

# Memo

Date: Friday, June 14, 2024

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To: Lori Myott, PE, Lansing Board of Water & Light (BWL)

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From: Lara Zawaideh, PE, HDR Michigan, Inc.

Subject: Erickson Power Station CCR Impoundments Determination of Statistically Significant Levels (SSL) over Groundwater Protection Standards (GPS) per Code of Federal Regulations (CFR) §257.95(g) and Michigan Part 115 Rule R 299.4441(7).

The U.S. Environmental Protection Agency's (EPA's) final Coal Combustion Residuals (CCR) Rule and Michigan Part 115 regulation established a comprehensive set of requirements for the management and disposal of CCR (or coal ash) in landfills and surface impoundments by electric utilities. The objective of this memorandum is to document the updated groundwater protection standards (GPS) concentrations for the glacial aquifer and establish the GPS concentrations for the bedrock aquifer for each constituent of interest (COI) at the CCR facilities at Erickson Power Station and evaluate if the concentration of detected COIs were present at statistically significant levels (SSLs) over the updated GPS.

## Facility Description, Closure Status, and Groundwater Monitoring

Erickson Power Station, owned and operated by the Lansing Board of Water & Light (BWL), and located in Delta Township, Michigan has one CCR unit subject to the CCR Rule composed of three surface impoundments: the Forebay, Retention Basin, and Clear Water Pond. CCR waste disposal ceased to the impoundments on December 29, 2022 and non-CCR stormwater flows ceased to the impoundments on January 3, 2023. In February 2023, the impoundments were dewatered in preparation for closure by removal of CCR materials. Water removed from the impoundments was treated onsite, monitored, and discharged into nearby Lake Delta in compliance with a NPDES permit. Ash, liner, and CCR impacted riprap have been removed from the CCR impoundments and disposed of at Granger Wood Street Landfill.

Groundwater monitoring at Erickson is composed of a certified monitoring network as specified by CFR §257.91 and Michigan Rule R 299.4906 as detailed in the Groundwater Monitoring System Certification for Erickson Power Station (HDR, 2024). In 2022 and 2023, additional wells were installed at Erickson Power Station to better understand conditions upgradient of the impoundments and evaluate conditions further downgradient of the impoundments. These additional wells were installed both within the uppermost (glacial) aquifer as well as the deeper Saginaw (bedrock) aquifer in response to the identification of concentrations of COIs at SSLs over GPS. A summary of the installed wells may be found in the updated revision to the Monitoring Well Installation for Erickson Power Station (HDR, 2023).

## Determination of Background Values

Consistent with CFR §257.95 and Michigan Rule R 299.4441, Erickson Power Station currently operates assessment monitoring programs under both regulations. Constituents monitored at Erickson Power Station and their applicability to regulation under the federal and state assessment monitoring programs are identified below in **Table 2**.

<b>Table 2. Constituents Monitored and Applicability to Assessment Monitoring Programs</b>		
Constituent	Federal	State
Antimony	✓	✓
Arsenic	✓	✓
Barium	✓	✓
Beryllium	✓	✓
Boron		✓
Cadmium	✓	✓
Calcium		✓
Chloride		✓
Chromium	✓	✓
Cobalt	✓	✓
Copper		✓
Fluoride		✓
Iron		✓
Lead	✓	✓
Lithium	✓	✓
Mercury	✓	✓
Molybdenum	✓	✓
Nickel		✓
pH		✓
Radium-226	✓	✓
Radium-228	✓	✓
Radium-226/228	✓	✓
Selenium	✓	✓
Silver		✓
Sulfate		✓
Thallium	✓	✓
Total Dissolved Solids (TDS)		✓
Total Suspended Solids (TSS)		
Vanadium		✓
Zinc		✓

In October 2023, in accordance with CFR §257.95(h) and Michigan Rule R 299.4904(4a), background values were updated for the glacial aquifer using shallow wells completed in the glacial sediments, and background values were calculated for the first time for the bedrock aquifer using wells completed in the deeper bedrock aquifer. Background values were calculated for COIs listed for assessment monitoring under the federal CCR Rule and the Michigan Part 115 regulations as shown in **Table 2**. Under the assessment monitoring program regulations, the upper tolerance limit (UTL) is used as the background value for each COI. The UTLs serve as the background values for development of the GPS.

## Glacial Aquifer

The UTLs for the glacial aquifer were updated to account for an expanded data set (more sample dates) for wells originally used to calculate GPS for Erickson Power Station (MW-1 and MW-4) and the additional wells installed to better understand conditions upgradient of the impoundments at Erickson Power Station (MW-11 and MW-12) after eight sample events had been completed. The UTLs for assessment monitoring constituents within the glacial aquifer at Erickson Power Station were updated with data collected through the February 2023 sampling event and are presented in **Table 3**.

Constituent	Unit	n	No. BDL	% BDL	Recommended distribution	State and Federal Program UTL
Antimony	mg/L	50	50	100%	Nonparametric	0.00500*
Arsenic	mg/L	50	3	6%	Nonparametric	0.0210
Barium	mg/L	50	0	0%	Nonparametric	0.168
Beryllium	mg/L	50	50	100%	Nonparametric	0.00100*
Boron <sup>1</sup>	mg/L	48	0	0%	Nonparametric	0.480
Cadmium	mg/L	50	50	100%	Nonparametric	0.00500*
Calcium <sup>1</sup>	mg/L	48	0	0%	Nonparametric	185
Chloride <sup>1</sup>	mg/L	48	0	0%	Normal	90.4
Chromium	mg/L	50	49	98%	Nonparametric	0.00500*
Cobalt	mg/L	50	50	100%	Nonparametric	0.00500*
Copper <sup>1</sup>	mg/L	50	50	100%	Nonparametric	0.00500*
Fluoride <sup>1</sup>	mg/L	48	48	100%	Nonparametric	1.00*
Iron <sup>1</sup>	mg/L	50	0	0%	Nonparametric	23.5
Lead	mg/L	50	50	100%	Nonparametric	0.00300*
Lithium	mg/L	50	11	22%	Nonparametric	0.0410
Mercury	mg/L	50	50	100%	Nonparametric	0.000200*
Molybdenum	mg/L	50	38	76%	Nonparametric	0.0240
Nickel <sup>1</sup>	mg/L	50	40	80%	Nonparametric	0.0210
pH, Field <sup>1</sup>	su	49	0	0%	Nonparametric	7.43
Radium-226/228	pCi/L	50	0	0%	Nonparametric	5.00
Selenium	mg/L	50	50	100%	Nonparametric	0.00500*
Silver <sup>1</sup>	mg/L	50	50	100%	Nonparametric	0.000500*
Sulfate <sup>1</sup>	mg/L	48	9	19%	Nonparametric	344
Thallium	mg/L	50	50	100%	Nonparametric	0.00200*
Total Dissolved Solids <sup>1</sup>	mg/L	48	0	0%	Gamma	1169
Vanadium <sup>1</sup>	mg/L	50	50	100%	Nonparametric	0.00500*
Zinc <sup>1</sup>	mg/L	50	37	74%	Nonparametric	0.0360

1) Constituent not included in the Federal CCR Rule Assessment Monitoring Program.

- Constituent is 100% non-detects, so the maximum detection limit is chosen as the UTL.

## Bedrock Aquifer

Similar to the updates for UTLs in the glacial aquifer, UTLs were also calculated for the bedrock aquifer at Erickson Power Station after eight sample events had been established for bedrock wells MW-11B and MW-12B. The UTLs for assessment monitoring constituents within the bedrock aquifer at Erickson Power Station were established with data collected through the February 2023 sampling event and are presented in **Table 4**.

Table 2. Upper Tolerance Limits for Assessment Monitoring – Bedrock Aquifer						
Constituent	Unit	n	No. BDL	% BDL	Recommended distribution	State and Federal Program UTL
Antimony	mg/L	18	18	100%	Nonparametric	0.00500*
Arsenic	mg/L	18	9	50%	Nonparametric	0.00900
Barium	mg/L	18	0	0%	Nonparametric	0.0810
Beryllium	mg/L	18	18	100%	Nonparametric	0.00100*
Boron <sup>1</sup>	mg/L	18	0	0%	Nonparametric	3.52
Cadmium	mg/L	18	18	100%	Nonparametric	0.000500*
Calcium <sup>1</sup>	mg/L	18	0	0%	Nonparametric	69.6
Chloride <sup>1</sup>	mg/L	18	18	100%	Nonparametric	5.00*
Chromium	mg/L	18	18	100%	Nonparametric	0.00500*
Cobalt	mg/L	18	18	100%	Nonparametric	0.00500*
Copper <sup>1</sup>	mg/L	18	18	100%	Nonparametric	0.005*
Fluoride <sup>1</sup>	mg/L	18	18	100%	Nonparametric	1.00*
Iron <sup>1</sup>	mg/L	18	0	0%	Nonparametric	3.04
Lead	mg/L	18	18	100%	Nonparametric	0.00300*
Lithium	mg/L	18	0	0%	Normal	0.0510
Mercury	mg/L	18	17	94%	Nonparametric	0.000200
Molybdenum	mg/L	18	13	72%	Nonparametric	0.0110
Nickel <sup>1</sup>	mg/L	18	17	94%	Nonparametric	0.011
pH, Field <sup>1</sup>	su	18	0	0%	Normal	8.16
Radium-226/228	pCi/L	18	0	0%	Normal	4.42
Selenium	mg/L	18	18	100%	Nonparametric	0.00500*
Silver <sup>1</sup>	mg/L	18	18	100%	Nonparametric	0.00050*
Sulfate <sup>1</sup>	mg/L	18	18	100%	Nonparametric	5.00*
Thallium	mg/L	18	18	100%	Nonparametric	0.00200*
Total Dissolved Solids <sup>1</sup>	mg/L	18	0	0%	Nonparametric	380
Vanadium <sup>1</sup>	mg/L	18	18	100%	Nonparametric	0.0050*
Zinc <sup>1</sup>	mg/L	18	16	89%	Nonparametric	0.0420

- 1) Constituent not included in the Federal CCR Rule Assessment Monitoring Program.
- Constituent is 100% non-detects, so the maximum detection limit is chosen as the UTL.

## Determination of GPS

### Glacial Aquifer

In accordance with CFR §257.95(h) and Michigan Rule R 299.4441(9), GPS values for the COIs monitored for the assessment monitoring programs were updated for the glacial aquifer. The site-specific background levels, applicable federal and state established criteria, and GPS for the glacial aquifer at Erickson Power Station are presented in **Table 5**.

<b>Table 5. Groundwater Protection Standards for Glacial Monitoring Wells at Erickson Power Station</b>					
<b>Constituent</b>	<b>Site-Specific Background Level Upper Tolerance Limit (UTL) (mg/L)</b>	<b>Federal Maximum Contaminant Level (mg/L)</b>	<b>State Non-Residential Drinking Water Cleanup Criteria for Groundwater (mg/L)</b>	<b>State Compliance Program Groundwater Protection Standards for Site (mg/L)</b>	<b>Federal Compliance Program Groundwater Protection Standards for Site (mg/L)</b>
Antimony	0.005	0.006	0.006	0.006	0.006
Arsenic	0.021	0.01	0.01	0.021	0.021
Barium	0.168	2	2	2	2
Beryllium	0.001	0.004	0.004	0.004	0.004
Boron <sup>1</sup>	0.48	NV	0.5	0.5	No GPS
Cadmium	0.0005	0.005	0.005	0.005	0.005
Calcium <sup>1</sup>	188	NV	NV	188	No GPS
Chloride <sup>1</sup>	94.377	250	250	250	No GPS
Chromium	0.005	0.1	0.1	0.1	0.1
Cobalt	0.005	0.006	0.1	0.006	0.006
Copper <sup>1</sup>	0.005	1.3	1	1	No GPS
Fluoride	1	4	2	2	4
Iron <sup>1</sup>	23.5	0.3	0.3	23.5	No GPS
Lead	0.003	0.015	0.004	0.004	0.015
Lithium	0.0397	0.04	0.35	0.04	0.04
Mercury	0.0002	0.002	0.002	0.002	0.002
Molybdenum	0.024	0.1	0.21	0.1	0.1
Nickel <sup>1</sup>	0.021	NV	0.1	0.1	No GPS
Radium-226/228	5.00 pCi/L	5 pCi/L	NV	5 pCi/L	5 pCi/L
Selenium	0.005	0.05	0.05	0.05	0.05
Silver <sup>1</sup>	0.0005	0.1	0.098	0.098	No GPS
Sulfate <sup>1</sup>	344	250	250	344	No GPS
Thallium	0.002	0.002	0.002	0.002	0.002
Total Dissolved Solids <sup>1</sup>	1168.639	500	500	1168.639	No GPS
Vanadium <sup>1</sup>	0.005	NV	0.062	0.062	No GPS
Zinc <sup>1</sup>	0.036	5	5	5	No GPS

1) Constituent not included in the Federal CCR Rule Assessment Monitoring Program.

### **Bedrock Aquifer**

In accordance with CFR §257.95(h) and Michigan Rule R 299.4441(9), GPS values for the COIs monitored for the assessment monitoring programs were established for the bedrock aquifer. The site-specific background levels, applicable federal and state established criteria, and GPS for the bedrock aquifer at Erickson Power Station are presented in **Table 6**.

<b>Constituent</b>	<b>Site-Specific Background Level Upper Tolerance Limit (UTL)(mg/L)</b>	<b>Federal Maximum Contaminant Level (ug/L)</b>	<b>State Non-Residential Drinking Water Cleanup Criteria for Groundwater (mg/L)</b>	<b>State Compliance Program Groundwater Protection Standards for Site (mg/L)</b>	<b>Federal Compliance Program Groundwater Protection Standards for Site (mg/L)</b>
Antimony	0.005	0.006	0.006	0.006	0.006
Arsenic	0.009	0.01	0.01	0.01	0.01
Barium	0.081	2	2	2	2
Beryllium	0.001	0.004	0.004	0.004	0.004
Boron <sup>1</sup>	3.52	NV	0.5	3.52	No GPS
Cadmium	0.0005	0.005	0.005	0.005	0.005
Calcium <sup>1</sup>	69.6	NV	NV	69.6	No GPS
Chloride <sup>1</sup>	5	250	250	250	No GPS
Chromium	0.005	0.1	0.1	0.1	0.1
Cobalt	0.005	0.006	0.1	0.006	0.006
Copper <sup>1</sup>	0.005	1.3	1	1	No GPS
Fluoride <sup>1</sup>	1	4	2	2	No GPS
Iron <sup>1</sup>	3.04	0.3	0.3	3.04	No GPS
Lead	0.003	0.015	0.004	0.004	0.015
Lithium	0.051	0.04	0.35	0.051	0.051
Mercury	0.0002	0.002	0.002	0.002	0.002
Molybdenum	0.011	0.1	0.21	0.1	0.1
Nickel <sup>1</sup>	0.011	NV	0.1	0.1	No GPS
Radium-226/228	5.5 pCi/L	5 pCi/L	NV	5.5 pCi/L	5.5 pCi/L
Selenium	0.005	0.05	0.05	0.05	0.05
Silver <sup>1</sup>	0.0005	0.1	0.098	0.098	No GPS
Sulfate <sup>1</sup>	5	250	250	250	No GPS
Thallium	0.002	0.002	0.002	0.002	0.002
Total Dissolved Solids <sup>1</sup>	380	500	500	500	No GPS
Vanadium <sup>1</sup>	0.005	NV	0.062	0.062	No GPS
Zinc <sup>1</sup>	0.042	5	5	5	No GPS

1) Constituent not included in the Federal CCR Rule Assessment Monitoring Program.

## Determination of SSLs

Previous SSLs for Erickson Power Station had been detected and notified for Erickson Power Station for downgradient wells MW-2, MW-5, MW-6 in November 2020, and MW-7 in August 2022 and confirm Erickson Power Station's assessment monitoring status. Therefore, in accordance with CFR §257.95(g) and Michigan Rule R 299.4441(7) additional wells were installed for which to define the contaminant plume. Consistent with CFR §257.93(e) and Michigan Rule R 299.4907(8), background sampling for the downgradient wells identified in **Table 1** was performed until enough samples for statistical significance (8 samples) was achieved. Samples were analyzed for the COIs identified in **Table 2**.

### **SSLs Under the Federal CCR Rule Compliance Program - §257.95(g)**

In accordance with CFR §257.95(e), downgradient well concentrations were compared against background values, and some concentrations were found to be above background values. In accordance with CFR §257.95(f), detected assessment monitoring COIs were compared against GPS and some were found to exceed GPS. Therefore, following CFR §257.95(g) downgradient well concentrations were statistically evaluated to determine if one or more assessment monitoring COIs were detected at SSLs above the GPS.

To determine if an exceedance of the GPS was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells for the CCR unit for each of the detected federal assessment monitoring COIs. The data set used to calculate the LCL included federal assessment monitoring results from the samples collected at these wells since the installation of these wells.

### ***Glacial Aquifer***

Monitoring wells MW-7C, MW-14, and MW-16A were installed on March 8, 2022, January 9, 2023, and January 25, 2023 respectively. Groundwater sampling was conducted on a 5-week frequency for MW-7C between March and November 2022, for MW-14 between January and September 2023, and for MW-16A from February to November 2023 until 8 samples could be collected for statistical analysis. The monitoring data from these 8 sample events was compared to the GPS values for these three new monitoring wells and, under the federal CCR monitoring program, lithium was found to exceed the GPS in both wells and molybdenum was found to exceed the GPS in MW-7C only. To determine if an exceedance of a GPS is statistically significant, the 95% lower confidence limit (95% LCL) is calculated for each of the downgradient wells for each of the Appendix IV COIs. The LCLs for MW-7C and MW-14 through November 2023 are provided in **Table 7** and represent SSLs over GPS for lithium and molybdenum, as was originally reported in the 2023 Annual Groundwater Monitoring and Corrective Action Report and Semi-Annual Remedy Selection and Design Progress Report on January 30, 2024. No SSLs were recorded for constituents monitoring under the federal CCR program for well MW-16A. Since the impoundment was already in assessment monitoring and assessment of corrective measures, these updated SSL results do not change the status of the ongoing groundwater monitoring program.

**Table 7. Monitoring Wells with SSLs that Exceed Federal GPS through November 2023.**

Monitoring Well	Constituent	Lithium	Molybdenum
	Federal GPS	0.040 mg/l	0.10 mg/l
MW-7C <sup>1</sup>	95% LCL	0.126	0.391
MW-14 <sup>2</sup>	95% LCL	0.109	-

<sup>1</sup> - Denotes the LCL did not exceed the established GPS.

### ***Bedrock Aquifer***

Under the Federal CCR Rule Compliance Program there are no SSLs detected within the bedrock aquifer. As the Erickson impoundments are already in assessment monitoring and assessment of corrective measures, the absence of SSLs within the bedrock aquifer does not change the status of the ongoing groundwater monitoring program.

### **SSLs Under Michigan Part 115 Compliance Program - R 299.4441(7)**

Similar to the above, in accordance with Michigan Rule R 299.4441(5), downgradient well concentrations were compared against background values, and some concentrations were found to be above background values. In accordance with Michigan Rule R 299.4441(6), detected assessment monitoring COIs were compared against GPS and some were found to exceed GPS. Therefore, following Michigan Rule R 299.4441(7) downgradient well concentrations were statistically evaluated to determine if one or more assessment monitoring COIs were detected at SSLs above the GPS.

To determine if an exceedance of the GPS was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells for the CCR unit for each of the detected federal assessment monitoring COIs. The data set used to calculate the LCL included federal assessment monitoring results from the samples collected at these wells since the installation of these wells.

### ***Glacial Aquifer***

The LCL results that exceeded the State GPS at SSLs for the downgradient wells installed to monitor the glacial aquifer are provided in **Table 8**.

Table 8. Glacial Monitoring Wells with SSLs that Exceed State GPS through November 2023								
Monitoring Well	Constituent	Boron	Calcium	Chloride	Lithium	Molybdenum	Sulfate	TDS
	State GPS	0.50 mg/l	188 mg/l	250 mg/l	0.040 mg/l	0.10 mg/l	344 mg/l	1,169 mg/l
MW-7C	95% LCL	6.48	235	-	0.126	0.391	680	1,360
MW-14	95% LCL	2.09	-	-	0.109	-	-	-
MW-16A	95% LCL	-	-	405	-	-	-	1,285

<sup>1</sup> - Denotes the LCL did not exceed the established GPS.

BWL intends to prepare an Alternate Source Demonstration (ASD) for the chloride and TDS SSLs at MW-16A as groundwater flow information from Erickson Power Station does indicate that the concentrations observed in these wells originate from the CCR impoundments. The ASD will be documented under separate cover.

### ***Bedrock Aquifer***



Well MW-16D was installed on January 25, 2023, with background sampling on a five-week frequency between February and November 2023 until 8 sample events could be collected for statistical analysis. Downgradient well concentrations were compared against background values, and some concentrations were found to be above background values. In accordance with Michigan Rule R 299.4441(6), detected assessment monitoring COIs were compared against GPS and some were found to exceed GPS. Therefore, following Michigan Rule R 299.4441(7) downgradient well concentrations were statistically evaluated to determine if one or more assessment monitoring COIs were detected at SSLs above the GPS.

To determine if an exceedance of the GPS was statistically significant, the 95% lower confidence limit (95LCL) was calculated for each of the downgradient wells for the CCR unit for each of the detected federal assessment monitoring COIs. The data set used to calculate the LCL included assessment monitoring results from the samples collected at these wells since the installation of these wells. The LCL results that exceeded the State GPS at SSLs for the downgradient wells installed to monitor the bedrock aquifer are provided in **Table 9**.

<b>Table 9. Bedrock Monitoring Wells with SSLs that Exceed State GPS through November 2023.</b>		
<b>Monitoring Well</b>	<b>Constituent</b>	<b>Boron</b>
	<b>State GPS</b>	<b>3.52 mg/l</b>
<b>MW-16D<sup>1</sup></b>	<b>95% LCL</b>	<b>4.57</b>

BWL intends to prepare an Alternate Source Demonstration (ASD) for the boron SSL at MW-16D as groundwater flow information from Erickson Power Station does indicate that the concentrations observed in these wells originate from the CCR impoundments. The ASD will be documented under separate cover.

Incorporating these newly detected SSLs into the list of prior SSL observations at Erickson, results in the current status of observed SSLs for the impoundments (**Table 10**).

<b>Table 10. Detected SSLs at Erickson Power Station through November 2023</b>		
<b>Monitoring Wells</b>	<b>Constituents with concentrations at SSLs over Federal GPS</b>	<b>Constituents with concentrations at SSLs over State GPS</b>
MW-2	Lithium	Boron, Calcium, Lithium, Sulfate, TDS
MW-5	Lithium	Boron, Calcium, Lithium, Sulfate, TDS
MW-6	Lithium	Boron, Lithium
MW-7	Lithium, Molybdenum	Boron, Lithium, Molybdenum
MW-7C	Lithium, Molybdenum	Boron, Calcium, Lithium, Molybdenum, Sulfate, TDS
MW-14	Lithium	Boron, Lithium
MW-16A	Lithium	Chloride, TDS
MW-16D	-	Boron