Semiannual Progress Report
Selection of Remedy – OGS Ash Pond

Ottumwa Generating Station
Ottumwa, Iowa

Prepared for:

Alliant Energy

SCS ENGINEERS

25220083.00 | March 11, 2022

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1.0 INTRODUCTION AND PURPOSE

The Semiannual Progress Report for remedy selection at the Interstate Power and Light Company (IPL) Ottumwa Generating Station (OGS) was prepared to comply with U.S. Environmental Protection Agency (USEPA) regulations regarding the Disposal of Coal Combustion Residuals (CCR) from Electric Utilities [40 CFR 257.50-107], or the "CCR Rule" (Rule). Specifically, the selection of remedy process was initiated to fulfill the requirements of 40 CFR 257.97.

1.1 BACKGROUND

The Assessment of Corrective Measures (ACM) for the OGS Ash Pond was completed on September 12, 2019. The ACM was completed in response to the detection of cobalt at a statistically significant level (SSL) above the Groundwater Protection Standard (GPS) in groundwater samples from downgradient monitoring well MW-305.

IPL initially completed a Selection of Remedy (SOR) Report in September 2020, but a subsequent revision to the ACM, completed in November 2020, resulted in a retraction of the SOR Report. The initial SOR Report is now considered to be the September 2020 semiannual progress report because it discusses activities completed during the March 2020 through September 2020 reporting period.

This Semiannual Progress Report summarizes data collected and remedy evaluation progress made since the September 2019 ACM and November 2020 revised ACM, and outlines planned future activities to complete the selection of remedy process. This semiannual progress report covers the 6-month period of September 2021 through February 2022.

1.2 SITE INFORMATION AND MAPS

OGS is located southwest of the Des Moines River, approximately 8 miles northwest of the City of Ottumwa in Wapello County, Iowa (**Figure 1**). The address of the plant is 20775 Power Plant Road, Ottumwa, Iowa. In addition to the coal-fired generating station, the property also contains the OGS Ash Pond, the Low Volume Wastewater Pond (LVWTP) (constructed in location of former OGS liquid discharge pond [ZLDP]), the coal stockpile, and the hydrated fly ash stockpile.

The two CCR units at the facility (OGS Ash Pond and OGS ZLDP) are each monitored with single unit groundwater monitoring systems. The OGS Ash Pond is the subject of this Semiannual Progress Report.

A map showing the CCR units and all background (or upgradient) and downgradient monitoring wells with identification numbers for the CCR groundwater monitoring program is provided on **Figure 2**.

Groundwater flow at the site is generally to the east-northeast, and the groundwater flow direction and water levels fluctuate seasonally due to the proximity to the river. Depth to groundwater as measured in the site monitoring wells varies from 1 to 25 feet below ground surface due to topographic variations across the facility and seasonal variations in water levels.

In September 2020, IPL discontinued the use of the existing wet bottom ash handling system at OGS and ceased the discharge of bottom ash transport water to the OGS Ash Pond. A dry bottom ash handling system was installed and operating as of December 2020.

2.0 SUMMARY OF WORK COMPLETED

Work completed to support remedy selection for the OGS Ash Pond is summarized in **Table 1**. Activities completed within the 6-month period of September 2021 through February 2022 covered by this semiannual report are discussed in more detail below.

2.1 MONITORING NETWORK CHANGES

Two additional monitoring wells, MW-312 and MW-313, were installed at OGS. The process from planning to installation was completed from March 2021 through December 2021. The 9-month schedule for installing these wells included the following tasks:

- Well location selection, planning, and permit preparation:
  - Field reconnaissance to select viable location options
  - Preliminary underground utilities evaluation
  - Permit preparation
- Joint application review by USACE & IDNR
- County Floodplain Permit (must be submitted after joint permit approval)
- County Well Construction Permit (also must be submitted after joint permit approval)
- Driller Scheduling (drillers request permit approvals prior to scheduling)
- Utilities clearance:
  - State program for utility clearance
  - Private utility locator clearance
  - Hydrovac of upper eight feet of each borehole
- Well Installation

The two new monitoring wells, MW-312 and MW-313, were installed between December 14 and December 16, 2021. The new monitoring wells are located between existing monitoring wells MW-305/305A and MW-310/310A to characterize site conditions, evaluate the nature and extent of CCR impacts in groundwater, and support the selection of remedy process.

The locations of existing monitoring wells at OGS are shown on **Figure 2**.

2.2 SOIL AND GROUNDWATER MONITORING

Since September 2021, soil and groundwater samples were collected during two sampling events in December and October 2021 and January and February 2022:

- The October 2021 monitoring event was part of the routine semiannual assessment monitoring program. The wells sampled included the six wells in the original monitoring system (MW-301 through MW-306), two additional wells (MW-310 and MW-311), and three additional piezometers (MW-305A, MW-310A, and MW-311A).

- During the December 2021 installation of monitoring wells MW-312 and MW-313, additional borings were performed immediately adjacent to existing monitoring wells MW-305, MW-307, and MW-310 to obtain saturated soil samples from the screened elevation of each well. Samples of the saturated soil was analyzed to:
  - Assess the potential for adsorption.
  - Assess the degree to which cobalt has adsorbed or coprecipitated on to the sand matrix.

  - Prepare cobalt adsorption isotherms to assess capacity of the sand to absorb cobalt and determine maximum adsorption capacity.

- The January 2022 monitoring event was an additional sampling event collecting initial samples from new monitoring wells MW-312 and MW-313. Additional samples were obtained from monitoring wells MW-312 and MW-313 to support an ongoing cobalt treatability and attenuation study that included:
  - Field parameters and both total and dissolved laboratory parameters to better define the downgradient chemistry and evolution with flow.
  - Dissolved cobalt and iron to assess potential adsorption of cobalt to colloidal iron.
  - Filtration of turbid groundwater produced by the monitoring wells and analysis of the solid filtrate for aluminum, iron, and cobalt to determine the degree to which the cobalt is associated with suspended solids.

- The January 2022 monitoring event also included sampling from monitoring wells MW-305 and MW-307 to support the ongoing cobalt treatability and attenuation study. The samples were analyzed to evaluate the degree of iron precipitation and cobalt coprecipitation and adsorption from MW-305 and MW-307 groundwater with aeration (i.e. redox increase) to better understand the degree to which cobalt adsorption and coprecipitation contributes to attenuation. The information will also be used to evaluate the potential to catalyze additional adsorption if groundwater were treated with iron.

- The February 2022 monitoring event was a second additional sampling event collecting samples from new monitoring wells MW-312 and MW-313, and additional samples from MW-305, MW-306, and MW-307.

A summary of groundwater samples collected since the completion of the September 2019 ACM is provided in Table 2.

2.3 STATISTICAL EVALUATION

Statistical evaluation of October sampling results during the period covered by this update were discussed in the 2021 Annual Groundwater Monitoring and Corrective Action Report, dated January 31, 2022. Based on the October 2021 monitoring results, the parameters at an SSL above the GPS include cobalt at compliance well MW-305 and lithium at downgradient delineation piezometers MW-310A and MW-311A. Cobalt was also at an SSL above the GPS at MW-307, which is a compliance well installed to monitor the liquid discharge pond (ZLDP) CCR Unit. The SSL for cobalt at MW-307 was attributed to the Ash Pond in an alternative source demonstration (ASD) prepared under the ZLDP monitoring program. The lithium GPS exceedances are attributed to natural background conditions in the Mississippian bedrock aquifer

2.4 SURFACE IMPOUNDMENT CLOSURE

Construction for the closure of the OGS ZLDP and OGS Ash Pond began in May 2021. The closure of the OGS ZLDP enables construction of the new lined treatment pond, redirection of non-CCR waste waters from the OGS Ash Pond, and subsequent closure of the OGS Ash Pond. Construction activities during the current semiannual report period included:

- Dewatering during the closure of the ZLDP and construction of the LVWTP, completed December 16, 2021.

- Excavation of CCR from ZLDP to OGS Ash Pond was substantially completed on October 9, 2021.

- Construction of the new lined treatment pond was substantially completed on December 17, 2021.

2.5 EVALUATION OF CORRECTIVE MEASURE ALTERNATIVES

A qualitative assessment of potential Corrective Measure Alternatives using the selection criteria in 40 CFR 257.97(b) and (c) was provided in the September 2019 ACM and revised in the November 2020 Addendum #1.

Cobalt concentrations observed at MW-310 are lower than expected if the only process affecting concentrations is dilution by mixing. This is based on a comparison of the percent reduction of cobalt to the percent reduction of lithium between monitoring wells MW-305 and MW-310. Lithium is a more conservative constituent, less amenable to concentration reduction by adsorption or precipitation. Laboratory experiments are underway to characterize the distribution of cobalt in groundwater and saturated sediments and identify processes (precipitation, coprecipitation, or adsorption) that may immobilize cobalt. Saturated soil samples were collected in December 2021 by installing boreholes adjacent to MW-305, MW-307, and MW-310. Additional water samples from MW-305 were collected in January 2022. The specific planned analyses are described in Section 3.0.

In addition, IPL has developed a design for closure of the OGS Ash Pond and initiated closure construction as discussed in Section 2.4.

Updates to the quantitative assessment discussed in the ACM and development of a new SOR Report will be completed in the future based on updates to the conceptual site model, delineation of the nature and extent of impacts, ash pond closure design and construction activities, and collection of additional data relevant to remedy selection.

3.0 PLANNED ACTIVITIES

Planned activities related to the remedy selection process include the following:

Install groundwater level well(s) west of the Ash Pond to constrain groundwater elevation within and upgradient of the Ash Pond.

- Continue semiannual assessment monitoring for the existing monitoring well network and new monitoring wells.

- Continued evaluation of groundwater flow and groundwater quality.

- Complete the cobalt treatability and attenuation study, and update the conceptual site model based on findings of the study and ongoing groundwater sampling and data evaluation.

- Finalize evaluation of remedial options and issue a final SOR report per 40 CFR 257.97(a).

Tables

Table 1. Timeline for Completed Work - Selection of Remedy
Ottumwa Generating Station / SCS Engineers Project #25220083.00

Date	Activity
August 2019	Additional monitoring wells installed to investigate nature and extent (MW-310 and MW-311)
September 2019	Completed ACM
November 2019	Completed Well Construction Documentation for new monitoring wells
January 2020	Completed Statistical Evaluation of October 2019 groundwater monitoring results
January 2020	Completed 2019 Annual Groundwater Monitoring and Corrective Action Report
August 2019 - February 2020	OGS Ash Pond closure design (ongoing)
December 2019 to February 2020	Planning, permitting, and access for three additional monitoring wells (piezometers) to investigate the vertical extent of impacts
February 2020	Collected second round of groundwater samples from the new monitoring wells (MW-310 and MW-311) and background well
February 2020 to March 2020	Complete the installations of three piezometers (MW-305A, MW-310A, and MW-311A)
March 2020	Completed groundwater sampling for specific metals and MNA parameters from selected monitoring wells as well as the newly installed piezometers
June 2020	Conduct assessment monitoring resample for selected parameters and monitoring well
June 2020	Held public ACM meeting
September 2020	Completed Semiannual Progress Report for the Selection of Remedy
September 2020	Completed Well Documentation Report for additional peizometers (MW-305A, MW-310A, and MW-311A).
September 2020	Discontinued wet bottom ash sluicing at OGS
October 2020	Conducted semiannual assessment monitoring event and additional MNA parameter samples for the selection of remedy process
November 2020	Submitted application to EPA for a site-specific alternative deadline to insitate closure of the Main Ash Pond
November 2020	Complete the ACM Addendum No. 1
January 2021	Completed Statistical Evaluation of October 2020 groundwater monitoring results
January 2021	Completed 2020 Annual Groundwater Monitoring and Corrective Action Report

Table 1. Timeline for Completed Work - Selection of Remedy
Ottumwa Generating Station / SCS Engineers Project #25220083.00

Date	Activity
February 2021	Held public ACM Addendum meeting on February 18, 2021
February 2021	Conduct additional assessment monitoring for selected parameters and monitoring wells
March 2021	Completed Semiannual Progress Report for the Selection of Remedy
March 2021 - June 2021	Planning, design, draft permit preparation, and access evaluation for two additional monitoring wells to evaluate MNA processes.
July 2021	Submitted joint permit application to the United State Army Corps of Engineers and Iowa Department of Natural Resources
July 2021	Submitted Notification of Groundwater Protection Standard Exceedance for lithium at MW-310A and MW-311A
July 2021	Conduct assessment monitoring resample for selected parameters and monitoring wells
August 2021	Received approval letters from USACE for installation of monitoring wells MW-312 and MW-313
September 2021	Completed Semiannual Progress Report for the Selection of Remedy
October 2021	Completion of an ASD for lithium SSLs at MW-310A and MW-311A
October 2021	Submitted Closure Permit Application for Main Ash Pond to IDNR Land Quality Bureau
October 2021	Received approval of Antidegradation Analysis from IDNR
November 2021	Received approval letters from IDNR November 2021 for installation of monitoring wells MW-312 and MW-313
November 2021	Received Closure Permit for Main Ash Pond from IDNR Land Quality Bureau
November 2021	Received Facility Plan Approval letter for new wastewater outfall to Des Moines River
November-December 2021	Prepared NPDES Wastewater Permit Amendment Request
December 2021	Submitted well permit application for monitoring wells MW-312 and MW-313 to Wapello County and received approval of permit
December 2021	Performed utility clearances and Hydovac clearance and installed additional monitoring wells MW-312 and MW-313 to characterize site conditions for the selection of remedy
December 2021	Completed 3 boreholes adjacent to existing monitoring wells MW-305, MW-307, and MW-310 to collect saturated soil samples for laboratory analyses of iron and cobalt coprecipitation
December 2021 - February 2022	Performed laboratory analysis of soil and groundwater samples as part of the cobalt treatability and attenuation study

Table 1. Timeline for Completed Work - Selection of Remedy
Ottumwa Generating Station / SCS Engineers Project #25220083.00

Date	Activity
January 2022	Completed 2021 Annual Groundwater Monitoring and Corrective Action Report
January 2022	Completed first round of groundwater monitoring sampling at MW-312 and MW-313. Samples analysis performed in support of cobalt treatability and attenuation study
January 2022	Measured water levels at all site monitoring wells.
February 2022	Completed second round of groundwater monitoring sampling at MW-312 and MW-313 and obtained additional samples from monitoring wells MW-305, MW-306, and MW-307
February 2022	Measured water levels at all site monitoring wells.

A-R = Resampling event under Assessment Monitoring Program

* = Resampling event completed in 2019 but analytical results will be used for evaluation for the October 2018 sampling event.

Created by:	SCC	Date:	2/17/2020
Last revision by:	JAO	Date:	2/26/2022
Checked by:	TK	Date:	2/26/2022

I:\25220083.00\Deliverables\2022 Semiannual - Remedy Selection\2022 March Semiannual Update\Tables\[Table 1_Timeline_SOR_OGS.xlsx]Timeline

Table 2. CCR Rule Groundwater Samples Summary - Events Since the ACM Submittal
Ottumwa Generating Station - Ash Pond / SCS Engineers Project #25220083.00

Sample Dates	Compliance Wells				Delineation Well	Compliance Well	Delineation Wells						Background Well
	MW-302	MW-303	MW-304	MW-305	MW-305A	MW-306	MW-310	MW-310A	MW-311[(1)]	MW-311A	MW-312	MW-313	MW-301
10/23-24/2019	A	A	A	A	NI	A	A	NI	A	NI	NI	NI	A
2/5/2020	--	--	--	--	NI	--	A	NI	A	NI	NI	NI	A
3/12-13/2020	--	--	--	Add.	Add.	--	Add.	Add.	Add.	Add.	NI	NI	Add.
4/13-14/2020	A	A	A	A	A	A	A	A	A	A	NI	NI	A
6/30/2020	--	--	--	--	--	--	--	--	--	A - R	NI	NI	--
10/8-12/2020	A	A	A	A	A	A	A	A	A	A	NI	NI	A
2/23/2021	--	--	--	--	--	Add.	Add.	--	--	Add.	NI	NI	--
4/12-16/2021	A	A	A	A	A	A	A	A	A	A	NI	NI	A
7/6/2021	--	--	--	--	--	Add.	Add.	--	--	Add.	NI	NI	--
10/6-8/2021	A	A	A	A	A	A	A	A	A	A	NI	NI	A
1/12/2022	--	--	--	--	--	--	--	--	--	--	Add.	Add.	--
2/14/2022	--	--	--	--	--	--	--	--	--	--	Add.	Add.	--
Total Samples	5	5	5	6	5	7	9	7	7	8	2	2	7

Abbreviations:
A = Assessment Monitoring Program
NI = Not Installed
Add. = Additional sampling event for selected parameters
-- = Not sampled
A - R = Assessment Resample

Notes:
(1) Sufficient water for sample collection was not present in MW-311 during the October 2021 sampling event.

Created by:	NDK	Date:	2/17/2021
Last revision by:	JAO	Date:	2/8/2022
Checked by:	RM	Date:	2/8/2022

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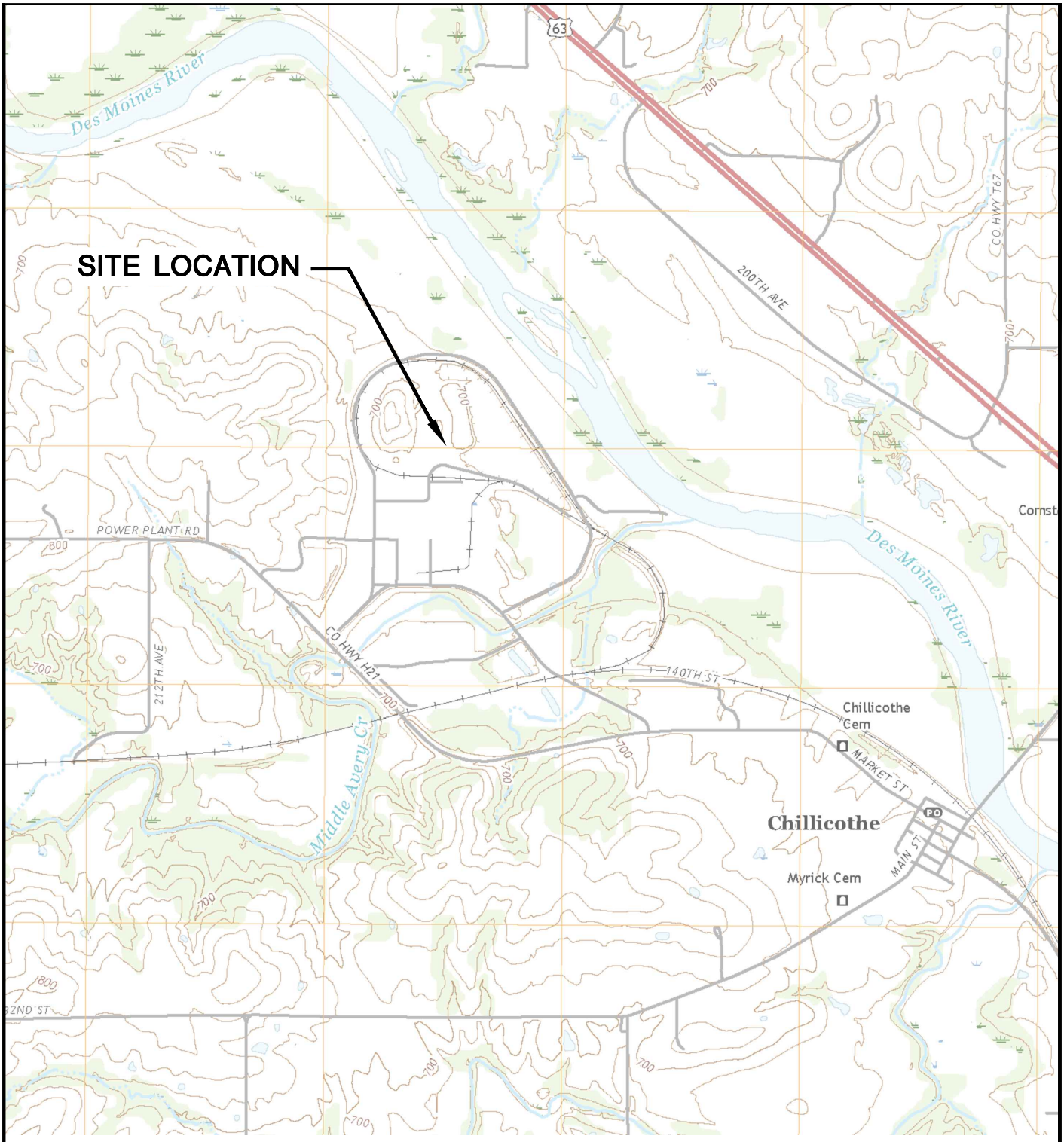
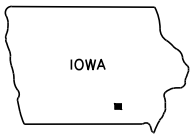
Figures



N

CHILLICOTHE QUADRANGLE
IOWA–WAPELLO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
2018
SCALE: 1" = 2,000'



CLIENT	INTERSTATE POWER AND LIGHT CO. 20775 POWER PLANT ROAD OTTUMWA, IA 52501	SITE	ALLIANT ENERGY OTTUMWA GENERATING STATION OTTUMWA, IOWA

SITE LOCATION MAP

PROJECT NO.	25219072.00	DRAWN BY:	BSS
DRAWN:	11/15/2019	CHECKED BY:	MDB
REVISED:	01/10/2020	APPROVED BY:	TK 01/30/2020

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FIGURE
1

I:\25219072.00\Drawings\CCR 2019 Annual Report\Site Location Map.dwg, 1/30/2020 3:51:43 PM

COAL PILE RUNOFF POND

MW-309

COAL PILE

C-STONE PILE

OGS ZERO LIQUID DISCHARGE POND

MW-308

MW-307

MW-306

MW-305

MW-312

MW-310

MW-313

MW-304

IPL OTTUMWA GENERATING STATION

CCR PILE

DES MOINES RIVER

OGS ASH POND

MW-303

MW-302

MW-301

MW-311

LEGEND

- CCR UNIT
- CCR MONITORING WELL
- CCR BACKGROUND MONITORING WELL
- ADDITIONAL MONITORING WELL

NOTES:

1. 2014 AERIAL PHOTOGRAPH SOURCES: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, USDA FSA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY.
2. CCR UNIT LIMITS ARE APPROXIMATE.
3. MONITORING WELLS MW-301, MW-302, AND MW-304, WERE INSTALLED BY CASCADE DRILLING, LLP. UNDER THE SUPERVISION OF SCS ENGINEERS FROM NOVEMBER 11-12, 2015.
4. MONITORING WELLS MW-303 AND MW-305 WERE INSTALLED BY CASCADE DRILLING LLP. UNDER THE SUPERVISION OF SCS ENGINEERS ON DECEMBER 7-8, 2015.
5. MONITORING WELLS MW-307, MW-308, AND MW-309 WERE INSTALLED BY CASCADE DRILLING, LLP. UNDER THE SUPERVISION OF SCS ENGINEERS FROM OCTOBER 25-27, 2016.
6. MONITORING WELLS MW-310 AND MW-311 WERE INSTALLED BY ROBERTS ENVIRONMENTAL DRILLING ON AUGUST 27, 2019.
7. THE BACKGROUND MONITORING WELL FOR THE OGS ASH POND IS MW-301.

N

800 0 800

SCALE: 1" = 800'

PROJECT NO.	25220072.00	DRAWN BY:	BSS
DRAWN:	11/15/2019	CHECKED BY:	MDB
REVISED:	01/24/2020	APPROVED BY:	TK 01/28/2022

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CLIENT

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SITE

ALLIANT ENERGY
OTTUMWA GENERATING STATION
OTTUMWA, IOWA

SITE PLAN AND MONITORING WELL LOCATIONS-ASH POND

FIGURE 2

I:\25220072.00\Drawings\Site Plan and Monitoring Well Locations_Settling Pond and CCR Pile.dwg, 1/24/2022 9:57:54 AM