150	74	80	22	14	16	120	120	130	52	40	150	150	35	37	27	1200	1300	1300
Total Dissolved Solids	mg/L	600	630	520	490	440	350	490	460	410	390	360	330	480	500	470	360	330	430	400	210	360	260	1900	1800	2200
CCR Appendix IV																										
Antimony	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	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.015	0.014	0.013	0.005 U	0.005 U	0.0035 J	0.016	0.005 U	0.005 U	0.014	0.0077	0.008	0.005 U	0.005 U	0.005 U	0.005	0.006	0.0014 J	0.00091 J	0.012	0.0028 J	0.026	0.005 U	0.005 U	0.005 U
Barium	mg/L	0.088	0.087	0.069	0.19	0.15	0.071	0.11	0.1	0.11	0.087	0.079	0.079	0.12	0.11	0.1	0.081	0.063	0.093	0.078	0.041	0.049	0.055	0.11	0.11	0.11
Beryllium	mg/L	0.001 U	0.0014	0.001 U	0.00086 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	0.00089 J	0.001 U	0.0013	0.001 U	0.001 U	0.001 U	0.001 U	0.00083 J	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	0.001 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	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0044	0.002 U	0.002 U
Cobalt	mg/L	0.0016	0.0017	0.001	0.00033 J	0.00019 J	0.0099	0.0048	0.0005 J	0.001 U	0.0031	0.0027	0.0028	0.001 U	0.001 U	0.00044 J	0.0012	0.00057 J	0.001 U	0.001 U	0.0083	0.0026	0.014	0.00058 J	0.001 U	0.001 U
Fluoride	mg/L	0.31 J+	0.31 J+	0.41	0.14 J+	0.15	0.2	0.17	0.22	0.26	0.21	0.23	0.24	0.11	0.11	0.11	0.24	0.31	0.35	0.34	0.21	0.18	0.23	0.31	0.4	0.39
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	0.00048 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
Lithium	mg/L	0.0021 J	0.0023 J	0.0025 J	0.0047 J	0.0042 J	0.0038 J	0.0058 J	0.008 U	0.008 U	0.0027 J	0.0028 J	0.003 J	0.0043 J	0.0043 J	0.004 J	0.008 U	0.008 U	0.0019 J	0.0017 J	0.008 U	0.008 U	0.008 U	0.0058 J	0.0057 J	0.0059 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	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Molybdenum	mg/L	0.033	0.033	0.031	0.0011 J	0.01 U	0.0071 J	0.0063 J	0.0068 J	0.0074 J	0.0034 J	0.0032 J	0.0036 J	0.0014 J	0.0013 J	0.0015 J	0.012	0.0068 J	0.021	0.017	0.0074 J	0.011	0.0084 J	0.028	0.017	0.017
Radium, Total	pci/l	1.21	0.781		2.11		0.373 U		0.596		0.474 U			1.03 J	0.544 J		0.473 U		0.529			0.345		2.05		
Radium-226	pci/l	0.693	0.474		1.13		0.314 U		0.38 U		0.307 U			0.439	0.426 U		0.241 U		0.436			0.318 U		0.802		
Radium-228	pci/l	0.517	0.388 U		0.982		0.373 U		0.442		0.474 U			0.592	0.373 U		0.473 U		0.435 U			0.328 U		1.25		
Selenium	mg/L	0.0075	0.0077	0.0057	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	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.00093 J	0.005 U	0.005 U
Thallium	mg/L	0.001 U	0.00021 J	0.00046 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	0.00039 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00021 J	0.001 U	0.001 U	0.001 U	0.001 U	0.00022 J	0.001 U	0.001 U
Sample Parameters																										
Dissolved Oxygen	mg/L		1.97	0.31	1.06	0.32	1.1	0.43	1.7	0.58	1.07		2.61		0.76	4.86	1.35	2.26	1.16	2.1	0.32	3.21	1.49	1.07		2.16
Oxidation-Reduction Potential	millivolts		27.1	-217.5	-23.6	-196.7	40.1	-182.6	7.6	-181.9	-12.7		-4.1		-10.2	-34.9	94.8	42	17.8	-45.2	-11.5	61.3	38.2	28.8		-21.4
pH	SU		6.89	7.2	6.98	6.94	6.94	6.74	7.15	7.08	7.06		7.32		7	7.63	6.79	7.15	7.3	7.81	7.01	7.27	7.14	7.75		7.93
Specific Conductivity	uS/cm		624	547	563	468	352	510	527	443	381		421		560	482	304	433	394	440	226	223	325	1887		2124
Temperature	deg c		2.4	15.9	9.88	13.8	3.28	15	9.03	13.1	0.8		12.97		11.5	1.39	1.7	9.2	3.39	11.67	8.79	10.3	14.71	12.8		13.37
Turbidity	ntu		4.48	3.8	3.15	1.2	3.49	4.41	3.56	1.92	12.6		3.1		3.56	4.02	4.63	1.38	4.07	2.03	4.43	4.68	2.51	2.79		0.71

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 may be biased high.
"J-" = Indicates the result is estimated and may be biased low.
"UJ" = Indicates the result was not detected above the MDL, 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

Analyte	Unit	GAMW42									GAMW42B						
		2019-03-04		2019-04-18	2019-06-05	2019-07-17	2019-08-26	2019-10-02	2019-11-05		2019-03-04	2019-04-18	2019-06-05	2019-07-17	2019-08-27	2019-10-02	2019-11-05
		FD	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N
CCR Appendix III																	
Boron	mg/L	0.033 J	0.031 J	0.044 J	0.033 J	0.037 J	0.043 J	0.1 U	0.034 J	0.033 J	0.039 J	0.033 J	0.035 J	0.038 J	0.026 J	0.22	0.031 J
Calcium	mg/L	44	43	36	39	40	47	41	42	43	52	47	50	48	52	52	53
Chloride	mg/L	2.9	2.8	2.8		2.5	3.1	3.3	3.1	3.2	5	4.3		4	4.3	5.6	6.4
Fluoride	mg/L	0.2	0.2	0.19		0.22	0.2	0.22	0.23	0.21	0.18	0.18		0.19	0.18	0.18	0.18
pH	SU		6.93	7.1	6.85	7.58	7.54	7.41		7.83	7.23	7.7	7.12	8.25	7.57	7.67	8.25
Sulfate	mg/L	25	25	30		23	27	26	25	25	30	26		26	27	31	35
Total Dissolved Solids	mg/L	180	200	640		180	210	190	190	190	220	84		220	230	230	250
CCR Appendix IV																	
Antimony	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	0.00059 J	0.002 U
Arsenic	mg/L	0.0026 J	0.0025 J	0.0023 J	0.0019 J	0.0016 J	0.0018 J	0.0022 J	0.0019 J	0.0021 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Barium	mg/L	0.023	0.022	0.024	0.018	0.019	0.021	0.02	0.021	0.022	0.011	0.0093	0.012	0.012	0.014	0.013	0.013
Beryllium	mg/L	0.0004 J	0.001 U	0.001 U	0.00056 J	0.001 U	0.001 U	0.00057 J	0.001 U	0.00072 J	0.001 U	0.001 U	0.0014	0.001 U	0.001 U	0.00074 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	0.001 U	0.001 U
Chromium	mg/L	0.0012 J	0.0012 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0013 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0024
Cobalt	mg/L	0.001 U	0.001 U	0.00044 J	0.0002 J	0.001 U	0.001 U	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
Fluoride	mg/L	0.2	0.2	0.19		0.22	0.2	0.22	0.23	0.21	0.18	0.18		0.19	0.18	0.18	0.18
Lead	mg/L	0.00045 J	0.001 U	0.00064 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	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	0.008 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
Molybdenum	mg/L	0.0024 J	0.0022 J	0.003 J	0.0023 J	0.0019 J	0.002 J	0.0029 J	0.0023 J	0.003 J	0.0031 J	0.0026 J	0.0031 J	0.0025 J	0.0035 J	0.0039 J	0.0033 J
Radium, Total	pci/l	0.536	0.437 U	0.346 U		0.393 U	0.48 U	0.539			0.396 U	0.384 U		0.46	0.73	0.972	
Radium-226	pci/l	0.165	0.0922 U	0.0867 U		0.36 UJ	0.1 UJ	0.244 J+			0.233	0.139		0.278 UJ	0.165	0.428 J+	
Radium-228	pci/l	0.436 U	0.437 U	0.346 U		0.393 UJ	0.48 UJ	0.408 U			0.396 U	0.384 U		0.413 UJ	0.462 U	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	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0011 J	0.005 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.00022 J	0.001 U	0.001 U	0.00062 J	0.001 U	0.0007 J	0.001 U	0.001 U	0.00062 J	0.001 U	0.0005 J	0.0008 J	0.00023 J
Sample Parameters																	
Dissolved Oxygen	mg/L		0.06	0.79	0.29	2.19	1.95	0.22		1.25	0.07	0.65	0.27	1.46	0.9	0.18	0.8
Oxidation-Reduction Potential	millivolts		113.7	-38.9	-82.3	13.9	-94.6	75.7		108	-157.6	-133.1	-139.2	-132	-137.7	44.8	-60.2
pH	SU		6.93	7.1	6.85	7.58	7.54	7.41		7.83	7.23	7.7	7.12	8.25	7.57	7.67	8.25
Specific Conductivity	uS/cm		184	192	198	211	229	220		208	244	245	245	246	262	254	255
Temperature	deg c		8.2	8.8	11.5	13.7	14.8	14.9		13.06	10.9	10.8	12.2	12.7	12.8	13.4	11.81
Turbidity	ntu		3.16	8.18	2.47	2.4	1.4	1.6		2.81	3.15	4.05	0.6	1.09	0.58	0.96	0.36

Analyte	Unit	GAMW42C				GAMW43							
		2019-07-18	2019-08-28	2019-10-03	2019-11-05	2019-03-05	2019-04-19		2019-06-05	2019-07-17	2019-08-27	2019-10-02	2019-11-19
		N	N	N	N	N	FD	N	N	N	N	N	N
CCR Appendix III													
Boron	mg/L	1	1	0.79	0.75	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.19	0.024 J
Calcium	mg/L	45	50	45	45	24	21	22	22	25	28	28	34
Chloride	mg/L	6.4	6.5	5.8	5.8	1.4	1.1	0.92 J		0.78 J	0.89 J	1.2	1.1
Fluoride	mg/L	0.3	0.25	0.25	0.26	0.11	0.11	0.1		0.14	0.13	0.14	0.14
pH	SU	7.81	7.28	7.48	7.64	6.8		7.07	6.62	7.35	7.1	6.98	6.94
Sulfate	mg/L	13	4.3	5.6	4.5	29	31	31		22	22	30	30
Total Dissolved Solids	mg/L	220	290	270	280	150	130	140		140	140	180	180
CCR Appendix IV													
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.00061 J	0.00077 J	0.00063 J	0.002 U	0.002 U	0.002 U	0.00077 J
Arsenic	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.0036 J	0.0024 J	0.0024 J	0.0027 J	0.0025 J	0.0037 J	0.0033 J	0.0035 J
Barium	mg/L	0.015	0.015	0.01	0.01	0.021	0.016	0.016	0.015	0.019	0.018	0.026	0.06
Beryllium	mg/L	0.001 U	0.00048 J	0.001 U	0.001 U	0.00097 J	0.001 U	0.00075 J	0.0019	0.001 U	0.001 U	0.001 U	0.0014
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
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.001 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	0.0004 J	0.001 U	0.0003 J	0.02	0.013	0.014	0.0067	0.0034	0.0036	0.0045	0.0037
Fluoride	mg/L	0.3	0.25	0.25	0.26	0.11	0.11	0.1		0.14	0.13	0.14	0.14
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.00048 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.037	0.038	0.025	0.023	0.008 U	0.008 U	0.008 U	0.0023 J	0.008 U	0.008 U	0.0022 J	0.0026 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
Molybdenum	mg/L	0.0053 J	0.0049 J	0.0027 J	0.0031 J	0.0016 J	0.0015 J	0.0017 J	0.0017 J	0.01 U	0.0015 J	0.0035 J	0.0048 J
Radium, Total	pci/l	0.723	1.14	0.972		0.371 U	0.405 U	0.369 U		0.362 U	0.199	0.411 U	
Radium-226	pci/l	0.668 J-	0.701	0.752		0.0944 U	0.125	0.0973 U		0.268 UJ	0.524 U	0.151 U	
Radium-228	pci/l	0.42 U	0.437	0.433 U		0.371 U	0.405 U	0.369 U		0.362 UJ	0.524 U	0.411 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	0.001 J	0.005 U	0.005 U	0.005 U	0.0012 J
Thallium	mg/L	0.00039 J	0.00061 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00073 J	0.001 U	0.001 U	0.00024 J	0.00091 J
Sample Parameters													
Dissolved Oxygen	mg/L	0.83	0.29	0.04	0.22	0.1		0.99	0.17	0.88	0.63	0.31	0.32
Oxidation-Reduction Potential	millivolts	-127.9	-205.2	-64.7	293.9	42.7		119.6	47.7	18.7	-18.6	87.7	-220.2
pH	SU	7.81	7.28	7.48	7.64	6.8		7.07	6.62	7.35	7.1	6.98	6.94
Specific Conductivity	uS/cm	360	350	292	259	148		141	150	171	203	235	197
Temperature	deg c	13.3	12.3	11.9	11.5	7.48		8.2	12	15.7	16.3	16.4	12.6
Turbidity	ntu	4.43	4.5	4.69	9.33	3.99		4.6	4.2	2.98	1.95	4.2	4.05

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
"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 high.
"J-" = Indicates the result is estimated and may be biased low.
"UJ" = Indicates the result was not detected above the MDL, 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

Analyte	Unit	GAMW43B								GAMW44									GAMW44B							GAMW51		GAMW51B	
		2019-03-05	2019-04-19	2019-06-06		2019-07-17	2019-08-27	2019-10-02	2019-11-19	2019-03-05	2019-04-22	2019-06-06	2019-07-24	2019-08-27		2019-10-01		2019-11-20	2019-03-05	2019-04-22	2019-06-06	2019-07-24	2019-08-27	2019-10-02	2019-11-20	2019-04-26	2019-11-12	2019-04-26	2019-11-12
		N	N	FD	N	N	N	N	N	N	N	N	N	FD	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
CCR Appendix III																													
Boron	mg/L	0.029 J	0.036 J	0.1 U	0.1 U	0.035 J	0.024 J	0.16	0.035 J	0.025 J	0.032 J	0.1 U	0.036 J	0.1 U	0.032 J	0.026 J	0.03 J	0.034 J	0.024 J	0.03 J	0.1 U	0.024 J	0.1 U	0.12	0.1 U	0.5	0.61	7.6	0.028 J
Calcium	mg/L	42	43	38 J-	39 J-	37	38	36	38	24	24	20 J-	20	37	23	32	34	27	32	31	30	31	32	31	30	140	150	290	1 U
Chloride	mg/L	1.5	1.6			1.5	1.5	1.6	1.5	2.4	3.1		1.8	1.5	1.6	1.9 J+	1.9 J+	1.7	1.6	1.5		1.3	1.3	1.5	1.3	3.6	5.4	57	57
Fluoride	mg/L	0.17	0.17			0.18	0.18	0.19	0.18	0.13	0.16		0.1	0.19	0.11	0.099 J+	0.11 J+	0.096	0.13	0.13		0.14	0.13	0.15	0.15	0.39	0.4	0.81	0.83
pH	SU	7.62	7.76		7.47	8.09	7.49	7.41	7.5	6.23	6.41	5.99	6.6		6.31		6.91	6.22	7.79	7.62	7.52	8.28	7.64	7.16	7.44	7.14	6.78	7.48	7.15
Sulfate	mg/L	31	35			28	24	22	29	57	68		42	24	42	51 J+	51 J+	44	14	16		11	7.8	7.6	10	190	240	1400	1500
Total Dissolved Solids	mg/L	140	170			160	160	160	170	170	200		170	170	160	190	200	170	120	160		150	130	120	130	620	680	2400	2300
CCR Appendix IV																													
Antimony	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	0.001 J	0.00072 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	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0019 J	0.0019 J	0.0045 J	0.0087	0.005 U	0.01	0.0095	0.0091	0.054	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0016 J	0.0015 J	0.0034 J	0.005 U
Barium	mg/L	0.012	0.014	0.012	0.012	0.011	0.011	0.011	0.011	0.024	0.028	0.032	0.025	0.011	0.024	0.031	0.032	0.034	0.0098	0.0091	0.0084	0.0087	0.0087	0.0093	0.0081	0.096	0.1	0.085	0.005 U
Beryllium	mg/L	0.001 U	0.001 U	0.00075 J	0.0011	0.001 U	0.001 U	0.001 U	0.001 U	0.00073 J	0.00083 J	0.00099 J	0.001 U	0.001 U	0.001 U	0.001 U	0.0008 J	0.00041 J	0.001 U	0.001 U	0.00031 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
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	0.001 U	0.001 U	0.001 U	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	0.0028	0.0029	0.0031	0.0028	0.002 U	0.0017 J	0.0012 J	0.0016 J	0.0023	0.002 U	0.002 U	0.002 U	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	0.0017	0.0019	0.0025	0.0025	0.001 U	0.0028	0.0039	0.0039	0.0079	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0031	0.003	0.001 U	0.001 U
Fluoride	mg/L	0.17	0.17			0.18	0.18	0.19	0.18	0.13	0.16		0.1	0.19	0.11	0.099 J+	0.11 J+	0.096	0.13	0.13		0.14	0.13	0.15	0.15	0.39	0.4	0.81	0.83
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	0.0006 J	0.00045 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.0006 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
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	0.0038 J	0.0043 J	0.0042 J	0.005 J	0.008 U	0.0047 J	0.0042 J	0.0052 J	0.0042 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0049 J	0.006 J	0.064	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	0.0002 U	0.0002 U	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 J	0.0018 J	0.0022 J	0.0025 J	0.0019 J	0.002 J	0.0022 J	0.0021 J	0.01 U	0.01 U	0.0013 J	0.0012 J	0.0019 J	0.002 J	0.0037 J	0.0049 J	0.0058 J	0.0025 J	0.0026 J	0.0026 J	0.0021 J	0.0019 J	0.002 J	0.0022 J	0.016	0.018	0.18	0.01 U
Radium, Total	pci/l	0.373 U	0.375 U			0.393 U	0.442 U	0.479 U		0.362 U	0.543		0.435 U	0.496 U	0.973	0.622 U	0.445 U		0.35 U	0.312 U		0.438 U	0.465 U	0.446 U		0.536		2.74	
Radium-226	pci/l	0.0977 U	0.105 U			0.317 UJ	0.124 U	0.144 U		0.193	0.12		0.196 U	0.153 U	0.138 U	0.255	0.155 U		0.0972 U	0.105 U		0.175 U	0.162 U	0.147 U		0.323		1.37	
Radium-228	pci/l	0.373 U	0.375 U			0.393 UJ	0.442 U	0.479 U		0.362 U	0.423		0.435 U	0.496 U	0.518 U	0.622 U	0.445 U		0.35 U	0.312 U		0.438 U	0.465 U	0.446 U		0.381 U		1.38	
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	0.00096 J	0.00092 J	0.00093 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	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	0.00042 J	0.00058 J	0.001 U	0.001 U	0.001 U	0.00028 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00094 J	0.00046 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
Sample Parameters																													
Dissolved Oxygen	mg/L	0.05	0.99		0.22	0.77	0.67	0.82	0.27	0.05	3.85	1.95	3.04		1.06		0.96	0.39	0.04	1.53	1.19	1.75	0.65	0.28	0.14	1.12	0.09	1.69	0.1
Oxidation-Reduction Potential	millivolts	-85.9	-92.1		-114.5	-119.2	-87.8	78.7	-208.4	101.4	134.8	166.1	75.1		28.7		83.1	-148.8	-124	9.7	-126.1	-33.3	-122.7	115.3	-171.5	17.2	-191.3	25.8	-222.3
pH	SU	7.62	7.76		7.47	8.09	7.49	7.41	7.5	6.23	6.41	5.99	6.6		6.31		6.91	6.22	7.79	7.62	7.52	8.28	7.64	7.16	7.44	7.14	6.78	7.48	7.15
Specific Conductivity	uS/cm	187	197		193	186	190	175	154	140	170	140	151		189		279	156	148	150	144	143	154	153	122	661	640	2139	1796
Temperature	deg c	10.3	10		11.9	13	13.3	13.3	12	6.02	9.1	12.1	14.3		15.7		16.1	11.7	10.49	11.5	11.7	11.7	12.8	12.6	11.4	9.1	14.1	10	12.9
Turbidity	ntu	1.56	2.44		3.16	0.9	0.66	0.87	1.43	3.09	4.96	5.75	4.69		4.78		3.65	4.4	1.99	1.11	0.54	0.78	0.37	0.24	1.14	2.91	4.58	1.89	3.16

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 may be biased high.
"J-" = Indicates the result is estimated and may be biased low.
"UJ" = Indicates the result was not detected above the MDL, 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

Analyte	Unit	GAMW57				GAMW57B				GAMW58					GAMW58B				GAMW59		GAMW59B		GAMW60			GAMW60B	
		2019-07-23	2019-08-29	2019-10-01	2019-11-19	2019-07-23	2019-08-29	2019-10-01	2019-11-19	2019-07-22		2019-08-29	2019-10-01	2019-11-20	2019-07-22	2019-08-29	2019-10-01	2019-11-20	2019-07-19	2019-11-11	2019-07-19	2019-11-11	2019-07-22	2019-11-11		2019-07-19	2019-11-11
		N	N	N	N	N	N	N	N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N	FD	N	N	N
CCR Appendix III																											
Boron	mg/L	0.037 J	0.042 J	0.023 J	0.038 J	0.095 J	0.19	0.031 J	0.16	0.043 J	0.046 J	0.047 J	0.028 J	0.037 J	0.047 J	0.043 J	0.029 J	0.026 J	1.2	1.4	4.8	5.4	2.1	1.4	1.5	8.1	7.2
Calcium	mg/L	22	25	23	24	46	48	39	46	10	10	13	38	8.8	38	39	39	36	250	280	310	330	330	350	350	280	300
Chloride	mg/L	1.5	1.2	1 J+	1.3	9.4	12	8.9 J+	11	1.2	1.3	1.1	3.9 J+	1.5	4	3.8	3.9 J+	3.7	6.5	9.8	38	44	7.8	11	11	19	18
Fluoride	mg/L	0.031 J	0.034 J	0.033 J+	0.031 J	0.14	0.13	0.14 J+	0.14	0.32	0.31	0.31	0.16 J+	0.29	0.17	0.17	0.17 J+	0.16	0.65	0.63	0.46	0.46	0.65	0.64	0.66	0.37	0.39
pH	SU	7.42	7.7	7.58	7.61	8.21	7.4	7.67	7.53		5.42	5.82	6.18	5.02	8.74	8.33	7.57	7.49	7.51	7.29	7.83	7.47	7.34		7.15	8.41	7.78
Sulfate	mg/L	33	35	31 J+	34	23	18	17 J+	14	43	43	41	25 J+	40	24	21	26 J+	25	580	770 J-	1400	1600 J-	890	880 J-	890 J-	1200	1200 J-
Total Dissolved Solids	mg/L	150	120	120	130	210	220	190	190	95 J+	100 J+	110	190	100	180	200	180	160	1100	1200	2100	2100	1400	1500 J	780 J	1700	1600
CCR Appendix IV																											
Antimony	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	0.00063 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	0.005 U	0.005 U	0.005 U	0.005 U	0.00075 J	0.00076 J	0.005 U	0.005 U	0.005 U	0.005 U	0.00098 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0033 J	0.0024 J	0.0015 J	0.00081 J	0.005 U	0.0009 J	0.00086 J	0.00088 J	0.005 U
Barium	mg/L	0.012	0.008	0.006	0.0088	0.024	0.029	0.018	0.025	0.055	0.055	0.047	0.017	0.058	0.018	0.02	0.017	0.017	0.1	0.088	0.065	0.058	0.044	0.036	0.036	0.06	0.063
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	0.0011	0.0013	0.00097 J	0.001 U	0.0015	0.00035 J	0.001 U	0.00055 J	0.001 U	0.001 U	0.00044 J	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	0.00031 J	0.00035 J	0.001 U	0.001 U	0.0004 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
Chromium	mg/L	0.0014 J	0.002 U	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	0.002 U	0.002 U	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	0.00074 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.011	0.011	0.01	0.001 U	0.0096	0.00021 J	0.00019 J	0.001 U	0.001 U	0.0005 J	0.00081 J	0.0003 J	0.00023 J	0.0011	0.0019	0.002	0.00021 J	0.00024 J
Fluoride	mg/L	0.031 J	0.034 J	0.033 J+	0.031 J	0.14	0.13	0.14 J+	0.14	0.32	0.31	0.31	0.16 J+	0.29	0.17	0.17	0.17 J+	0.16	0.65	0.63	0.46	0.46	0.65	0.64	0.66	0.37	0.39
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	0.0011	0.001	0.0011	0.001 U	0.0012	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	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	0.0029 J	0.0058 J	0.008 U	0.0044 J	0.0018 J	0.002 J	0.0017 J	0.0028 J	0.0021 J	0.0031 J	0.0025 J	0.0032 J	0.0019 J	0.015	0.016	0.019	0.019	0.0068 J	0.008 U	0.008 U	0.0067 J	0.008 U
Mercury	mg/L	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 U	0.0002 U	0.0002 U	0.0002 UJ	0.0002 UJ	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 UJ	0.0002 U	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 UJ	0.0002 U	0.0002 UJ
Molybdenum	mg/L	0.016	0.022	0.0055 J	0.024	0.0061 J	0.011	0.0028 J	0.0073 J	0.01 U	0.01 U	0.0016 J	0.0059 J	0.0017 J	0.023	0.02	0.0069 J	0.011	0.03	0.046	0.06	0.092	0.042	0.035	0.035	0.37	0.39
Radium, Total	pci/l	0.419 U	0.453 U	0.548 U		0.502	0.435 U	0.543 U		0.54 U	0.599 U	0.457 U	1.2		0.504 U	0.506 U	0.603 U		1.11		2.3		0.504 U			2.25	
Radium-226	pci/l	0.161 U	0.118 U	0.193		0.213 U	0.233	0.295		0.286 U	0.282 U	0.243	0.307		0.232 U	0.118 U	0.174		0.607		0.981		0.298 U			1.63	
Radium-228	pci/l	0.419 U	0.453 U	0.548 U		0.492 U	0.435 U	0.543 U		0.54 U	0.599 U	0.457 U	0.895		0.504 U	0.506 U	0.603 U		0.499		1.32		0.504 U			0.622	
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	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	0.0003 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00038 J	0.001 U	0.001 U	0.00064 J	0.0005 J	0.001 U	0.00067 J	0.001 U	0.001 U	0.00049 J	0.001 U	0.00034 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Sample Parameters																											
Dissolved Oxygen	mg/L	5.56	3.89	3.94	2.67	1.12	0.78	0.35	0.22		4.29	1.88	0.63	3.38	1.21	8.56	0.43	0.19	0.77	0.21	0.55	0.11	1.06		0.32	0.67	0.14
Oxidation-Reduction Potential	millivolts	54.6	43.1	126.2	-127	-98.1	-109.6	94.6	-211.9		114.8	95.4	102.8	-53.6	-165	-248.6	90	-179.2	-94.6	154.8	-117.3	-214.4	23.5		-152.8	-160.7	-202.1
pH	SU	7.42	7.7	7.58	7.61	8.21	7.4	7.67	7.53		5.42	5.82	6.18	5.02	8.74	8.33	7.57	7.49	7.51	7.29	7.83	7.47	7.34		7.15	8.41	7.78
Specific Conductivity	uS/cm	127	152	133	124	237	277	213	190		8.6	99	105	67	204	214	204	168	1264	1132	2082	1837	1437		1182	1643	1320
Temperature	deg c	12.4	12.3	13.3	11.6	11.8	11.8	12.5	10.8		13.1	13.8	14.5	12	11	12.2	12.8	11.1	20.9	18	16	14.3	17.6		15.3	15.8	12.8
Turbidity	ntu	4.81	2.82	2.9	3.06	4.9	4.39	0.82	1.28		4.02	1.8	0.61	1.98	4.35	2.75	0.49	1.02	1.5	2.41	4.84	2.55	2.46		2.11	4.1	3.83

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 may be biased high.
"J-" = Indicates the result is estimated and may be biased low.
"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

Prepared by: AMH
Checked by: DFS
Reviewed by: MAH

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

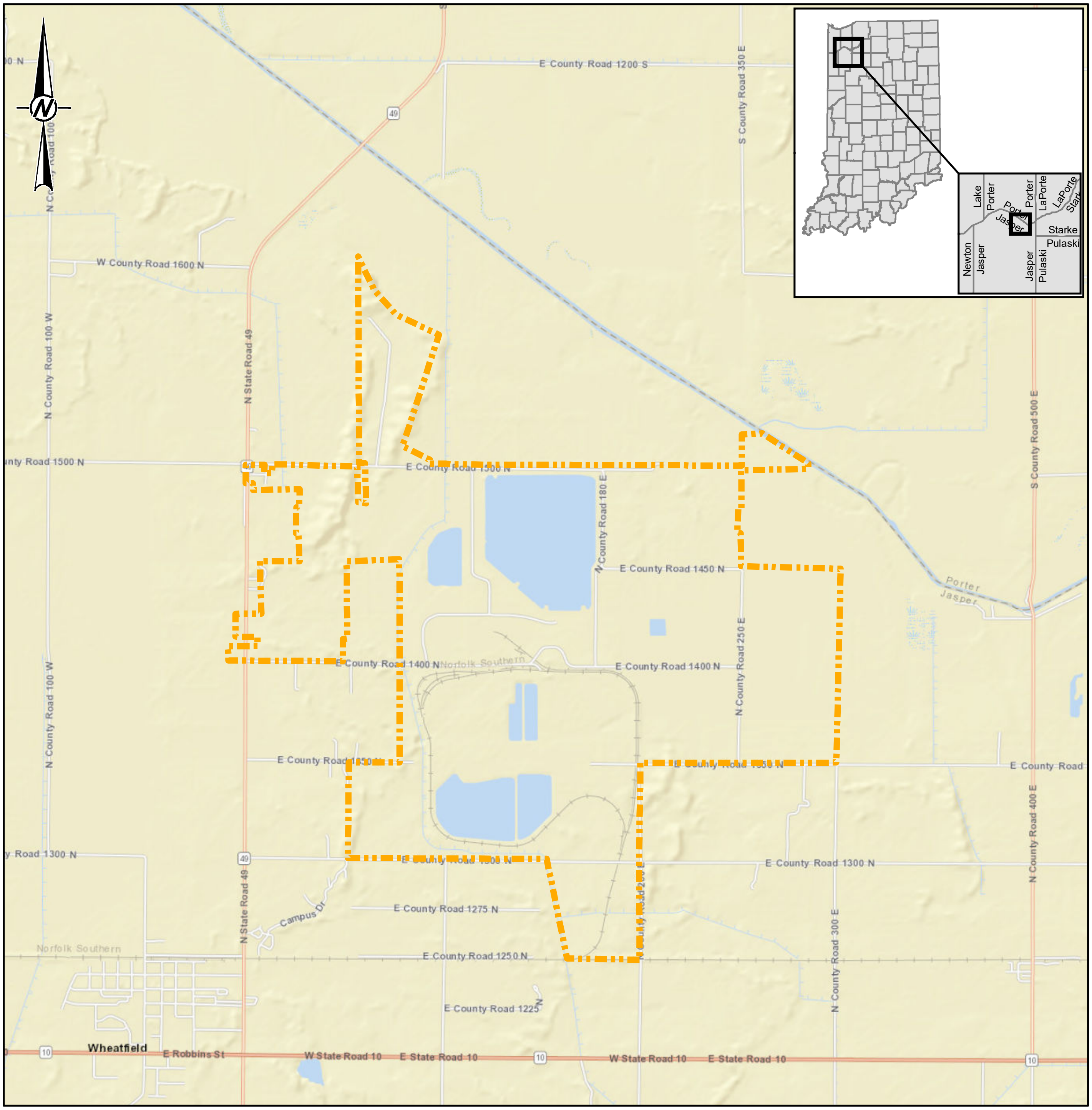
Analyte	MCL (mg/L)	GWPS (mg/L)
Antimony	0.006	0.006
Arsenic	0.01	0.015
Barium	2	2
Beryllium	0.004	0.004
Cadmium	0.005	0.005
Chromium	0.1	0.1
Cobalt(1)	0.006	0.015
Fluoride	4	4
Lead(1)	0.015	0.015
Lithium(1)	0.04	0.04
Mercury	0.002	0.002
Molybdenum(1)	0.1	0.1
Radium 226+228	5	5
Selenium	0.05	0.05
Thallium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

Notes:
MCL= Environmental Protection Agency Maximum Contaminant Level
GWPS= Groundwater Protection Standard calculated in February 2019
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.

Prepared by: DFS
Checked by: AMH
Reviewed by: MAH

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, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (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

YYYY-MM-DD	12/31/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	1

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\19121567_2019Support\40_PROD\0002_Annual_Report\19121567-0002-HS-0001.mxd PRINTED ON: 2019-12-31 AT: 12:30:17 PM

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

1 in

0

LEGEND

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

0 410 820
1 " = 400 feet Feet

NOTE(S)

REFERENCE(S)
1. SERVICE LAYER CREDITS: SOURCE: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, 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

YYYY-MM-DD	1/22/2020
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
19121567	A	0	2

APPENDIX A

Waste Disposal Area Alternative Source Demonstration May 2019

Northern Indiana Public Service Company (NIPSCO)

R. M. Schahfer Generating Station – Waste Disposal Area

Wheatfield, Indiana

Certification of Alternative Source Demonstration

40 CFR §257.95

I have personally reviewed this alternative source demonstration (ASD), the subject of which is the Waste Disposal Area (WDA) at the NIPSCO R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated May 2019. 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 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

5/17/2019
Date

ALTERNATIVE SOURCE DEMONSTRATION - WASTE DISPOSAL AREA

Northern Indiana Public Service Company

Rollin M. Schahfer Generating Station

Wheatfield, Indiana

Submitted to:

Northern Indiana Public Service Company

801 East 86th Avenue
Merrillville, Indiana 46410

Submitted by:

Golder Associates Inc.

670 North Commercial Street, Suite 103

Manchester, NH 03101

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164817101.03

May 2019

Table of Contents

TABLES

FIGURES

1.0 INTRODUCTION

On behalf of Northern Indiana Public Service Company (NIPSCO), Golder Associates Inc. (Golder) performed a statistical evaluation of groundwater analytical results from the second (October 2018) groundwater Assessment Monitoring event at the Rollin M. Schahfer Generating Station (RMSGS or Site) Waste Disposal Area (WDA, the CCR Unit), located at 2723 E 1500 N Road, Wheatfield, Jasper County, Indiana (see Figure 1). This evaluation was performed in accordance with applicable provisions of 40 Code of Federal Regulations (CFR) Parts 257 and 261, “Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals (CCR) from Electric Utilities; Final Rule” (CCR Final Rule), as amended.

Statistical analyses of the Appendix IV Assessment Monitoring data for arsenic and cobalt indicated the lower confidence interval (LCI) exceeded the background concentration for those parameters in downgradient monitoring wells GAMW-01 and GAMW-14, respectively, which NIPSCO 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) 90 days from the date of determination (February 18, 2019) to demonstrate a source other than the CCR Unit or another condition caused the SSLs.

Golder’s initial review of the Site history and geologic conditions indicates the potential for SSLs to have resulted from a source other than the CCR Unit. To assess potential sources and natural variability of groundwater concentrations, Golder collected and analyzed porewater, CCR source materials, overburden, bedrock, and groundwater samples. Based upon this assessment and in accordance with provisions of the CCR Final Rule, Golder prepared this Alternative Source Demonstration (ASD) for the WDA. This ASD includes an evaluation of geological, hydrogeological, and chemical information regarding porewater and groundwater obtained from monitoring wells installed within and adjacent to the WDA.

The ASD conforms to the requirements of 40 CFR §257.95(g)(3) and provides the basis for concluding that the apparent SSLs are not a result of a release from the WDA. The following sections provide a summary of the RMSGS WDA Conceptual Site Model (CSM), sampling procedures and analytical methods, analytical and geochemical modeling results, and lines of evidence demonstrating an alternative source is responsible for the SSLs.

2.0 CONCEPTUAL SITE MODEL

Golder developed this CSM to help frame and support the ASD assessment approach. The CSM presents WDA construction and operational history, a summary of geologic and hydrogeologic information, and a discussion of groundwater monitoring data, which together lay the groundwork for consideration and development of the ASD.

2.1 Description of Waste Disposal Area

The WDA is an approximately 80-acre impoundment located in the southwestern corner of RMSGS as shown in Figure 2. According to NIPSCO construction drawings, the WDA is unlined and is surrounded by berms that were constructed with an approximate two-foot wide slurry wall that extends from just below the top of the berms to the underlying shale located approximately 30 to 35 feet below ground surface (ft bgs). NIPSCO designed and constructed the slurry walls to reduce potential migration of the CCR constituents out of the WDA.

The WDA receives primarily bottom ash/boiler slag that is slurried from all four active boilers. Most of the ash/slag is deposited in the northern half of the WDA, closest to the discharge points of the slurry lines. Due to size of the unit and settling/depositional properties of the CCR materials, preliminary studies have shown little, if any, ash/slag is present in the southern half of the WDA.

2.2 Site Geology and Hydrogeology

The Site is directly underlain by unconsolidated, upper-Pleistocene (post-Wisconsin) fine-grained sand and silt and outwash deposits of the Atherton Formation, occasionally overlain by alluvial and lacustrine deposits of the Martinsville Formation (Schneider and Keller, 1970). According to Fraser and Bleur (1991), during the late Pleistocene, the Site was occupied by a post-glacial lake followed by a broad, low-gradient outwash stream that deposited sand uniformly across the basin to form the Kankakee-Valparaiso Formation. Golder's interpretation of the Site geology is based on bedrock geology maps, prior reports, and CCR Final Rule-related well installation activities, and includes the following stratigraphy:

Overburden

- Brown fine- to medium-grained sand from the ground surface to approximately 14 ft bgs
- Grayish-brown fine to medium sand from approximately 14 ft bgs to 30-35 ft bgs (coarsens with depth)

Bedrock

- Black to dark gray shale with planar cleavage (Antrim Shale). Top of bedrock is approximately 30 to 35 ft bgs near the impoundments

Regional bedrock consists of more than 4,000 feet of sedimentary rocks that overly Precambrian granitic bedrock (Fennelon 1994). This assemblage is part of the north side of the Kankakee Arch, which is the major structural feature in the Kankakee River Basin. The first 3,500 feet of sedimentary rocks overlying the granitic bedrock are Cambrian and Ordovician in age. The uppermost 300 feet of Ordovician rocks are composed of shale and minor limestones and are referred to as the Maquoketa Group. The Maquoketa Group underlies Silurian, Devonian and Mississippian rocks and consist of a wide variety of sedimentary layers ranging from shaley to coarse-grained carbonate rocks. This carbonate sequence is overlain by a series of shales including the Antrim Shale, a brownish-black, non-calcareous shale (Fennelon, 1994).

Available groundwater elevation data indicate that groundwater in the uppermost aquifer near the WDA flows to the north and northwest (and possibly northeast, immediately adjacent to the WDA). Groundwater flow direction is influenced by the slurry walls that surround the WDA and adjacent Recycle Settling Basin and Inactive Retired Waste Disposal Basin (IRWDB - both of these latter impoundments are non-CCR Final Rule regulated). Hydraulic heads measured inside the slurry walls that surround the WDA are significantly higher (i.e., up to 15 feet or more) than those measured beyond the slurry wall. This contrast in potentiometric levels indicates that the slurry walls significantly impede the flow of water from the CCR Unit to the uppermost aquifer.

2.3 Groundwater Monitoring Network

Design of the CCR Final Rule-compliant WDA monitoring program considered the size, disposal/operational history, hydraulic influence of the slurry walls, anticipated groundwater flow direction, and saturated thickness of the uppermost aquifer. Based on the available hydrogeologic information for the WDA, groundwater mounding is occurring within the slurry walls. NIPSCO's monitoring approach for the CCR surface impoundment featured the installation of well pairs including shallow (approximately 15 ft bgs) and deep (approximately 35 ft bgs – to the top of shale [signified with a "B" in Figure 2]) couplets at each background and downgradient monitoring well location outside of the perimeter slurry walls as shown in Figure 2. As-built drawings of the slurry walls are not available;

therefore, it is unknown if the slurry walls were keyed into the underlying shale. Depending upon the degree of contact between the slurry walls and shale, the higher hydraulic head observed within the slurry walls may result in the discharge of water beneath the slurry walls. Consequently, as illustrated in Figure 2-3, Golder installed deep monitoring wells to supplement shallow wells and monitor potential flow paths beneath the slurry walls into the aquifer.

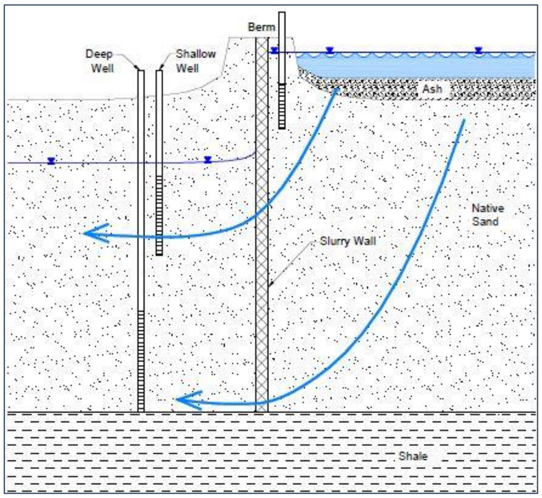

Figure 2-3: Conceptual Site Model

NIPSCO modified the groundwater monitoring well network to include two new deep wells (GAMW-01B, GAMW-12B) and four assessment monitoring well pairs (GAMW-42/42B, GAMW-43/43B, GAMW-44/44B, and GAMW-51/51B) in May and July 2018 at the locations shown in Figure 2. Golder installed the two new deep wells to monitor groundwater at the bedrock/overburden interface co-located with existing shallow wells (GAMW-01 and GAMW-12) near the waste boundary and four new well pairs further downgradient of the WDA to assess the extent of potential groundwater impacts detected during Assessment Monitoring (see Figure 2). The WDA monitoring network includes two background and eight downgradient monitoring wells. The groundwater monitoring network is summarized in Table 2-3.

Table 2-3: Waste Disposal Area Monitoring Well Network

Background Monitoring Wells	Downgradient Monitoring Wells	Assessment Monitoring Wells
GAMW-03 and GAMW-03B	GAMW-01, GAMW-01B*, GAMW-12, GAMW-12B*, GAMW-13, GAMW-13B, GAMW-14, and GAMW-14B	GAMW-42*, GAMW-42B*, GAMW-43*, GAMW-43B*, GAMW-44*, GAMW-44B*, GAMW-51*, and GAMW-51B*

*Monitoring well installed in 2018

Golder installed piezometer GAPIEZ04 in the northwest corner of the WDA within the slurry wall to assess groundwater elevations in the WDA. GAPIEZ04 is screened within the CCR materials.

2.4 Groundwater Conditions

Between July 2016 and August 2017, Golder collected eight independent background groundwater samples from each background and downgradient well, as required by 40 CFR §257.94. The results of the background monitoring phase were used to develop appropriate, statistically-valid background values for each constituent/monitoring well. Following completion of the eight background monitoring events, Golder collected the first Detection Monitoring groundwater samples in October 2017 and compared the results to the calculated prediction limits to determine 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 (with verification sampling in April 2018). Following receipt and validation of laboratory results, Golder evaluated the results of the first Assessment Monitoring sampling event to determine the concentration of Appendix IV constituents relative to CCR Unit-specific calculated groundwater protection standards (GWPSs). The GWPS is the maximum contaminant level (MCL), if an MCL exists, or the unit-specific background concentration for each analyte using a tolerance/prediction limit procedure. Based on this statistical analysis, Golder concluded that the only constituent demonstrating an apparent SSL was molybdenum. The calculated GWPS (unit-specific background concentration) for molybdenum was 0.009 milligrams per liter (mg/L). However, the detected groundwater molybdenum concentrations did not exceed the new U. S. Environmental Protection Agency (USEPA) risk-based level for molybdenum of 0.1 mg/L, which USEPA published in the Federal Register on July 30, 2018 and became effective August 29, 2018 (CCR Final Rule Part 1 Phase 1 Addendum). Golder completed an ASD in November 2018 concluding that the molybdenum SSLs determined in August 2018 are not due to a release from the CCR Unit. The key supporting lines of evidence described in the ASD indicate that the molybdenum detected in monitoring wells downgradient of the WDA is due to a natural source and not the WDA.

Golder performed the second Assessment Monitoring event in October 2018 by collecting groundwater samples from each background and downgradient monitoring well, including the new Assessment Monitoring wells per 40 CFR §257.95. Golder performed the statistical evaluation in February 2019 and concluded that the only constituents demonstrating apparent SSLs were arsenic, in GAMW-14, and cobalt, in GAMW-01. A summary of the GWPSs for these compounds are provided in Table 2-4.

Table 2-4: Waste Disposal Area Groundwater Protection Standards

Analyte	USEPA MCL or risk-based level	GWPS
Arsenic	0.01 mg/L	0.015 mg/L
Cobalt	0.006 mg/L	0.015 mg/L

3.0 SAMPLING PROCEDURES AND ANALYTICAL METHODS

To further assess potential groundwater impacts downgradient of the WDA, Golder performed supplemental assessment activities between July 24 and October 31, 2018. Golder conducted the supplemental assessment activities in accordance with the RMSGS Groundwater Monitoring Program Implementation Manual (GMPIM, Golder 2017). The following sections summarize the supplemental assessment activities.

3.1 Source Material Assessment

3.1.1 Sample Collection

Golder collected three WDA source material samples from the north side of the WDA (see Figure 2 for sample locations). Golder's field engineer composited three sub-samples into one sample per excavation area for submittal to the laboratory. The three WDA source material samples are described as follows:

- WDA-West Sample: Collected from approximately 1.5 ft below the top of a pile of recently dredged source material that originated from the northwestern corner of the WDA
- WDA-MID Sample: Collected from approximaterly one ft below the top of a pile from a recently dredged source material pile that originated near the effluent discharge pipes in the north-central portion of the WDA
- WDA-East Sample: Collected from approximately 1.5 ft below the top of a pile from a recently dredged source material pile that originated from the northeastern portion of the WDA

3.1.2 Geochemical Characterization

Golder used two geochemical analytical methods to characterize the source material samples: total metals analysis and leachability testing. The selected geochemical test methods are summarized in the following paragraphs. The analytical results for the WDA source material are provided in Table 1.

Total Metals: The purpose of this test was to assess the chemical composition of potential source and aquifer materials. The total mass of metals in combination with the results from leachability testing can be used to determine the provenance of the COC metals and their relative leachability. The laboratory analyzed a target analyte list (TAL) of metals following the 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 (January 1998).

Leachability: The purpose of this test was to obtain an understanding of the fraction of total metals that is leachable, which is important for evaluating the long-term environmental stability of potential source materials. The analysis simulates the interaction between a solid and meteoric water, and thus provides the leachability potential of a material. This analysis was only conducted on source materials (i.e., samples collected from within the WDA, see Section 3.1.1). The laboratory used porewater collected by Golder from the WDA (piezometer GAPIEZ04) as the leaching medium to simulate natural conditions. The laboratory tested the leachability of the source materials using USEPA SW846 1312 Modified Synthetic Precipitation Leaching Procedure (SPLP) (September 1994).

3.2 Overburden Soil and Bedrock Shale Samples

Golder subcontracted a union-licensed well driller to advance borings and install monitoring wells using sonic drilling methods. Golder collected a composite overburden sample (i.e., two-foot interval) from within the well screen interval (i.e., 10-foot screened interval) of monitoring well GAMW-42B. Golder also collected two shale samples from boring GAMW-42B, including one shale sample located just below the contact between the overburden/shale (i.e., considered as ”weathered” shale) and one shale sample located approximately two feet into the shale (i.e., ”non-weathered” shale). Golder submitted the overburden and shale samples to a certified laboratory under chain-of-custody procedures for analysis of total metals (see Section 3.1.12 for analytical method). The overburden and bedrock analytical results are provided in Table 1.

3.3 Groundwater and Porewater Assessment

3.3.1 Sample Collection

Golder field personnel collected groundwater and porewater (i.e., water in direct contact with CCR materials) samples in accordance with the RMSGS GMPIM. Porewater samples were collected in August, September, and October 2018. Porewater analytical results are provided in Table 2 and groundwater analytical results are provided in Table 3. Groundwater and porewater samples were analyzed for Appendix III and IV metals and other groundwater quality parameters, as described below.

3.3.2 Geochemical Characterization

The geochemical analytical methods Golder used to characterize the porewater and groundwater samples included total metals analyses and major cations and anions analyses. These selected analytical methods are summarized below.

Metals: Metals analyses (i.e., Appendix III and IV) are important to understand the geochemical properties of porewater and groundwater. In porewater, metal results can be used for geochemical modeling and provide an indication of the leachable fraction of the solids (ITRC, 2012). In groundwater, metals analysis allows for the delineation of a potential plume, and identification of background contributions from natural sources or off-site locations.

Major Cations and Anions/Field Parameters: Geochemical modeling of mineral solubility, metal attenuation and background contributions requires analysis of major cations and anions because they affect and participate in sorption and mineral dissolution/precipitation reactions. Required field parameters include pH, dissolved oxygen, oxidation reduction potential (ORP), conductivity, and temperature, which are needed to support geochemical modeling and serve an important quality assurance/quality control (QA/QC) function.

The laboratory analyzed porewater and groundwater samples using the following methods:

- Chloride, Fluoride, and Sulfide following USEPA SW846 9056A Determination of Inorganic Anions by Ion Chromatography Revision 1 (February 2007)
- pH following USEPA SW846 9040C pH Electrometric Measurement (November 2004)
- Total Target Analyte List (TAL) Metals following USEPA SW846 6010C Inductively Coupled Plasma- Atomic Emission Spectrometry Revision 3 (November 2000), SW846 6020B Inductively Coupled Plasma- MS Revision 2 (July 2014), SW846 6020A Inductively Coupled Plasma- MS Revision 1 (January 1998), and SW846 7470A Mercury in Liquid Wastes (Manual Cold- Vapor Technique) Revision 1 (September 1994)
- Total Dissolved Solids following SM 2540C Total Dissolved Solids Dried at 180°C (1993)
- Alkalinity following SM 2320B Alkalinity by Titration (2005)

4.0 DATA EVALUATION AND FINDINGS

4.1 Source Material Results

Golder collected three WDA source material samples to assess the potential contribution of source materials to groundwater. The laboratory reported results as both total and leachable arsenic and cobalt concentrations. Total arsenic and cobalt concentrations were low, ranging from 3.4 to 5.2 milligram per kilogram (mg/kg) and 5.4 to 19 mg/kg, respectively. These WDA source material concentrations are less than the range of concentrations observed in the on-Site unimpacted soil and bedrock samples (described below in Section 4.2). In addition, the laboratory measured the leachability potential of the WDA source material samples using interstitial porewater collected from the WDA (i.e., GAPIEZ-04) following U.S. EPA Modified SPLP Method protocols (see Section 3.1.2). The arsenic and cobalt leachability levels were non-detect (<0.015 mg/L and <0.004 mg/L for arsenic and cobalt, respectively), indicating that the WDA source material has negligible to no leaching potential for either arsenic or cobalt. Therefore, constituents of the WDA source materials, if they have been released from the CCR

Unit, do not appear to be contributing to the downgradient groundwater arsenic and cobalt concentrations. The WDA CCR source material results are provided in Table 1.

4.2 Overburden Soil and Bedrock Shale Results

Golder collected soil and bedrock samples from boring/monitoring well GAMW-42B to assess the presence of naturally-occurring arsenic and cobalt. Boring/monitoring well GAMW-42B is located west of and in an area unimpacted by the WDA. Total arsenic and total cobalt concentrations ranged from 2 to 30 mg/kg and 3.7 to 41 mg/kg, respectively, across the three intervals samples (30-34 ft bgs, 34-36 ft bgs, and 36-38 ft bgs). The range of total arsenic and cobalt concentrations in the samples demonstrates the heterogeneity in the natural geology of the Site. Groundwater reaches equilibrium with the naturally-occurring metals as it flows through the media, which accounts for natural variability in the arsenic and cobalt groundwater concentrations. Both arsenic and cobalt are sensitive to changes in groundwater chemistry (e.g., pH or redox potential) and can be easily remobilized into groundwater (Hem 1989). As a consequence, seasonal or other natural fluctuations in groundwater chemistry will also lead to fluctuating arsenic and cobalt concentrations.

4.3 Groundwater and Porewater Results

As stated in the CSM (see Section 2.1), most of the bottom ash/boiler slag is deposited in the northern half of the WDA, closest to the discharge points of the slurry lines. Due to size of the unit and settling/depositional properties of the CCR materials, very little, if any, ash/slag is present in the southern half of the WDA. Overall, Golder expects that if there was a release from the WDA, the highest concentrations would be expected in the groundwater samples collected from monitoring wells installed near the northwest corner of the WDA (e.g.,GAMW-14/14B), as compared to concentrations detected in monitoring wells installed near the southwest corner of the WDA (e.g., GAMW-01/01B). This expectation helps explain the groundwater findings and frames the porewater results as compared to groundwater quality. The porewater and groundwater analytical results are provided in Table 2 and Table 3, respectively, and described in the following sections.

4.3.1 Geochemistry

Golder evaluated groundwater and porewater data using the relative abundance of major cations and anions to differentiate between groundwater compositions. Golder generated Piper and Durov plots using Geochemist's Workbench software to visually depict major ion chemistry abundance and elucidate relationships between background groundwater, downgradient groundwater, and porewater.

Golder used the Spece8 package in Geochemist's Workbench to assess mineral saturation in groundwater samples and determine if mineral precipitation would impact relative ion abundance. The Spece8 analysis only used data from monitoring wells with a full suite of groundwater analytical results (i.e., all major ions), which is a prerequiste for reliable and defensible geochemical modeling. The evaluation of major ion composition indicates that there are three discrete groundwater groups:

- Background and downgradient groundwater
- Groundwater influenced by an alternative source
- WDA porewater

Groundwater quality observed in samples collected from downgradient GAMW-01B and GAMW-12B showed a closer relationship to groundwater quality in background monitoring wells GAMW-03 and GAMW-03B than the WDA porewater samples (see Figure 4-3(1)). This similarity in major ion composition suggests that downgradient groundwater has the same source as background groundwater. As a comparison, in cases where groundwater is impacted by a potential large discrete source (e.g., unlined fly ash landfill), the major groundwater ions would plot between the background and source groundwater, indicating mixing of the two waters. Wells GAMW-13B, GAMW-14B, and GAMW-51B are deeper wells installed to the top of bedrock and their groundwater compositions are different with respect to relative ion abundance from those of other downgradient wells, suggesting a potential alternative source. Neither GAMW-13B, GAMW-14B, or GAMW-51B show exceedances of arsenic or cobalt. Based on the Piper plot, the composition of groundwater in GAMW-13B is the most closely related to that of WDA porewater, and if the WDA was the source of arsenic and cobalt in groundwater, it would most likely be present in GAMW-13B.

The WDA not being the source of arsenic and cobalt in wells GAMW-01 and GAMW-14 is also supported by the total dissolved solids (TDS) content measured in these wells. The TDS contents measured in GAMW-01 and GAMW-14 in October 2018 were 350 mg/L and 290 mg/L, respectively, which was lower than in both the WDA (710 mg/L) and groundwater from background well GAMW-03/03B (440 mg/L to 450 mg/L; Figure 4-3(2)). In the absence of attenuation reactions such as mineral precipitation (which would lower the TDS of a groundwater sample), the TDS of a mixture of two samples should range between the TDS values of both inputs. Based on geochemical modeling, mineral saturation is not achieved in GAMW-01 or GAMW-14, so the groundwater does not represent a mixture of WDA porewater and groundwater from GAMW-03/03B. The TDS content measured in monitoring wells GAMW-14B and GAMW-51B is much higher than in other monitoring wells and WDA porewater samples. The TDS concentrations from these wells group independently on both the Piper and Durov diagrams compared to TDS concentrations in other wells and are likely influenced by an alternative source affecting their groundwater chemistry while demonstrating no influences from the WDA. The analytical results used to develop the Piper Plots were obtained from groundwater samples collected in October 2018 and are provided in Table 2 and Table 3.

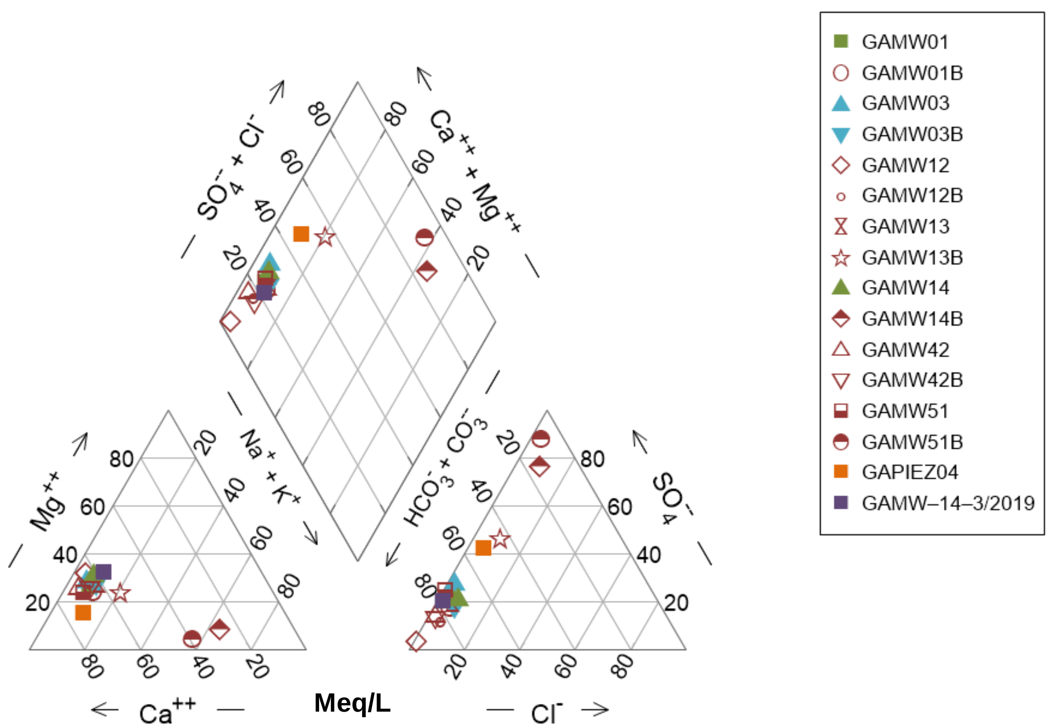

Figure 4-3(1): WDA Piper plot of relative ion abundance in groundwater samples

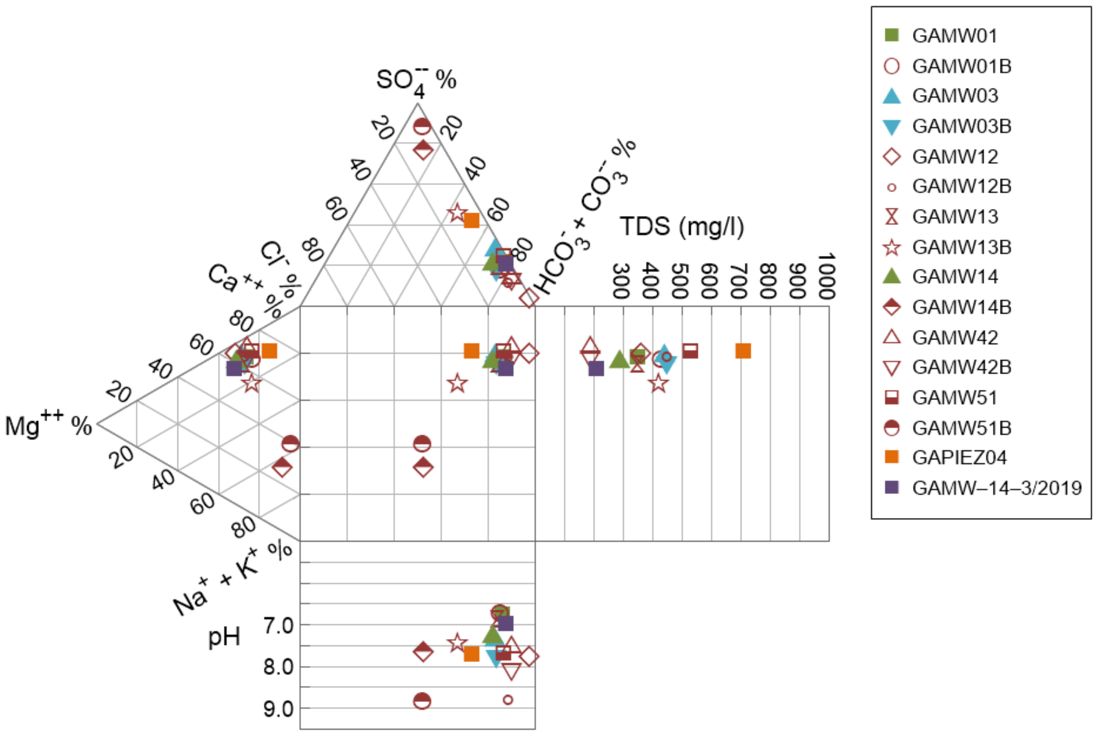

Figure 4-3(2): WDA Durov plot of relative ion abundance in groundwater and TDS (Note: TDS for GAMW-14B and GAMW-51B >1000mg/L not shown due to axis constraints)

4.3.2 Arsenic

Arsenic has been detected at concentrations above the MCL (0.01 mg/L) in groundwater samples collected from the shallow background monitoring well, shallow downgradient monitoring wells, and GAPIEZ-04 during the July 2016 to October 2018 monitoring events. The arsenic time-series plot (Figure 4-3(3)) shows seasonal impacts to the arsenic concentrations, with the lowest arsenic concentrations detected during the winter (December-March) and the highest concentrations detected during the late summer and fall (July-October). Given the WDA disposal history, types of CCR materials placed in the WDA, and decades since CCR was first placed in the WDA, Golder anticipates that a mature plume (i.e., steady-state or consistent concentration levels), if any, would be detected in groundwater near the WDA. The fluctuations in arsenic concentration suggest seasonality effects and/or heterogeneity in the overburden based on the following findings:

- Arsenic concentrations found in groundwater samples collected from shallow background well GAMW-03 range from non-detect (<0.005 mg/L) to 0.018 mg/L.
- Total arsenic concentrations in the WDA porewater are similar to background concentrations (0.012 to 0.015 mg/L).
- Arsenic was observed at concentrations above the GWPS (0.015 mg/L) and/or the MCL in groundwater samples collected from shallow downgradient monitoring wells GAMW-01, GAMW-12, GAMW-13, GAMW-14. However, based on the statistical methodology applied, an SSL for arsenic has only been reported for GAMW-01. The arsenic concentrations in groundwater samples collected from monitoring well GAMW-01 range from 0.01 mg/L to 0.039 mg/L.

- Porewater arsenic concentrations measured in GAPIEZ-04 (groundwater in direct contact with CCR materials) are lower than the arsenic concentrations observed in the groundwater samples from downgradient monitoring well GAMW-01, suggesting that arsenic in groundwater samples collected from GAMW-01 is not due to a release from the CCR Unit.
- Monitoring well GAMW-01 is located at the waste boundary near the southwest corner of the WDA as shown in Figure 2. Previous bathymetric studies have indicated that there are few, if any, CCR materials in the southwest corner of the WDA. Therefore, groundwater quality at GAMW-01 should not be influenced by the contents of the WDA.

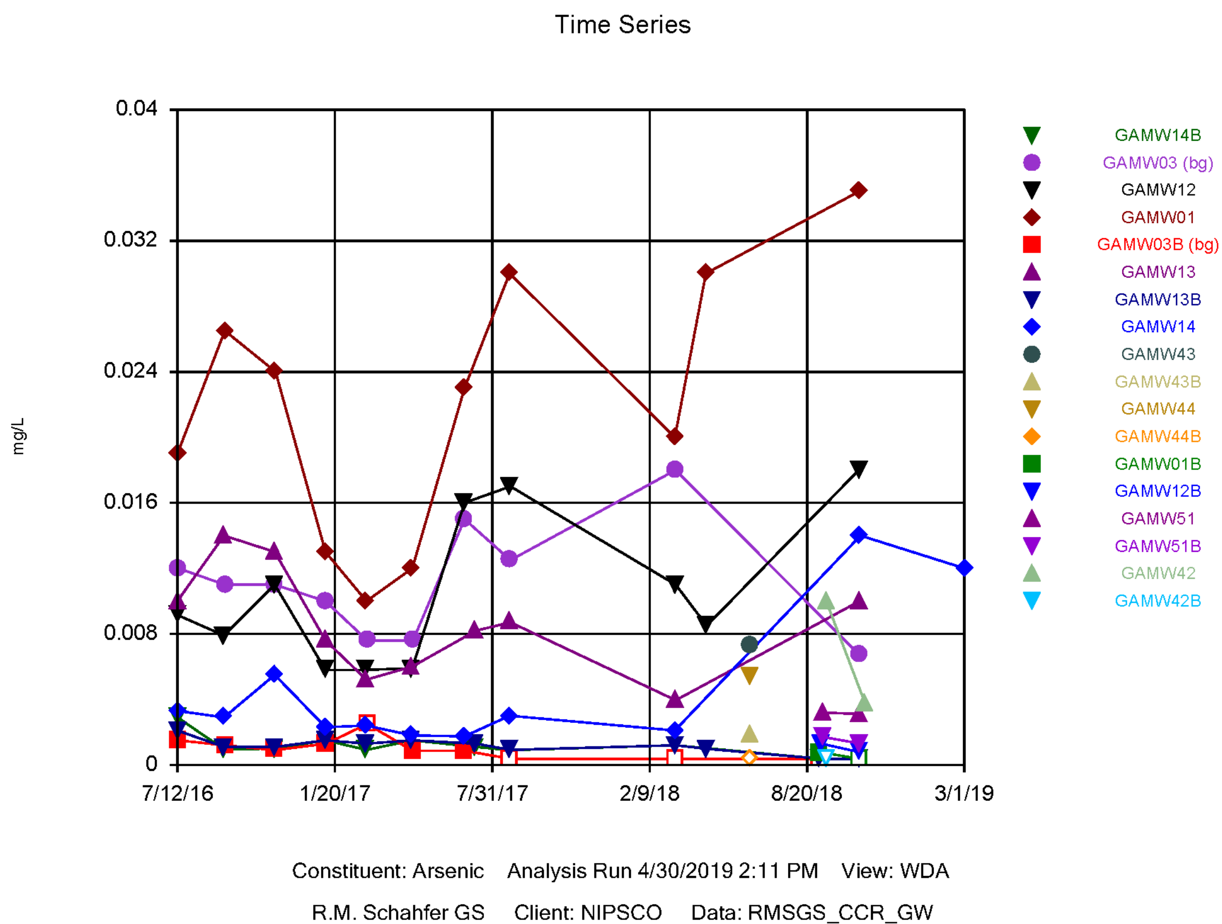

Figure 4-3(3): Arsenic Time-Series Plot

4.3.3 Cobalt

Cobalt has been detected at concentrations above the risk-based standard (0.006 mg/L) in groundwater samples collected from the shallow background monitoring well, shallow downgradient monitoring well GAMW-14, and upgradient well GAMW-03 during the July 2016 to October 2018 monitoring events. Given the WDA disposal history, types of CCR materials placed in the WDA, and decades since CCR was first placed in the WDA, Golder anticipates that a mature plume (i.e., steady-state or consistent concentration levels), if any, would be detected in groundwater near the WDA. However, the cobalt time-series plot (Figure 4-3(4)) shows cobalt concentrations in GAMW-14 are fluctuating. Cobalt in all other monitoring wells is consistently observed at concentrations below the risk-based standard

(0.006 mg/L). The fluctuations in cobalt concentration suggest seasonality effects and/or heterogeneity in the overburden based on the following findings:

- Cobalt concentrations found in groundwater samples from shallow background well GAMW-03 range from non-detect (<0.001 mg/L) to 0.015 mg/L.
- Porewater cobalt concentrations observed in groundwater samples collected from GAPIEZ-04 (groundwater in direct contact with CCR materials) are not detected above the laboratory reporting limit (<0.001 mg/L).
- Cobalt was identified at a concentration above the risk-based standard and GWPS (0.015 mg/L) in groundwater samples collected from shallow downgradient monitoring well GAMW-14. Cobalt concentrations range from 0.0052 mg/L to 0.052 mg/L in groundwater samples collected from monitoring well GAMW-14 during the July 2016 to March 2019 monitoring events. The cobalt concentrations also show a statistically-significant increasing trend (see Figure 4-3(4) below) where the lower confidence interval is above the GWPS; therefore, an SSL for cobalt has been reported in GAMW-14. Golder collected a confirmation groundwater sample in March 2019. The cobalt result (0.0083 mg/L) obtained from the March 2019 monitoring event is lower than the cobalt concentration observed during the October 2018 (0.031 mg/L) monitoring event and lower than the GWPS (0.015 mg/L). While the cobalt level in GAMW-14 decreased substantially in March 2019, there was no substantial change in major relative ion abundance between the October 2018 and March 2019 samples (Figure 4-3(5)), indicating a consistent groundwater composition at this well.
- Porewater cobalt concentrations detected in GAPIEZ-04 (groundwater in direct contact with CCR materials) are lower than the cobalt concentrations found in downgradient monitoring well GAMW-14, suggesting that cobalt present in groundwater samples collected from GAMW-14 is not due to a release from the CCR Unit.

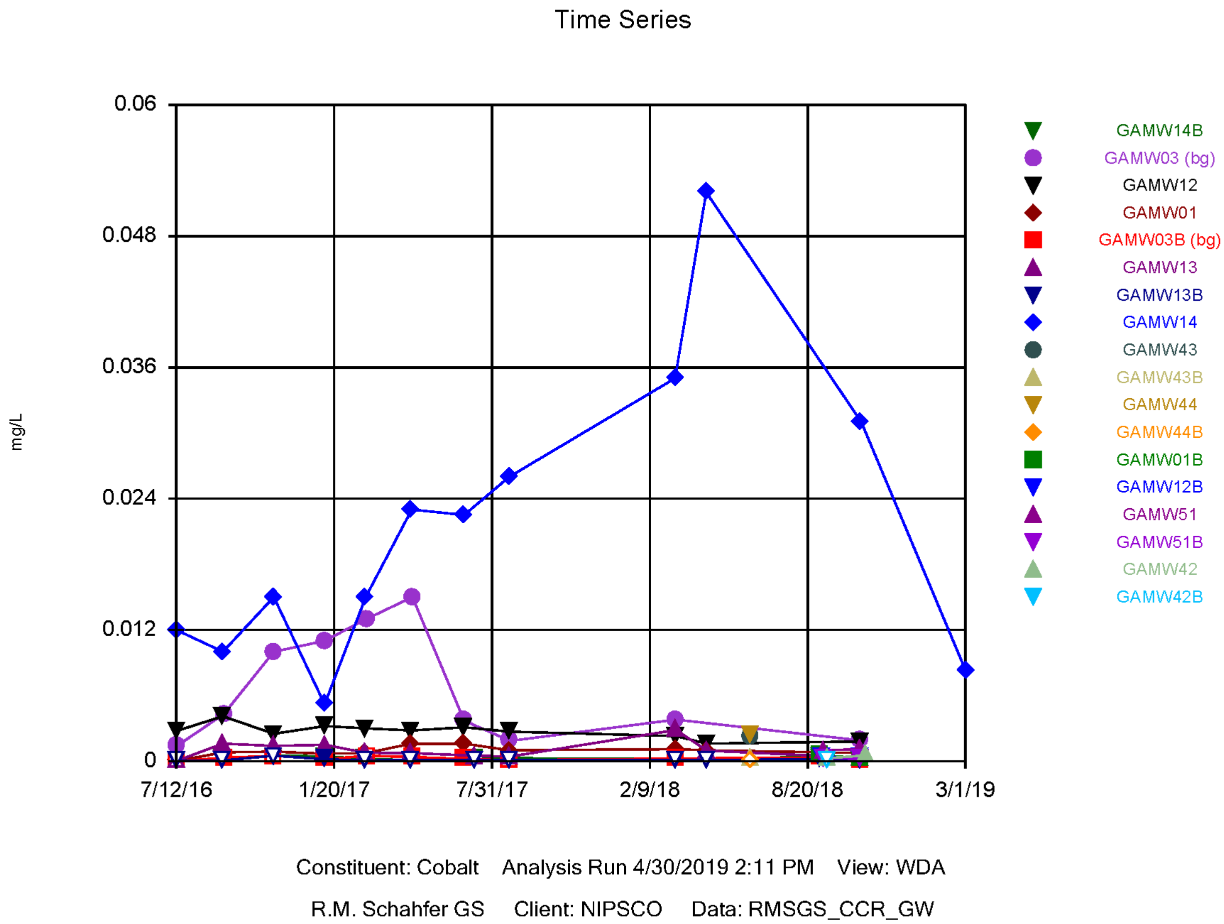

Figure 4-3(4): Cobalt Time-Series Plot

4.3.4 Indicator Parameters

The CCR Final Rule Appendix III parameters are common indicator parameters for CCR material and, depending upon site conditions, can be indicative of the presence of CCR material constituents in media of interest. Several of these indicator parameters, including boron, chloride, sulfate, and total dissolved solids, have been observed at higher concentrations in groundwater samples collected from downgradient deep monitoring well GAMW-14B (and to a lesser extent, GAMW-13B) than in the background monitoring wells. Boron, in particular, is a known CCR indicator parameter that has high mobility in groundwater and, as such, is expected to represent the furthest extent of groundwater impacts originating from CCR releases. A summary of groundwater boron concentrations is as follows:

- Boron concentrations found in groundwater samples collected from background monitoring wells GAMW-03 and GAMW-03B range from non-detect (<0.2 mg/L) to 0.32 mg/L.
- Porewater boron concentrations detected in groundwater samples collected from GAPIEZ-04 (groundwater in direct contact with CCR materials) range from 0.71 to 0.86 mg/L.
- The highest boron concentrations were observed in groundwater samples collected from the deep downgradient monitoring wells GAMW-14B (2.4 to 3.4 mg/L) and GAMW-13B (0.69 to 0.79 mg/L). These

boron concentrations are higher than background and porewater concentrations, indicating that they may be due to another source. Because boron is a groundwater tracer and the plume should be stable based on the disposal history of the WDA, Golder would expect that the highest concentrations of other CCR parameters would also be found in the same deep wells that contain elevated boron concentrations. However, this is not the case as the arsenic and cobalt SSLs occur in shallow wells. Boron concentrations in groundwater samples collected from GAMW-01 vary but are generally closer to background concentrations than porewater concentrations. Boron concentrations found in groundwater samples collected from GAMW-01 are below 0.3 mg/L in 2018. Boron concentrations detected in groundwater samples collected from GAMW-14 are similar to background concentrations and range from 0.23 to 0.36 mg/L (see Figure 4-3(5)).

Based on the lines of evidence provided above, it is considered unlikely that the WDA is the source of the arsenic and cobalt SSLs.

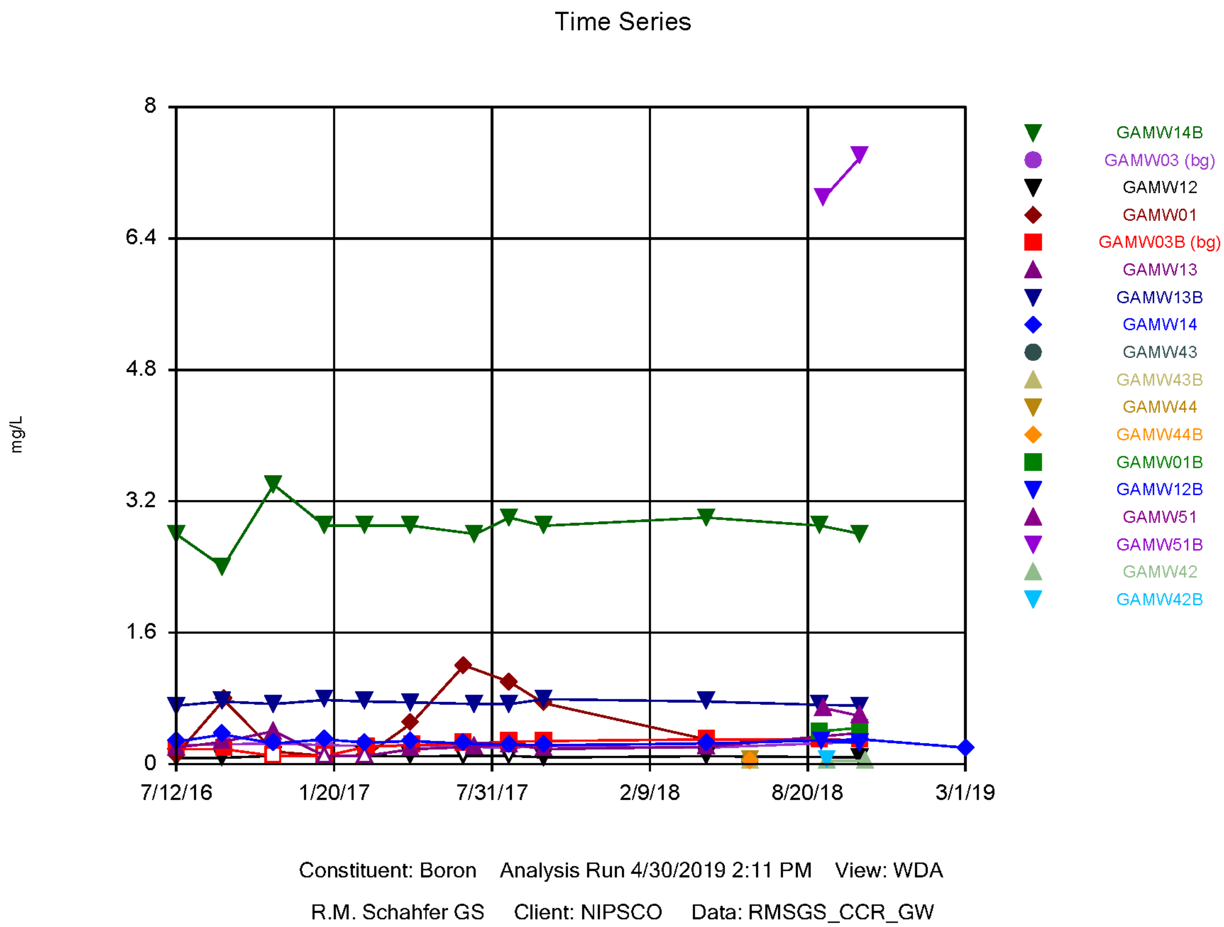

Figure 4-3(5): Boron Time-Series Plot

5.0 EVIDENCE OF AN ALTERNATIVE SOURCE

Based on a literature review and the testing results presented above, it is Golder's opinion that the arsenic and cobalt SSLs encountered in groundwater near the WDA are linked to an alternative source rather than a release from the WDA. Golder concludes the arsenic and cobalt SSLs are caused by natural variation in the arsenic and cobalt contents of the overburden and bedrock.

Primary lines of evidence and conclusions drawn from the evidence used to support this ASD are provided in Table 5-1.

Table 5-1: Primary Lines of Evidence and Supporting ASD Analysis

Key Line of Evidence	Supporting Evidence	Description
Source Material Characteristics	WDA source material and porewater concentrations	WDA source materials contain low levels of arsenic and cobalt but indicate low to no leaching potential for these compounds. Additionally, WDA porewater samples indicate lower levels of both arsenic and cobalt than in the downgradient wells. Therefore, another source must be present to account for the higher arsenic and cobalt concentrations observed in downgradient groundwater.
	Relative ion abundance differs from the WDA	As presented in the Piper and other ternary diagrams, major ion concentrations show distinct differences between the WDA porewater and downgradient groundwater samples. The geochemical properties of the downgradient groundwater samples cannot have been generated by a release from the WDA.
Natural Source	Natural Overburden and Bedrock Concentrations	Naturally occurring total arsenic and cobalt were detected in background soil boring (SB-42B). The concentrations varied across the three intervals (30-34 ft bgs, 34-36 ft bgs, 36-38 ft bgs), with concentrations up to 30 mg/kg and 41 mg/kg for arsenic and cobalt, respectively. The presence of this range in total arsenic and cobalt in the background soil boring demonstrates the heterogeneity in the natural geology of the site.
Hydrogeology	Groundwater Flow Direction	GAMW-01, a shallow well located farthest from the CCR source material, contains groundwater arsenic at concentrations above the GWPS. Arsenic has generally not been detected in samples from monitoring wells GAMW-12, GAMW-13, and GAMW-14, which are closer to and downgradient of the source material. This concentration pattern is inconsistent with the CCR Unit being the source of arsenic in this well.
	Indicator Parameters	Boron, because of its mobility, can be used to define the leading edge of the groundwater plume originating from a CCR source. The highest concentrations of boron in monitoring wells on the downgradient edge of the CCR Unit were found in GAMW-14B and GAMW-13B. Lower concentrations of boron were detected in GAMW-01 and GAMW-14. This concentration pattern is inconsistent with the CCR being the source for the cobalt and arsenic in these wells.
	Temporal trends and associations	In certain downgradient wells, seasonal variability is observed in arsenic groundwater concentrations. Cobalt concentrations were increasing between January 2017 and October 2018, but otherwise have been variable. This suggests the arsenic and cobalt is naturally occurring and not representative of a constant and consistent release from the WDA. Given the WDA disposal history, types of CCR materials placed in the WDA, and decades since CCR was first placed in the WDA, Golder anticipates that a mature plume (i.e., steady-state or consistent concentration levels), if any, would be found in groundwater near the WDA. However, this is not the case, indicating the arsenic and cobalt do not originate from the WDA.

6.0 CONCLUSION

The preceding information serves as the ASD prepared for the WDA in accordance with 40 CFR 257.95(g)(3)(ii) and supports the finding that the SSLs determined on February 18, 2019 are not due to a release from the CCR Unit. The key supporting lines of evidence described above indicate that the arsenic and cobalt observed in monitoring wells downgradient of the WDA are due to natural variation and not the WDA. Therefore, no further action (i.e., Assessment of Corrective Measures) is warranted, and the RMSGS WDA will remain in Assessment Monitoring.

7.0 REFERENCES

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https://golderassociates.sharepoint.com/sites/nipscoccrgwmonitoring/shared documents/r.m. schahfer generating station/reports/wda asd spring 2019/final/wda_ask-051719.docx

TABLES

Table 1: Source Material and Background Overburden Soil and Bedrock Shale Analytical Results
Waste Disposal Area
R. M. Schahfer Generating Station
Wheatfield, Indiana

Sample Location	WDA-EAST	WDA-MID	WDA-WEST	SB-42B		
Start Depth (ft bgs)	0	0	0	30	34	36
End Depth (ft bgs)	1.5	1	1.5	34	36	38
Total Arsenic Result	5.2	3.4	5.1	2 J	30	30
SPLP Arsenic Result	0.015 U	0.015 U	0.0015 U	NM	NM	NM
Total Cobalt Result	19 J	5.4	6.9	3.7 J	41	37
SPLP Cobalt Result	0.0040 U	0.0040 U	0.0040 U	NM	NM	NM

Notes:

ft bgs: Feet below ground surface

All results displayed are in milligram per kilogram (mg/kg), except SPLP results which are in milligram per liter (mg/L).

SPLP: Synthetic Precipitation Leaching Procedure

J: Indicates the result is estimated.

U: Indicates result was not detected above the laboratory method detection limit, the laboratory reporting limit is provided.

NM: Not measured

Prepared by: DFS
Checked by: ERW
Reviewed by: MAH

Table 2: Porewater Analytical Results
Waste Disposal Area
R. M. Schahfer Generating Station
Wheatfield, Indiana

Location	GAPIEZ04		
Sample Date	2018-08-09	2018-09-13	2018-10-30
Fraction	D	T	T
Analyte			
Alkalinity, Total	210 J	220	220
Arsenic	0.012	0.015	0.015
Boron	0.86	0.71	0.86
Calcium	140	160	170
Chloride	19	21	18
Cobalt	0.00026 J	0.001 U	0.001 U
Magnesium	20	20	20
pH	7.35	7.27	7.71
Potassium	4.8 J	5	4.8 J
Sodium	28	22	27
Sulfate	280	280	170
Total Dissolved Solids	670	660	710

Notes:

Table shows all results in milligram per liter (mg/L)

D: Dissolved

T: Total

J: Indicates result is estimated.

U: Indicates result was not detected above the laboratory method detection limit, the laboratory reporting limit is provided.

Prepared by: DFS
Checked by: ERW
Reviewed by: MAH

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW01													GAMW01B	
		2016-07-12	2016-09-08	2016-09-08	2016-11-09	2017-01-09	2017-02-28	2017-04-25	2017-06-28	2017-08-22	2017-10-03	2018-03-12	2018-04-19	2018-10-23	2018-09-06	2018-10-23
		N	FD	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																
Boron	mg/L	0.11	1.2 J	0.36 J	0.15 J	0.2 U	0.2 U	0.5	1.2	1	0.74		0.3	0.29	0.4	0.44
Calcium	mg/L	65	240 J	83 J	74	71	83	110	110	81	81		87	77	110	100
Chloride	mg/L	4.3	28 J	12 J	5.3	5.6	8.3	18	18	12	16		10	8.1	21	19
Fluoride	mg/L	0.34 J+	0.25 J	0.38 J	0.34 J	0.34 J	0.3 J	0.26 J	0.35 J	0.41 J	0.38 J	0.28 J	0.32 J	0.3	0.17 J	0.14
pH	SU	7.18		6.5	6.93	7.33	7.26	7.16	6.5	7.24	7.18	7.24	7	6.78	7.01	6.74
Sulfate	mg/L	54 J-	500 J	100 J	62	52	54	100	200	130	110		50	68	72	69
Total Dissolved Solids	mg/L	280	1100 J	380 J	320	280	340	480	580	420	420		360	350	450	430
Appendix IV Parameters																
Antimony	mg/L	0.00048 J	0.001 J	0.00068 J	0.001 J	0.0016 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	0.019	0.014 J	0.039 J	0.024	0.013	0.01	0.012	0.023	0.03		0.02	0.03	0.035	0.00077 J	0.005 U
Barium	mg/L	0.059	0.078 J	0.057 J	0.064	0.053	0.07	0.065	0.093	0.077		0.057	0.052	0.052	0.19	0.17
Beryllium	mg/L	0.00099 J	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	0.00036 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	0.00038 J		0.001 U		0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.00038 J	0.002 U	0.00037 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	0.001 U	0.00053 J	0.0011	0.00087 J	0.00068 J	0.00074 J	0.0016	0.0016	0.001		0.0011	0.001	0.00075 J	0.00056 J	0.00027 J
Fluoride	mg/L	0.34 J+	0.25 J	0.38 J	0.34 J	0.34 J	0.3 J	0.26 J	0.35 J	0.41 J	0.38 J	0.28 J	0.32 J	0.3	0.17 J	0.14
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.00023 J	0.001 U	0.001 U	0.001 U	0.001 U	0.00065 J		0.001 U		0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.0031 J	0.008 U	0.008 U	0.008 U	0.0031 J	0.0015 J	0.003 J	0.0042 J	0.0037 J		0.0019 J		0.0028 J	0.0039 J	0.0046 J
Mercury	mg/L	0.0002 U	0.00035	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	0.011	0.025	0.022	0.011	0.01 U	0.01 U	0.017	0.033	0.045		0.014	0.016	0.015	0.0015 J	0.01 U
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.00075 J	0.0018 J	0.001 J	0.0016 J	0.0031 J	0.0017 J		0.0016 J		0.001 J	0.001 J	0.005 U
Thallium	mg/L	0.00018 J	0.00035 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.00032 J		0.001 U		0.001 U	0.001 U	0.001 U
General Chemistry																
Alkalinity, Total	mg/L													250	290	320
Magnesium	mg/L													19	21	24
Potassium	mg/L													4.6 J	4.8 J	5.5
Sodium	mg/L													9.1	18	10
Field Parameters																
Dissolved Oxygen	mg/L	0.14		0.9	0.18	0.25	0.17	0.07	0.61	0.32	0.19	0.28	0.14	0.22	0.62	0.23
Oxidation-Reduction Potential	millivolts	-92.6		-21.4	-120.7	-110.5	-127.2	-102.8	98.3	-43.1	-48.2	-85.1	284.1	-130.2	-96.2	-111.7
pH	SU	7.18		6.5	6.93	7.33	7.26	7.16	6.5	7.24	7.18	7.24	7	6.78	7.01	6.74
Specific Conductance	uS/cm	448		604	512	416	508	707	844	650	673	395	550	594	684	687
Temperature	deg C	13.9		17.8	16.2	11.2	9.73	10.8	13.8	17	17.2	9.2	9.4	16.9	13.9	13.9
Turbidity	NTU	1.25		2.12	3.92	4.79	3.86	3.69	4.22	2.22	2.8	4.61	4.05	4.81	4.16	2.41

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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

"J+" = Indicates the result was estimated below the RL but above the MDL and may be biased high; the estimated value is provided.

"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW03														
		2016-07-13	2016-09-08	2016-11-08	2017-01-09	2017-01-09	2017-03-01	2017-04-26	2017-06-28	2017-08-23	2017-08-23	2017-10-04	2018-03-13	2018-04-20	2018-10-24	2018-10-24
		N	N	N	FD	N	N	N	N	FD	N	N	N	N	FD	N
Appendix III Parameters																
Boron	mg/L	0.23	0.24	0.25	0.24	0.22	0.22	0.23	0.21	0.2	0.2	0.22		0.2	0.28	0.26
Calcium	mg/L	83	87	100	110	94	100	110	87	75	77	87		93	97	94
Chloride	mg/L	7.7	8.6	10	9.1	9.1	8.1	6.8	10	8.2	8.3	9		4.9	22	7.7
Fluoride	mg/L	0.15 J+	0.19 J	5 U	0.12 J	0.12 J	0.14 J	0.13 J	0.2 J	0.17 J	0.18 J	0.12 J	0.16 J	0.2 J	0.21	0.15
pH	SU	6.85	6.62	6.53		6.69	6.66	6.64	6.76		7.1	6.9	6.61	7.13		7.37
Sulfate	mg/L	100 J-	100	110	110	110	120	130	83	77	77	93		110	67	100
Total Dissolved Solids	mg/L	400	390	500	440	430	450	510	420	370	370	430		380	440	440
Appendix IV Parameters																
Antimony	mg/L	0.00023 J	0.00091 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	0.012	0.011	0.011	0.01	0.01	0.0076	0.0076	0.015	0.012	0.013		0.018		0.005 U	0.013
Barium	mg/L	0.087	0.096	0.11	0.11 J	0.081 J	0.087	0.091	0.071	0.079	0.079		0.074		0.11	0.1
Beryllium	mg/L	0.00055 J	0.00053 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
Cadmium	mg/L	8.8E-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
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	0.0014	0.0043	0.01	0.011	0.011	0.013	0.015	0.0037	0.0018	0.0019		0.0038		0.001 U	0.0037
Fluoride	mg/L	0.15 J+	0.19 J	5 U	0.12 J	0.12 J	0.14 J	0.13 J	0.2 J	0.17 J	0.18 J	0.12 J	0.16 J	0.2 J	0.21	0.15
Lead	mg/L	0.001 U	0.001 U	0.00016 J	0.001 U	0.001 U	0.001 U	0.001 U	0.00052 J	0.00045 J	0.001 U		0.001 U		0.001 U	0.001 U
Lithium	mg/L	0.0064 J	0.008 U	0.008 U	0.0042 J	0.0044 J	0.0025 J	0.0045 J	0.0063 J	0.0067 J	0.0069 J		0.006 J		0.008 U	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 UJ		0.0002 U		0.0002 U	0.0002 U
Molybdenum	mg/L	0.0087 J	0.009 J	0.01 U	0.012 J+	0.01 U	0.01 U	0.0082 J	0.0084 J	0.0069 J	0.0076 J		0.0063 J		0.0065 J	0.0082 J
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.00085 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
Thallium	mg/L	0.001 U	0.00028 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
General Chemistry																
Alkalinity, Total	mg/L															260
Magnesium	mg/L															25
Potassium	mg/L															0.97 J
Sodium	mg/L															10
Field Parameters																
Dissolved Oxygen	mg/L	0.38	0.61	0.24		0.71	1.07	0.73	0.61		0.22	0.29	1.3	0.9		0.99
Oxidation-Reduction Potential	millivolts	186.5	7.4	-30.2		-34	-28.5	-21.7	-24.1		-28.5	-83.1	-76.4	-98.2		-283.8
pH	SU	6.85	6.62	6.53		6.69	6.66	6.64	6.76		7.1	6.9	6.61	7.13		7.37
Specific Conductance	uS/cm	599	630	711		586	588	760	550		583	655	369	572		675
Temperature	deg C	13.4	16.2	15.5		10.8	9.02	10.4	12.7		15.2	16.1	8.6	7.9		16.2
Turbidity	NTU	2.72	4.41	2.92		4.58	4.68	4.42	4.5		2.51	4.18	4.66	4.96		3.55

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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

"J+" = Indicates the result was estimated below the RL but above the MDL and may be biased high; the estimated value is provided.

"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW03B													
		2016-07-13	2016-09-08	2016-11-08	2017-01-10	2017-03-01	2017-04-26	2017-06-28	2017-08-23	2017-10-04	2018-03-13	2018-04-20	2018-09-06	2018-09-06	2018-10-24
		N	N	N	N	N	N	N	N	N	N	N	FD	N	N
Appendix III Parameters															
Boron	mg/L	0.18	0.18	0.2 U	0.2 U	0.21	0.23	0.25	0.27	0.28		0.3	0.32	0.28	0.29
Calcium	mg/L	98	100	110	98	110	110	110	99	95		110	100	99	98
Chloride	mg/L	14	13	15	16	20	20	22	21	25		23	24	25	22
Fluoride	mg/L	0.25 J+	0.23 J	5 U	0.24 J	0.23 J	0.2 J	0.24 J	0.24 J	0.21 J	0.2 J	0.22 J	0.23 J	0.23 J	0.21
pH	SU	7.01	6.74	6.53	7.08	7.04	6.97	6.81	7.29	7.07	6.83	7.12		7.1	7.77
Sulfate	mg/L	58 J-	59	58	77	67	67	66	68	84		66	64	64	67
Total Dissolved Solids	mg/L	420	410	420	440	450	480	510	450	460		420	470	450	450
Appendix IV Parameters															
Antimony	mg/L	0.00019 J	0.00033 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	0.0015 J	0.0012 J	0.0009 J	0.0013 J	0.005 U	0.00085 J	0.00087 J	0.005 U		0.005 U		0.005 U	0.005 U	0.005 U
Barium	mg/L	0.11	0.1	0.11	0.096	0.11	0.11	0.11	0.12		0.13		0.12	0.12	0.12
Beryllium	mg/L	0.00044 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
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
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.00033 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	0.00031 J	0.001 U	0.00017 J	0.001 U	0.00038 J	0.00021 J	0.001 U		0.00024 J		0.00034 J	0.00036 J	0.001 U
Fluoride	mg/L	0.25 J+	0.23 J	5 U	0.24 J	0.23 J	0.2 J	0.24 J	0.24 J	0.21 J	0.2 J	0.22 J	0.23 J	0.23 J	0.21
Lead	mg/L	0.001 U	0.001 U	0.00035 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	mg/L	0.0014 J	0.008 U	0.008 U	0.0011 J	0.0011 J	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
Molybdenum	mg/L	0.0044 J	0.0043 J	0.01 U	0.01 U	0.01 U	0.0045 J	0.0052 J	0.0055 J		0.0066 J		0.0067 J	0.0067 J	0.0066 J
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.00066 J	0.005 U	0.005 U	0.005 U	0.005 U		0.005 U		0.005 U	0.0014 J	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
General Chemistry															
Alkalinity, Total	mg/L													310	300
Magnesium	mg/L													27	25
Potassium	mg/L													1.4 J	1.2 J
Sodium	mg/L													20	18
Field Parameters															
Dissolved Oxygen	mg/L	0.42	1.11	0.32	0.48	0.41	0.15	0.38	0.31	0.17	0.4	0.19		1.12	0.5
Oxidation-Reduction Potential	millivolts	196.3	-26.8	-61.4	-98.9	-86.2	-77.9	-49.1	-34.5	-94.7	-85.2	-95.1		-66.2	-294.4
pH	SU	7.01	6.74	6.53	7.08	7.04	6.97	6.81	7.29	7.07	6.83	7.12		7.1	7.77
Specific Conductance	uS/cm	676	680	6.84	678	631	737	656	730	728	515	778		669	719
Temperature	deg C	12.4	13.2	13.2	12.2	11.63	12.1	12.2	13	13.3	11.3	4.1		13	13.69
Turbidity	NTU	3.66	4.73	2.84	2.02	3.1	2.51	1.84	1.16	0.81	4.59	4.36		3.55	3.54

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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

"J+" = Indicates the result was estimated below the RL but above the MDL and may be biased high; the estimated value is provided.

"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW12													GAMW12B	
		2016-07-12	2016-07-12	2016-09-07	2016-11-08	2017-01-09	2017-02-28	2017-04-25	2017-06-28	2017-08-23	2017-10-04	2018-03-13	2018-04-20	2018-10-23	2018-09-07	2018-10-23
		FD	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters																
Boron	mg/L	0.07	0.073	0.075	0.2 U	0.2 U	0.2 U	0.092 J	0.2 U	0.2 U	0.079 J		0.095 J	0.081 J	0.28	0.26
Calcium	mg/L	88	93	91	97	90	97	97	100	89	87		87	94	100	110
Chloride	mg/L	2.3	3.8	6.1	9.6	11	10	10	7.6	5.2	3.2		3.3	2.5	22	19
Fluoride	mg/L	0.11 J+	0.24 J+	0.23 J	5 UO	0.23 J	0.19 J	0.17 J	0.21 J	0.23 J	0.21 J	0.19 J	0.24 J	0.19	0.12 J	0.096
pH	SU		6.75	6.85	6.81	6.87	6.89	6.87	6.67	6.69	6.91	6.62	7.17	7.79	7.15	8.83
Sulfate	mg/L	5.9 J-	7.5 J-	15	6.8	17	12	14	11	11	11		11	12	63	49
Total Dissolved Solids	mg/L	380	390	390	430	400	410	390	400	400	390		350	360	870 J+	450
Appendix IV Parameters																
Antimony	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		0.00086 J		0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.0086	0.0097	0.0079	0.011	0.0058	0.0058	0.0059	0.016	0.017		0.011	0.0085	0.018	0.0013 J	0.00079 J
Barium	mg/L	0.14	0.14	0.15	0.14	0.11	0.14	0.12	0.14	0.13		0.11	0.1	0.12	0.11	0.12
Beryllium	mg/L	0.001 U	0.00021 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U		0.00032 J		0.00044 J	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		0.00024 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	0.0007 J	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U	0.00099 J
Cobalt	mg/L	0.0026	0.0029	0.0041	0.0025	0.0032	0.003	0.0028	0.0031	0.0027		0.0023	0.0016	0.0018	0.00039 J	0.00038 J
Fluoride	mg/L	0.11 J+	0.24 J+	0.23 J	5 UO	0.23 J	0.19 J	0.17 J	0.21 J	0.23 J	0.21 J	0.19 J	0.24 J	0.19	0.12 J	0.096
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	0.0025 J	0.003 J	0.008 U	0.008 U	0.0029 J	0.0026 J	0.0032 J	0.0034 J	0.003 J		0.0023 J		0.0032 J	0.0042 J	0.0042 J
Mercury	mg/L	0.00019 J+	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	0.01 U	0.002 J	0.0037 J	0.01 U	0.01 U	0.01 U	0.004 J	0.003 J	0.0029 J		0.0035 J		0.0033 J	0.01 U	0.01 U
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.00054 J	0.0007 J	0.005 U	0.005 U	0.005 U		0.00091 J		0.005 U	0.0024 J	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
General Chemistry																
Alkalinity, Total	mg/L													360	340	380
Magnesium	mg/L													25	27	28
Potassium	mg/L													2.2 J	2.8 J	3.2 J
Sodium	mg/L													5.5	13	14
Field Parameters																
Dissolved Oxygen	mg/L		0.57	2.06	0.25	0.31	0.25	0.1	0.4	0.32	0.46	0.33	0.25	0.93	0.6	0.52
Oxidation-Reduction Potential	millivolts		-47.5	-44.9	-71.8	-50.3	-74	-66.7	-75.8	-30.1	-101.1	-87.5	-239.8	-377.3	-98.9	-378.3
pH	SU		6.75	6.85	6.81	6.87	6.89	6.87	6.67	6.69	6.91	6.62	7.17	7.79	7.15	8.83
Specific Conductance	uS/cm		634	688	660	569	605	664	645	667	665	393	558	628	712	760
Temperature	deg C		14.7	19.5	16.2	10.6	9.38	10.8	14.3	17.2	17.5	8.2	8.7	16.99	14	14.11
Turbidity	NTU		2.97	3.11	4.9	4.44	4.61	4.46	3.78	3.33	3.41	3.55	4.12	2.91	3.33	1.39

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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

"J+" = Indicates the result was estimated below the RL but above the MDL and may be biased high; the estimated value is provided.

"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW13											
		2016-07-12	2016-09-07	2016-11-08	2017-01-09	2017-02-28	2017-04-25	2017-07-12	2017-08-23	2017-10-03	2018-03-13	2018-04-20	2018-10-24
		N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters													
Boron	mg/L	0.2	0.27	0.4	0.2 U	0.2 U	0.18 J	0.21	0.24	0.18 J		0.21	0.38
Calcium	mg/L	85	86	86	80	94	100	87	88	86		110	74
Chloride	mg/L	13	15	18	4.6	7.4	8.2	10	10	11		9.7	14
Fluoride	mg/L	0.32 J+	0.35 J	5 UO	0.19 J	0.19 J	0.22 J	0.27 J	0.31 J	0.28 J	5 U	0.27 J	0.28
pH	SU	6.71	6.76	6.78	6.72	6.76	6.74	6.81	6.46	6.8	6.4	6.94	6.88
Sulfate	mg/L	14 J-	47	62	40	43	52	25	15	25		52	59
Total Dissolved Solids	mg/L	340	400	430	320	360	380	340	370	360		400 J	350
Appendix IV Parameters													
Antimony	mg/L	0.00016 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
Arsenic	mg/L	0.01	0.014	0.013	0.0076	0.0052	0.006	0.0082	0.0087		0.0039 J		0.01
Barium	mg/L	0.13	0.14	0.14	0.092	0.11	0.13	0.16	0.14		0.11	0.12	0.14
Beryllium	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
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
Chromium	mg/L	0.00097 J	0.002 U	0.002 U	0.002 U	0.00068 J	0.002 U	0.002 U	0.002 U		0.0012 J		0.002 U
Cobalt	mg/L	0.001 U	0.0016	0.0014	0.0015	0.00077 J	0.00074 J	0.0005 J	0.00042 J		0.0029	0.00096 J	0.00032 J
Fluoride	mg/L	0.32 J+	0.35 J	5 UO	0.19 J	0.19 J	0.22 J	0.27 J	0.31 J	0.28 J	5 U	0.27 J	0.28
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	0.0012 J	0.008 U	0.008 U	0.00047 J	0.008 U	0.008 U	0.0019 J	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
Molybdenum	mg/L	0.0021 J	0.0074 J	0.013	0.01 U	0.01 U	0.004 J	0.0033 J	0.0022 J		0.0053 J		0.0054 J
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		0.0011 J		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
General Chemistry													
Alkalinity, Total	mg/L												240
Magnesium	mg/L												20
Potassium	mg/L												3.1 J
Sodium	mg/L												14
Field Parameters													
Dissolved Oxygen	mg/L	0.23	0.95	6.77	0.43	0.6	0.28	0.91	0.28	0.41	0.81	0.32	1.12
Oxidation-Reduction Potential	millivolts	-92.2	-70.8	-95.5	-66.2	-84.8	-96	-4.1	16.8	-34.8	-101.1	-112.4	-268.7
pH	SU	6.71	6.76	6.78	6.72	6.76	6.74	6.81	6.46	6.8	6.4	6.94	6.88
Specific Conductance	uS/cm	6.14	717	694	538	593	664	630	661	655	446	723	614
Temperature	deg C	16.3	20.5	16.6	10.4	9.14	11.2	16	17.6	17.8	8.2	8.7	17.02
Turbidity	NTU	4.75	2.41	3.92	1.59	1.51	2.11	3.16	1.28	2.05	4.77	2.88	1.12

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

"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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

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"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW13B															
		2016-07-12	2016-09-07	2016-11-08	2017-01-09	2017-02-28	2017-02-28	2017-04-25	2017-04-25	2017-07-12	2017-08-23	2017-10-03	2018-03-13	2018-04-20	2018-04-20	2018-09-06	2018-10-24
		N	N	N	N	FD	N	FD	N	N	N	N	N	FD	N	N	N
Appendix III Parameters																	
Boron	mg/L	0.71	0.76	0.73	0.78	0.74	0.78	0.74	0.76	0.73	0.73	0.79			0.76	0.72	0.71
Calcium	mg/L	80	70	78	76	76	79	78	77	75	72	78			76	72	71
Chloride	mg/L	24	25	25	25	25	25	25	26	26	27	28			27	27	24
Fluoride	mg/L	0.28 J+	0.29 J	5 UO	0.3 J	0.29 J	0.29 J	0.32 J	0.28 J	0.23 J	0.27 J	0.26 J	0.27 J		0.31 J	0.28 J	0.25
pH	SU	7.31	7.48	7.17	7.45		7.47		7.42	7.31	7.06	7.5	7.27		7.64	7.37	7.45
Sulfate	mg/L	150 J-	150	150	150	150	150	150	150	150	160	170			150	150	150
Total Dissolved Solids	mg/L	440	410	410	390	420	420	400	390	390	430	440			370 J	410	420
Appendix IV Parameters																	
Antimony	mg/L	0.00033 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	0.0021 J	0.0011 J	0.0011 J	0.0015 J	0.0013 J	0.0013 J	0.0016 J	0.0014 J	0.0013 J	0.00092 J		0.0012 J	0.00098 J		0.005 U	0.005 U
Barium	mg/L	0.093	0.08	0.084	0.084	0.093	0.097	0.091	0.093	0.089	0.086		0.1	0.091	0.094	0.087	0.082
Beryllium	mg/L	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
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	0.00036 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	0.001 U	0.001 U	0.001 U	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		0.00019 J	0.001 U
Fluoride	mg/L	0.28 J+	0.29 J	5 UO	0.3 J	0.29 J	0.29 J	0.32 J	0.28 J	0.23 J	0.27 J	0.26 J			0.31 J	0.28 J	0.25
Lead	mg/L	0.001 U	0.001 U	0.00042 J	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	0.001 U
Lithium	mg/L	0.0023 J	0.008 U	0.008 U	0.0019 J	0.0013 J	0.0016 J	0.0018 J	0.0017 J	0.0034 J	0.0021 J		0.008 U	0.008 U		0.008 U	0.0018 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
Molybdenum	mg/L	0.023	0.021	0.022	0.019 J+	0.02	0.02	0.021	0.021	0.022	0.021		0.021	0.022	0.021	0.018	0.018
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		0.001 J	0.005 U
Thallium	mg/L	0.00015 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
General Chemistry																	
Alkalinity, Total	mg/L															150	150
Magnesium	mg/L															19	19
Potassium	mg/L															2.9 J	2.9 J
Sodium	mg/L															28	30
Field Parameters																	
Dissolved Oxygen	mg/L	0.65	1.05	0.44	0.226		0.69		0.22	0.56	0.63	0.34	0.53		0.14	0.38	1.24
Oxidation-Reduction Potential	millivolts	-86.5	-92.3	-110.1	-111.5		-114.4		-125.7	-72.6	1.1	-72.1	-98.1		-230.2	-118.7	-235.5
pH	SU	7.31	7.48	7.17	7.45		7.47		7.42	7.31	7.06	7.5	7.27		7.64	7.37	7.45
Specific Conductance	uS/cm	634	634	624	575		611		604	613	652	681	464		607	631	639
Temperature	deg C	14.7	16.8	14.5	12.7		12.6		13.2	13.9	14.4	14.4	12		12.3	14.14	14.1
Turbidity	NTU	4.94	1.94	1.57	2.86		4.56		4.5	3.86	1.8	0.42	4.22		4.19	2.25	1.08

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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"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW14													
		2016-07-12	2016-09-07	2016-11-08	2017-01-09	2017-02-28	2017-04-25	2017-06-28	2017-06-28	2017-08-22	2017-10-03	2018-03-12	2018-04-19	2018-10-25	2019-03-01
		N	N	N	N	N	N	FD	N	N	N	N	N	N	N
Appendix III Parameters															
Boron	mg/L	0.27	0.36	0.25	0.3	0.26	0.28	0.26	0.24	0.24	0.23		0.25	0.3	0.2
Calcium	mg/L	69	69	72	55	65	57	58	58	68	73		37	58	38
Chloride	mg/L	15	11	8.7	7.6	8.4	5.1	2	2.1	1.7 J	1.8		1.4	13	2.8
Fluoride	mg/L	0.27 J+	0.24 J	2 UO	0.23 J	0.19 J	0.2 J	0.2 J	0.22 J	0.21 J	0.21 J	0.25 J	0.29 J	0.2	0.21
pH	SU	6.32 O	6.88	6.59	5.99 O	6.77	6.85		6.93	6.77	6.77	6.75	6.99	7.26	7.01
Sulfate	mg/L	100 J-	88	52	74	79	77	52	48	54	54		35	51	35
Total Dissolved Solids	mg/L	360	310	310	250 J+	310	260	270	260	300	340		220	290	210
Appendix IV Parameters															
Antimony	mg/L	0.00036 J	0.00032 J	0.002 U	0.00039 J	0.002 U	0.00091 J	0.002 U	0.002 U	0.002 U		0.0016 J		0.002 U	0.002 U
Arsenic	mg/L	0.0033 J	0.0029 J	0.0055	0.0023 J	0.0024 J	0.0018 J	0.0017 J	0.0018 J	0.003 J		0.0021 J		0.014	0.012
Barium	mg/L	0.065	0.068	0.065	0.059	0.07	0.071	0.065	0.066	0.069		0.061	0.049	0.058	0.041
Beryllium	mg/L	0.00013 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
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
Chromium	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.00046 J	0.002 U	0.002 U	0.002 U	0.002 U		0.0011 J		0.002 U	0.002 U
Cobalt	mg/L	0.012	0.01	0.015	0.0052	0.015	0.023	0.022	0.023	0.026		0.035	0.052	0.031	0.0083
Fluoride	mg/L	0.27 J+	0.24 J	2 UO	0.23 J	0.19 J	0.2 J	0.2 J	0.22 J	0.21 J	0.21 J	0.25 J	0.29 J	0.2	0.21
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	0.00046 J	0.008 U	0.008 U	0.00038 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
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
Molybdenum	mg/L	0.0088 J	0.011	0.01 U	0.013 J+	0.011	0.0098 J	0.008 J	0.0082 J	0.0078 J		0.011	0.0096 J	0.011	0.0074
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.00058 J	0.0011 J	0.00095 J	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
General Chemistry															
Alkalinity, Total	mg/L													180	140
Magnesium	mg/L													18	13
Potassium	mg/L													2.6 J	1.9 J
Sodium	mg/L													7.1	7
Field Parameters															
Dissolved Oxygen	mg/L	0.39	1.24	0.78	1.68	3.38	0.6		3.1	1.19	0.46	1.33	1.02	1.8	0.32
Oxidation-Reduction Potential	millivolts	179.6	163.9	75.6	2303	225.8	82.1		268.3	110.1	89.5	-117	-243.1	-240.9	-11.5
pH	SU	6.32	6.88	6.59	5.99	6.77	6.85		6.93	6.77	6.77	6.75	6.99	7.26	7.01
Specific Conductance	uS/cm	501	512	505	360	430	400		404	466	578	241	283	464	226
Temperature	deg C	14.7	18.6	15.5	11.2	9.85	10.9		13.5	16.2	16.7	8.99	9.4	16.3	8.79
Turbidity	NTU	2.33	1.33	0.57	0.91	4.14	2.71		3.23	3.71	2.61	4.41	4.89	1.81	4.43

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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

"J+" = Indicates the result was estimated below the RL but above the MDL and may be biased high; the estimated value is provided.

"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW14B												
		2016-07-12	2016-09-07	2016-11-08	2017-01-09	2017-02-28	2017-04-25	2017-07-12	2017-08-22	2017-10-03	2018-03-12	2018-04-19	2018-09-06	2018-10-25
		N	N	N	N	N	N	N	N	N	N	N	N	N
Appendix III Parameters														
Boron	mg/L	2.8	2.4	3.4	2.9	2.9	2.9	2.8	3	2.9		3	2.9	2.8
Calcium	mg/L	150	130	140	84	95	110	120	120	120		150	150	150
Chloride	mg/L	100	100	120	94	100	100	83	100	110		110	110	97
Fluoride	mg/L	0.29 J+	0.27 J	20 U	0.39 J	10 U	0.3 J	10 U	0.35 J	0.25 J	10 U	0.43 J-	0.33 J	0.31
pH	SU	7.26	7.38	7.11	7.48	7.41	7.39	6.96	7.44	7.47	7.59	7.55	7.29	7.67
Sulfate	mg/L	1200 J-	950	1100	790	860	900	780	960	880		990	1100	1100
Total Dissolved Solids	mg/L	1900	2000	2000	1700	1700	1700	1500	1800	1800		2000	2000	1900
Appendix IV Parameters														
Antimony	mg/L	0.00016 J	0.002 U	0.00071 J	0.0013 J	0.002 U	0.002 U	0.002 U	0.002 U		0.002 U		0.002 U	0.002 U
Arsenic	mg/L	0.0029 J	0.00095 J	0.001 J	0.0015 J	0.00092 J	0.0015 J	0.0011 J	0.0009 J		0.0012 J		0.005 U	0.005 U
Barium	mg/L	0.13	0.12	0.12	0.081	0.089	0.096	0.11	0.1		0.11	0.11	0.12	0.12
Beryllium	mg/L	0.00015 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
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
Chromium	mg/L	0.00094 J	0.002 U	0.002 U	0.002 U	0.0007 J	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	0.001 U	0.00045 J	0.0002 J	0.001 U	0.00019 J	0.00028 J		0.00019 J		0.00039 J	0.00022 J
Fluoride	mg/L	0.29 J+	0.27 J	20 U	0.39 J	10 U	0.3 J	10 U	0.35 J	0.25 J	10 U	0.43 J-	0.33 J	0.31
Lead	mg/L	0.0012	0.001 U	0.0004 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
Lithium	mg/L	0.005 J	0.008 U	0.008 U	0.0053 J	0.0046 J	0.0054 J	0.0065 J	0.0051 J		0.0043 J		0.0056 J	0.0057 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
Molybdenum	mg/L	0.035	0.035	0.023	0.031 J+	0.03	0.028	0.014	0.015		0.022	0.026	0.033	0.035
Selenium	mg/L	0.005 U	0.005 U	0.00087 J	0.00083 J	0.00061 J	0.005 U	0.005 U	0.00099 J		0.005 U		0.0021 J	0.001 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	0.00025 J		0.001 U		0.001 U	0.001 U
General Chemistry														
Alkalinity, Total	mg/L												220	220
Magnesium	mg/L												31	28
Potassium	mg/L												13	12
Sodium	mg/L												430	410
Field Parameters														
Dissolved Oxygen	mg/L	0.3	1.28	0.44	0.35	0.27	0.11	1.02	0.76	0.31	0.37	0.17	0.44	1.3
Oxidation-Reduction Potential	millivolts	-60.6	29.7	-76.7	-79.8	-81.4	-112.8	31.4	58	-93.4	102.6	-286.8	-114.1	-211.9
pH	SU	7.26	7.38	7.11	7.48	7.41	7.39	6.96	7.44	7.47	7.59	7.55	7.29	7.67
Specific Conductance	uS/cm	2425	2515	2557	2019	1990	2211	2156	2177	2295	1844	2171	2642	2542
Temperature	deg C	14.6	16.3	14	12.4	12.5	13.3	13.5	14	14.1	12.4	12.5	13.91	13.4
Turbidity	NTU	4.7	1.94	0.97	1.48	4.05	4.13	1.26	0.63	0.48	3.79	2.59	1.42	1.41

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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

"J+" = Indicates the result was estimated below the RL but above the MDL and may be biased high; the estimated value is provided.

"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

Table 3: Groundwater Analytical Results
Waste Disposal Area
NIPSCO Rollin M. Schahfer Generating Station
Wheatfield, Indiana

Analyte	Unit	GAMW42		GAMW42B	GAMW43	GAMW43B	GAMW44	GAMW44B		GAMW51		GAMW51B	
		2018-09-13	2018-10-31	2018-09-13	2018-06-13	2018-06-13	2018-06-13	2018-06-13	2018-06-13	2018-09-10	2018-10-25	2018-09-10	2018-10-25
		N	N	N	N	N	N	FD	N	N	N	N	N
Appendix III Parameters													
Boron	mg/L	0.04 J	0.041 J	0.061 J	0.025 J	0.037 J	0.05 J	0.036 J	0.034 J	0.68	0.58	6.9	7.4
Calcium	mg/L	44	38	46	26	38	25	39	40	130	130	250	240
Chloride	mg/L	3.1	2.8	4	6	1.5	10	7.8	7.9	6.3	3.6	62	54
Fluoride	mg/L	0.25 J	0.2	0.25 J	0.15 J	0.16 J	0.096 J	0.1 J	0.11 J	0.44 J	0.41	0.79 J	0.8
pH	SU	7.54	7.15	8.08	6.63	7.11	6.77		7.29	8.08	7.69	8.72	8.86
Sulfate	mg/L	21	23	21	25	26	50	24	25	130	110	1300	1600
Total Dissolved Solids	mg/L	190	170	190	160	180	200	180	170	550	530	2200	2200
Appendix IV Parameters													
Antimony	mg/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.0008 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.01	0.0037 J	0.005 U	0.0073	0.0018 J	0.0054	0.005 U	0.005 U	0.0032 J	0.0031 J	0.0017 J	0.0013 J
Barium	mg/L	0.034	0.046	0.016	0.028	0.015	0.024	0.013	0.013	0.16	0.17	0.07	0.063
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
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
Chromium	mg/L	0.002 U	0.0014 J	0.002 U	0.002 U	0.0011 J	0.0023	0.0011 J	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Cobalt	mg/L	0.00027 J	0.00053 J	0.001 U	0.0023	0.00033 J	0.0025	0.001 U	0.001 U	0.001	0.0011	0.00028 J	0.00022 J
Fluoride	mg/L	0.25 J	0.2	0.25 J	0.15 J	0.16 J	0.096 J	0.1 J	0.11 J	0.44 J	0.41	0.79 J	0.8
Lead	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.00092 J	0.001 U	0.00048 J	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
Lithium	mg/L	0.008 U	0.008 U	0.0018 J	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.0073 J	0.0052 J	0.05	0.048
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	0.0035 J	0.0022 J	0.0048 J	0.004 J	0.0022 J	0.013	0.0021 J	0.0021 J	0.028	0.022	0.13	0.13
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.001 J	0.00089 J	0.0014 J	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0011 J
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U
General Chemistry													
Alkalinity, Total	mg/L	130		140						350	350	160	160
Magnesium	mg/L	9.9		11						25	27	16	16
Potassium	mg/L	0.76 J		1.9 J						8.5	6.2	24	24
Sodium	mg/L	3 J		6.2						17	13	340	390
Field Parameters													
Dissolved Oxygen	mg/L	0.8	0.13	0.53	0.19	0.18	0.68		0.48	0.31	1.9	0.26	1.08
Oxidation-Reduction Potential	millivolts	-112.2	-147.1	-248.6	-12	-81.5	51.6		-55.9	-124.4	-247.2	-169.2	-258.6
pH	SU	7.54	7.15	8.08	6.63	7.11	6.77		7.29	8.08	7.69	8.72	8.86
Specific Conductance	uS/cm	288	274	297	269	245	272		248	1076	806	3438	2720
Temperature	deg C	14.8	13.9	12.8	13.1	12.1	12.8		11.6	15.79	15.08	14.43	13.63
Turbidity	NTU	3.92	4.11	4.9	4.35	2.01	4.38		3.22	0.94	1	2.98	1.49

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

Prepared by: DFS
Checked by: ERW
Reviewed by: MAH

"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 below the RL but above the MDL by the analytical laboratory; the estimated value is provided.

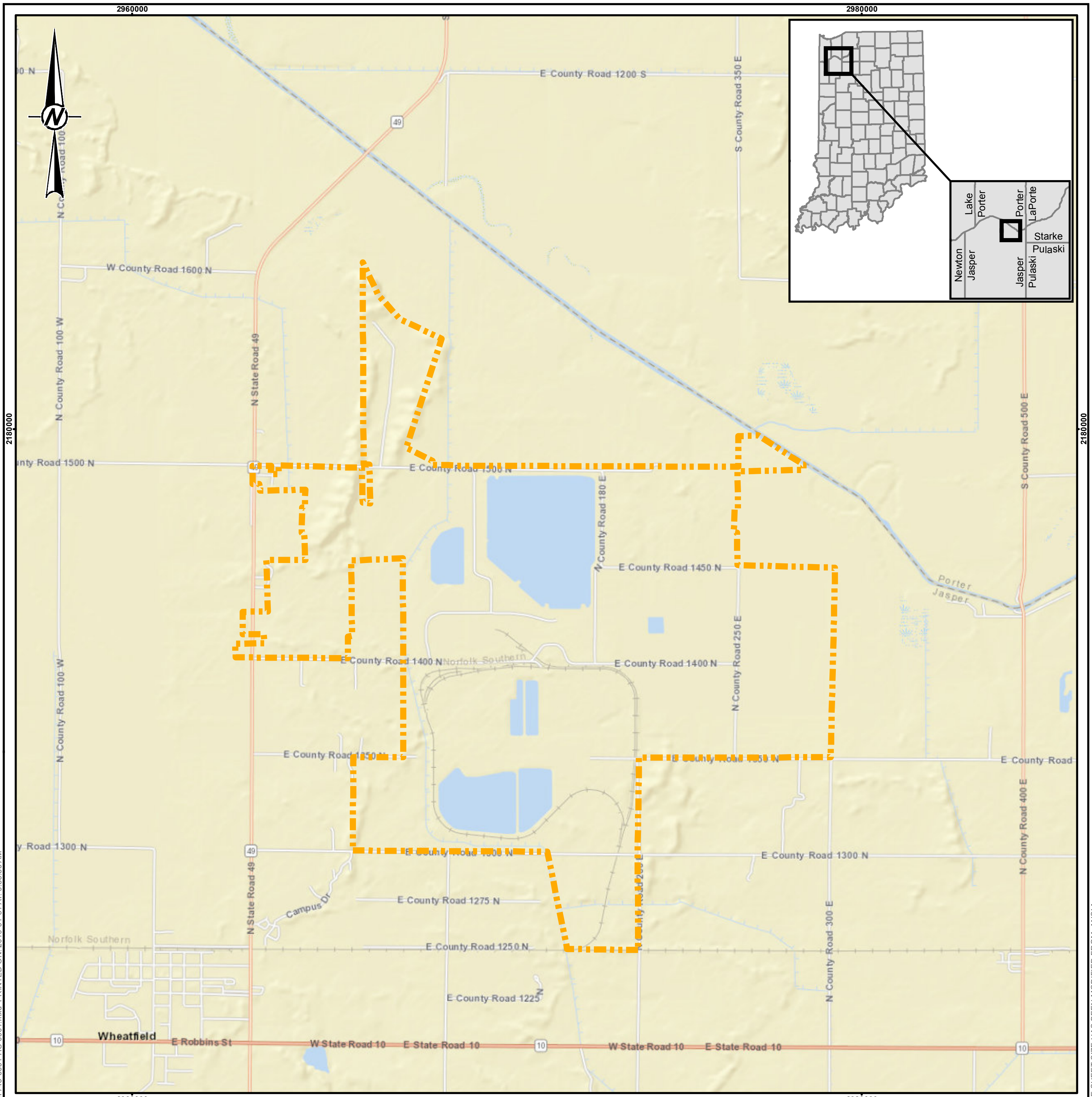
"J+" = Indicates the result was estimated below the RL but above the MDL and may be biased high; the estimated value is provided.

"J-" = Indicates the result was estimated below the RL but above the MDL and may be biased low; the estimated value is provided.

"UJ" = Indicates the result was not detected above the MDL, the estimated RL is provided.

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

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, INTERMAP, INCREMENT P, NRCAN, ESRI JAPAN, METI, ESRI CHINA (HONG KONG), ESRI KOREA, ESRI (THAILAND), NGCC, © OPENSTREETMAP CONTRIBUTORS, 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

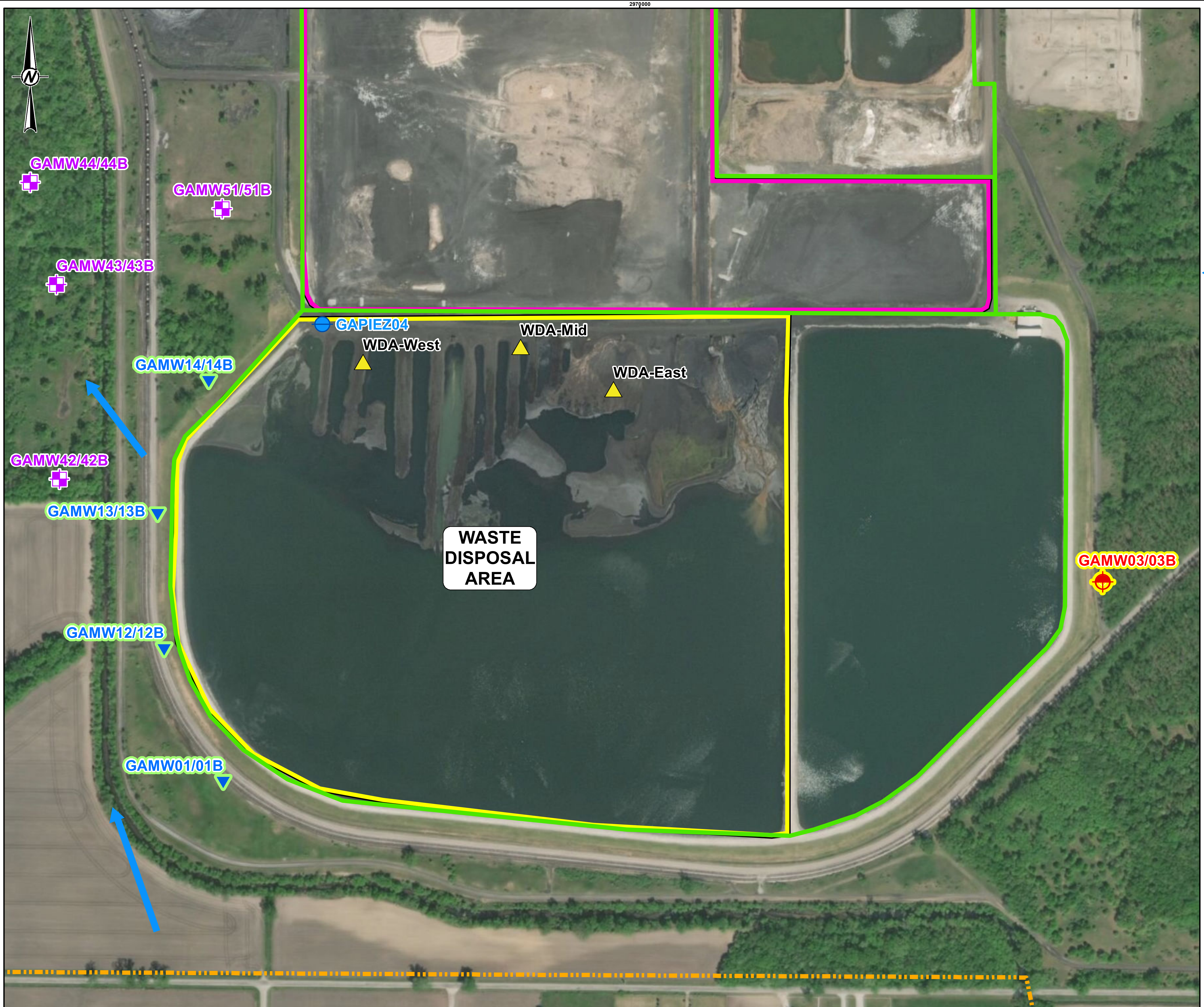
YYYY-MM-DD	1/31/2019
DESIGNED	DFS
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
164817101	A	0	1

PATH: V:\001 GIS Projects\NIPSCO\Schahfer\99_PROJ\164817101_EA\40_PROD\0009_2018AnnualReport\1527745-0001-HS-0001.mxd PRINTED ON: 2019-01-31 AT: 9:33:30 AM

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

0 1 in



LEGEND

- Background Monitoring Well
- Downgradient Monitoring Well
- Assessment Monitoring Well
- Porewater Sample Location
- CCR Source Material Sample Location
- Slurry Wall
- CCR Unit
- Approximate Extent of Inactive Retired Waste Disposal Area
- Generalized Groundwater Flow Directions
- Approximate Property Line

0 350 700

1 " = 350 feet Feet

NOTE(S)

REFERENCE(S)

1. SERVICE LAYER CREDITS: SOURCES: ESRI, DIGITALGLOBE, GEOEYE, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, 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

SAMPLE LOCATION MAP

CONSULTANT

GOLDER

YYYY-MM-DD	5/6/2019
DESIGNED	JSP
PREPARED	SHL
REVIEWED	JSP
APPROVED	MAH

PROJECT NO.	CONTROL	REV.	FIGURE
164817101	A	0	2

GOLDER

golder.com

APPENDIX B

Waste Disposal Area Alternative Source Demonstration November 2019

Northern Indiana Public Service Company (NIPSCO)

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 R. M. Schahfer Generating Station, prepared by Golder Associates Inc. and dated November 2019. 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.
REGISTERED
No. PE11900213
STATE OF
INDIANA
PROFESSIONAL ENGINEER

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

11/26/2019
Date

GOLDER

TECHNICAL MEMORANDUM

DATE November 26, 2019 **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 **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 third (April 2019) 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 third Assessment Monitoring event was completed on August 28, 2019. The results of the statistical evaluation indicated the lower confidence level (LCL) exceeded the background concentration for arsenic in downgradient monitoring well GAMW-01, 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 the same SSL after the second (October 2018) Assessment Monitoring event at the RMSGS Waste Disposal Area (WDA) and submitted an Alternative Source Demonstration (ASD) on May 17, 2019. As described in the ASD, the source materials characteristics, naturally occurring concentrations, and site hydrogeology indicate that the source of the arsenic SSL observed in GAMW-01 is due to natural variation and not the WDA.

1.0 SUMMARY OF RESULTS

The results of the third Assessment Monitoring event will be included in the 2019 Annual Report and the results of the statistical analysis are summarized below. The arsenic results collected from GAMW-01 in April 2019 were 0.014 milligram per liter (mg/L) and 0.015 mg/L, for normal and field duplicate samples, respectively. These results are at or below the arsenic groundwater protection standard (GWPS) for the WDA of 0.015 mg/L, which is calculated based on the background arsenic concentrations. In addition, these results are within the historical range of values recorded from GAMW-01. As described above, when the LCL exceeds the GWPS, this is interpreted as an apparent SSL. Despite the most recent data points being below the GWPS, the LCL (0.0151 mg/L) exceeds the GWPS by 0.0001 mg/L.

As discussed in the ASD, a second SSL, cobalt was identified at well GAMW-14. Subsequent to the second Assessment Monitoring event, Golder collected two samples from this well and both results were below the cobalt

GWPS of 0.015 mg/L. Consequently, the LCL is no longer above the GWPS and there is no cobalt SSL in the third Assessment Monitoring event. The differences in results are likely due to normal or temporal fluctuations in groundwater quality, which supports the conclusion of the ASD that the source of the SSL is natural variation.

2.0 ALTERNATIVE SOURCE DEMONSTRATION

The information presented above indicates the results of the third Assessment Monitoring event are consistent with the previous Assessment Monitoring events, and the rationale presented in the May 17, 2019 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 28, 2019 statistical evaluation are not due to release from the CCR Unit. As described above and in the May 17, 2019 ASD, the source materials characteristics, naturally occurring concentrations, and site hydrogeology indicate that the source of the arsenic SSL observed in GAMW-01 is due to natural variation and not 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, “Northern Indiana Public Service Company R.M. Schahfer Generating Station Wheatfield, Indiana - Alternative Source Demonstration – Waste Disposal Area”, May 17, 2019.

https://golderassociates.sharepoint.com/sites/nipscoccrgwmonitoring/shared documents/rmsgs/reports/wda asd fall 2019/wda recertification 112019_ final.docx

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