2019 Annual Groundwater Monitoring and Corrective Action Report

Ash Disposal Area

Big Stone Plant
Big Stone City, South Dakota

Prepared for
Otter Tail Power Company

January 2020

234 West Century Avenue
Bismarck, ND 58503
701.255.5460
www.barr.com

2019 CCR Annual Groundwater Monitoring and Corrective Action Report

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Big Stone City, South Dakota

January 2020

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Acronyms

Acronym	Description
ADA	Ash Disposal Area
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CFR	Code of Federal Regulations
EPA	Environmental Protection Agency
OTP	Otter Tail Power Company
SSI	Statistically Significant Increase

1.0 Introduction

Otter Tail Power Company (OTP) operates the Big Stone Plant (Big Stone), located near Big Stone City, South Dakota. Big Stone is a coal-fired electrical generating plant, operation of which results in coal combustion residuals (CCR) as a by-product. Management of CCR from plant operations includes placing CCR in an on-site landfill, referred to as the Ash Disposal Area (ADA). The ADA is required to comply with the provisions of the US Environmental Protection Agency (EPA) CCR Rule (40 CFR Parts 257 and 261 Disposal of Coal Combustion Residuals from Electric Utilities) for existing CCR landfills. The location of the ADA is shown on Figure 1.

This 2019 Annual Groundwater Monitoring and Corrective Action Report (Annual Report) describes the monitoring program and results for the ADA at Big Stone. The ADA is currently in detection monitoring as described by §257.94 of the CCR Rule for all wells and constituents.

1.1 Purpose

As stated in Section §257.90(e), the purpose of the Annual Groundwater Monitoring and Corrective Action Report (Annual Report) is to:

- Document the status of monitoring and corrective action program for the CCR unit
- Summarize key actions completed
- Describe any problems encountered
- Discuss actions to resolve the problems
- Highlight key activities for the upcoming year

1.2 Status of the Groundwater Monitoring and Corrective Action Program

Baseline monitoring was completed in 2017, as documented in the 2017 Annual Groundwater Monitoring and Corrective Action Report, Ash Disposal Area (Barr, 2018). The detection monitoring program, which is the evaluation of groundwater monitoring data for statistically significant increases over background levels for the constituents listed in Appendix III to the CCR Rule, began on October 17, 2017 and continued through 2019.

1.3 CCR Rule Requirements

This Annual Report has been prepared in accordance with the requirements of §257.90(e) of the CCR Rule, as outlined in the following Table 1.

Table 1 CCR Rule Requirements

CCR Rule Reference	Content Required in Report	Location
§257.90(e)(1)	Map showing the CCR unit and all monitoring wells that are part of the groundwater monitoring system	Section 2.1.1 Documentation; see Figure 1
§257.90(e)(2)	Discuss any new or decommissioned monitoring wells	Section 2.1.2 Changes to Monitoring System
§257.90(e)(3)	Provide the number and date groundwater samples were collected, and the monitoring (i.e., detection or assessment)	Section 2.2 Monitoring and Analytical Results
§257.90(e)(4)	Discuss any transition between monitoring programs	Section 2.4 Key Activities for Upcoming Year
§257.90(e)(5)	Other information specified in §257.90 through §257.98	Other information not required in this report

2.0 Groundwater Monitoring and Corrective Action Program

This section documents the status of the groundwater monitoring and corrective action program for the ADA for 2019. The groundwater monitoring system is described in Section 2.1, the monitoring and analytical results are described in Section 2.2, key actions completed and problems encountered are described in Section 2.3, and key activities planned for 2020 are described in Section 2.4.

2.1 Groundwater Monitoring System

2.1.1 Documentation

Figure 1 shows an aerial image of the ADA and all upgradient (background) and downgradient monitoring wells, including the well identification numbers, that are part of the groundwater monitoring system, as required by §257.90(e)(1). Further details on the monitoring system and the ADA monitoring wells can be found in the Groundwater Monitoring System Report, Big Stone Plant Ash Disposal Area (Barr, 2016) on the website maintained by OTP for Big Stone.

2.1.2 Changes to Monitoring System

The groundwater monitoring system was unchanged in 2019.

2.2 Monitoring and Analytical Results

Groundwater samples were collected from monitoring wells H2OX, H4OX, H6, H8, and H9 during two semiannual sampling events. Background monitoring well H3OX was sampled in fall 2019 but was not sampled in spring 2019 due to concerns for worker safety. Slippery conditions restricted access to monitoring well H3OX, which prompted a worker safety concern and the monitoring well was not sampled. A total of 11 groundwater samples were collected and analyzed for the constituents listed in Appendix III (Part 257) in 2019 under the detection monitoring program, consistent with the requirements of §257.94(c). Dates of sampling are reported on the field data sheets and analytical laboratory reports are presented in Appendix A.

Sampling for the fall 2018 monitoring event was conducted on November 6, 2018, and results are included in the 2018 Annual Report (Barr, 2019). Analytical assessment of the results in 2019 indicated elevated concentrations of fluoride at monitoring well H8. Therefore, resampling of fluoride at monitoring well H8 was conducted on February 1, 2019, to verify the analytical results. Based on the results of the resampling, the fluoride SSI was verified on February 11, 2019. An alternative source demonstration (ASD) successfully showed that measurement uncertainty in the analytical results caused the fluoride SSI. The written ASD is provided in Appendix B.

2.3 Key Actions Completed/Problems Encountered

The following key actions were completed for the groundwater monitoring program during 2019:

- Completed semiannual groundwater sampling under the detection monitoring program.
- Background monitoring well H3OX was sampled in fall 2019 but could not be sampled in spring 2019. The monitoring well was not sampled in spring 2019 because the monitoring well could not be accessed due to concerns for worker safety.
- Determined, pursuant to §257.93(h), that a statistically significant increase over background levels occurred for fluoride at downgradient monitoring well H8 during the fall 2018 detection monitoring sampling event. Evaluation of the analytical results determined that measurement uncertainty caused the SSI, forming the basis of an ASD under §257.94(e)(2). Because a successful ASD was completed, the CCR unit can continue in the detection monitoring program as described under §257.94(e)(2). The written ASD is provided in Appendix B.
- Determined, pursuant to §257.93(h), that a statistically significant increase over background levels did not occur for any of the constituents listed in Appendix III at any downgradient monitoring well during the 2019 detection monitoring sampling events.

Problems other than sampling H3OX were not encountered during the reporting period.

2.4 Key Activities for Upcoming Year

The following key groundwater monitoring program activities are planned for 2020:

- Continue the detection monitoring program in accordance with the CCR Rule.
- Evaluate analytical results from the 2020 semiannual detection monitoring events for statistically significant increases (SSIs) according to the CCR Groundwater Sampling and Analysis Plan (Carlson McCain, 2017).

3.0 References

Barr, 2019. 2018 Annual Groundwater Monitoring and Corrective Action Report, Big Stone Plant Ash Disposal Area. Prepared for Otter Tail Power Company. January 2019.

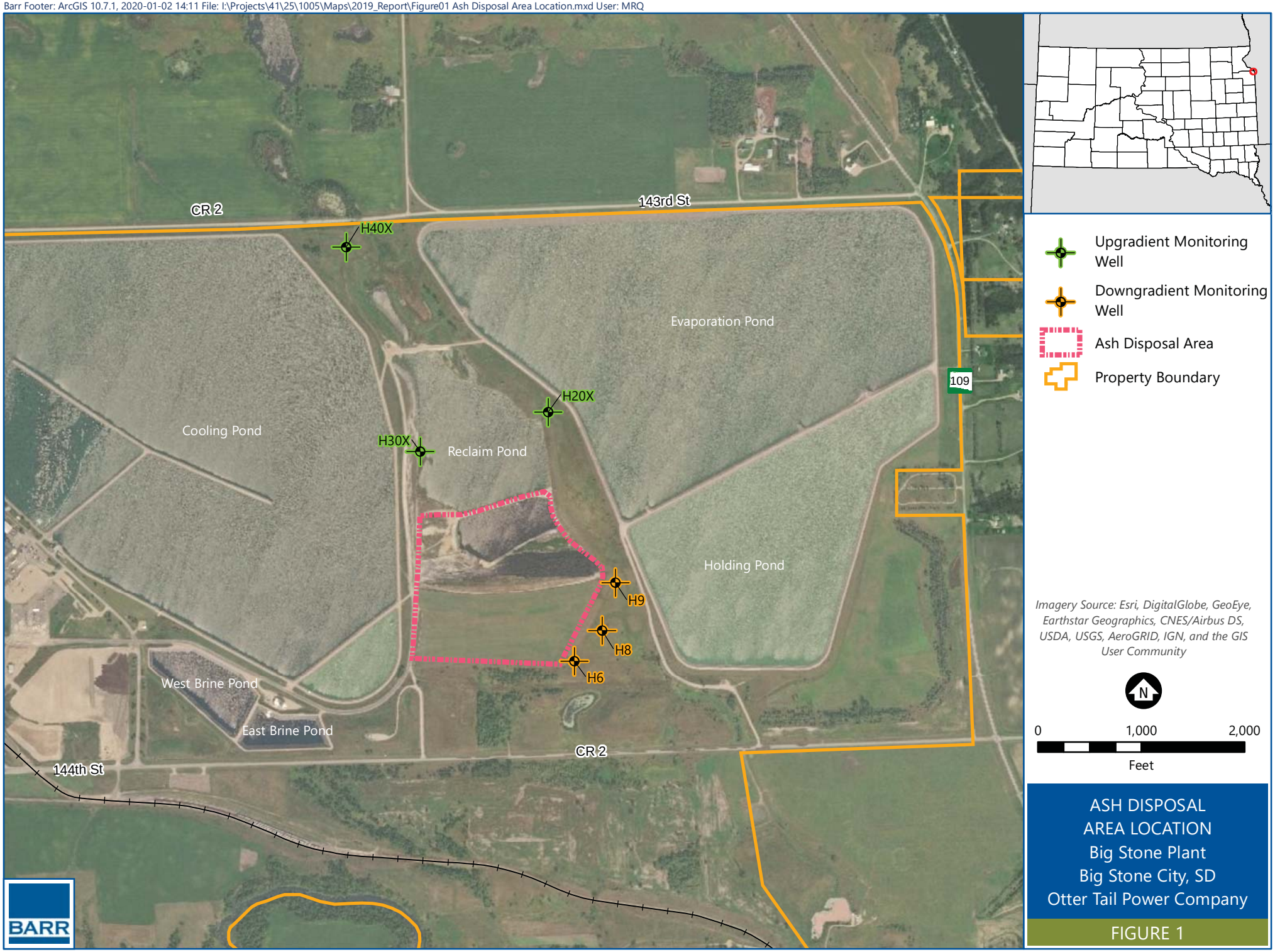
Barr, 2018. 2017 Annual Groundwater Monitoring and Corrective Action Report, Big Stone Plant Ash Disposal Area. Prepared for Otter Tail Power Company. January 2018.

Barr, 2016. Groundwater Monitoring System Report, Big Stone Plant Ash Disposal Area. Prepared for Otter Tail Power Company. December 2016.

Carlson McCain, 2017. CCR Groundwater Sampling and Analysis Plan (Including Statistical Method Selection and Certification), Big Stone Plant Ash Disposal Area. Prepared for Otter Tail Power Company. October 2017.

Figures

Barr Footer: ArcGIS 10.7.1, 2020-01-02 14:11 File: I:\Projects\41\25\1005\Maps\2019_Report\Figure01 Ash Disposal Area Location.mxd User: MRQ



Appendices

Appendix A

Laboratory Reports and Field Sheets

MINNESOTA VALLEY TESTING LABORATORIES, INC.
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1201 Lincoln Hwy. ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
www.mvtl.com

MEMBER ACIL

FINAL REPORT COMPLETION DATE: 13 Feb 19 AK

Date Reported: 6 Feb 2019

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Work Order #: 31-0040
Account #: 006106
PO #: 48680

Project Name: BIG STONE PLANT CCR

12Feb19
Field Service Manager/Date Reviewed

06 Feb 19
Chemistry Lab Manager/Date Reviewed

08Feb2019
Quality Assurance Director/Date Reviewed

RL = Reporting Limits
NQ = Not Present, Qualitative Only
PQ = Present, Qualitative Only
ND = Not Determined

All data for this report has been approved by MVTL Laboratory Management.

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: WELL H8

Report Date: 6 Feb 2019
Lab Number: 19-A3892
Work Order #: 31-0040
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 1 Feb 2019 11:52
Sampled By: MVTL FIELD PERSONNEL
Date Received: 1 Feb 2019 15:35
PO #: 48680

Temp at Receipt: 1.1C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
pH, Field	7.17	units	1.00	SM4500-H+-2011	1 Feb 19 11:52	BMW
Fluoride	0.660 @	mg/L	0.020	EPA 300.0	4 Feb 19 14:21	RMV

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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Quality Control Report

Lab ID: 19-A3892 **Project:** BIG STONE PLANT CCR **Work Order:** 201931-0040

Analyte	LCS Spike Amt	LCS Rec %	LCS % Rec Limits	Matrix Spike Amt	Matrix Spike ID	Matrix Spike Orig Result	Matrix Spike Result	Matrix Spike Rec %	Matrix Spike % Rec Limits	MSD/ Dup Orig Result	MSD/ Dup Result	MSD Rec %	MSD/ Dup RPD	MSD/ Dup RPD Limit (<)	Known Rec (%)	Known % Rec Limits	Method Blank
Fluoride mg/L	-	-	-	2.00	19-A2388	0.800	2.79	100	75-125	2.79	2.77	98	0.7	10	106	90-110	< 0.02

Approved by: _____

Minnesota Valley Testing Laboratories

1126 North Front Street New Ulm, MN 56003
Phone: 800 782 3557 Fax: 507 359 2890

Field Service Chain of Custody Record

Project Otter Tail Power Company	**Project Type:** Big Stone Plant CCR	**Name of Samplers:** Ben Wolf	
Report Otter Tail Power Company	**Carbon Copy:** Barr Engineering		
Attn: Paul Vukonich	Attn:	Quote Number:	
Address P.O. Box 496	Address:	Work Order Number: 31-0040	
Fergus Falls, MN 56538-0496		Lab Numbers:	
Phone: 218-739-8349			

Sample Information **Bottle Type** **Analysis**

Lab Number	Sample ID	Unique Station ID	Date	Time	Sample Type	Sample Location	1000 HNO3 Inner Mountain	500 None	1000 none	500 HNO3	Filter? Y or N	500 H2SO4	Filter? Y or N	1000 Amber none	1000 Amber H2SO4	500 NaOH	Other: 150 H2SO4	Other 150 None	Analysis Required
A3892	Well H8		~~24 Jan 19~~ (BW 1 Feb 19)	1152	GW			X											Flouride
	~~Slag 6~~		1 Feb 19																

Comments:

Samples Relinquished By: Ben Wolf			Samples Received By: A. Rueder		
Date: 1 Feb 19	Time: 1535	Temp: 1.1 TM724	Date: 3 Feb 19	Time: 900	Temp: 4.2 C
Samples Relinquished into: (Fridge) Log in Cart		Other:			
Samples Relinquished By:			Samples Received By:		
Date:	Time:	Temp:	Date:	Time:	Temp:
Delivery: Samplers	Other:		Seal Number(s) - If Used		
Transport: Ambient	Ice	Other:	Seals Intact?	Yes	No

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Sampling Personnel: Ben Wolf

Site: Otter Tail Power Co./ Big Stone
Facility ID:
Date: 1 Feb 19
Unique Station ID:
Sample ID: Well H8

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	(Yes)	No
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	22.33	Well Casing Elevation:	1081.23
Constructed Depth:	22.05	Static Water Elevation:	1072.83
Casing Diameter:	2"	Previous Static:	1074.00
Water Level Before Purge:	8.40	Water Level After Sample:	9.12
Well Volume:	2.25 Gallons	Measurement Method:	Elec. Wtl (Steel Tape)

Sampling Information

Weather Conditions: Temp: 5 Wind: S@10 Sky: Fair

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment: (Yes) No	Pumping Rate:	.25	gpm
Well Purged Dry? Yes No	Time Pump Began:	1125	(am) / pm
Time Purged Dry?	Time of Sampling:	1152	am / pm
Duplicate Sample? Yes (No) ID: —	Sample EH:	170.3	

Sample Appearance: General: Sl. cloudy Color: Tan Phase: None Odor: none

Time (9)	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1134	7.13	1347	8.62	NA	NA	2.25	1	
1143	7.14	1367	8.51			4.60	2	
1152	7.17	1378	8.39			6.75	3	
							4	
							5	

Stabilized? (Yes) No Amount Water Remove 6.75 Gallons

Comments:

Not in notes

Exceptions to Protocol:

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FINAL REPORT COMPLETION DATE: 14 May 19 ds

Date Reported: 10 May 2019

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Work Order #: 31-0140
Account #: 006106
PO #: 48680

Project Name: BIG STONE PLANT CCR

Jeff Hoffmann 13 May 19
Field Service Manager/Date Reviewed

10 May 2019
Chemistry Lab Manager/Date Reviewed

for 10 May 2019
Quality Assurance Director/Date Reviewed

RL = Reporting Limits
NQ = Not Present, Qualitative Only
PQ = Present, Qualitative Only
ND = Not Determined

All data for this report has been approved by MVTL Laboratory Management.

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Report Date: 10 May 2019
Lab Number: 19-A15072
Work Order #: 31-0140
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 15 Apr 2019 11:19
Sampled By: MVTL FIELD PERSONNEL
Date Received: 15 Apr 2019 19:17
PO #: 48680

Project Name: BIG STONE PLANT CCR

Sample Description: H20X

Temp at Receipt: 0.7C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Apr 19	JMS
pH, Field	6.77	units	1.00	SM4500-H+-2011	15 Apr 19 11:19	BMW
pH	* 6.8	units	1.0	SM 4500 H+ B-2000	16 Apr 19 13:06	NB
Sulfate	2310 ~	mg/L	5.0	ASTM D516-07	18 Apr 19 10:24	KCD
Chloride	3.6	mg/L	3.0	SM 4500 Cl E	18 Apr 19 11:07	SS
Solids, Total Dissolved	3900	mg/L	10	SM 2540 C-97	16 Apr 19 14:15	NB
Calcium	517.0 ~	mg/L	0.500	SW6010C	19 Apr 19 14:15	KAM
Boron	< 0.5 #	mg/L	0.1	SW6010C	19 Apr 19 14:15	KAM
Fluoride	0.410 @	mg/L	0.020	EPA 300.0	17 Apr 19 15:37	RMV

* Holding Time Exceeded

~ Sample diluted due to result above calibration of linear range.

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: H40X

Report Date: 10 May 2019
Lab Number: 19-A15073
Work Order #: 31-0140
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 15 Apr 2019 11:56
Sampled By: MVTL FIELD PERSONNEL
Date Received: 15 Apr 2019 19:17
PO #: 48680

Temp at Receipt: 0.7C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Apr 19	JMS
pH, Field	6.88	units	1.00	SM4500-H+-2011	15 Apr 19 11:56	BMW
pH	* 6.8	units	1.0	SM 4500 H+ B-2000	16 Apr 19 13:06	NB
Sulfate	1340 ~	mg/L	5.0	ASTM D516-07	18 Apr 19 10:24	KCD
Chloride	51.3	mg/L	3.0	SM 4500 Cl E	18 Apr 19 11:07	SS
Solids, Total Dissolved	2330	mg/L	10	SM 2540 C-97	16 Apr 19 14:15	NB
Calcium	328.0 @	mg/L	0.500	SW6010C	19 Apr 19 14:15	KAM
Boron	< 0.5 @	mg/L	0.1	SW6010C	19 Apr 19 14:15	KAM
Fluoride	0.590 @	mg/L	0.020	EPA 300.0	17 Apr 19 15:37	RMV

* Holding Time Exceeded

~ Sample diluted due to result above calibration of linear range.

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MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: WELL H6

Report Date: 10 May 2019
Lab Number: 19-A15074
Work Order #: 31-0140
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 15 Apr 2019 12:25
Sampled By: MVTL FIELD PERSONNEL
Date Received: 15 Apr 2019 19:17
PO #: 48680

Temp at Receipt: 0.7C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Apr 19	JMS
pH, Field	7.30	units	1.00	SM4500-H+-2011	15 Apr 19 12:25	JLH
pH	* 7.2	units	1.0	SM 4500 H+ B-2000	16 Apr 19 13:06	NB
Sulfate	121 @	mg/L	5.0	ASTM D516-07	18 Apr 19 10:24	KCD
Chloride	3.9	mg/L	3.0	SM 4500 Cl E	18 Apr 19 11:07	SS
Solids, Total Dissolved	734	mg/L	10	SM 2540 C-97	16 Apr 19 14:15	NB
Calcium	57.60 @	mg/L	0.500	SW6010C	19 Apr 19 14:15	KAM
Boron	4.000 @	mg/L	0.100	SW6010C	19 Apr 19 14:15	KAM
Fluoride	0.460 @	mg/L	0.020	EPA 300.0	17 Apr 19 15:37	RMV

* Holding Time Exceeded

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: WELL H8

Report Date: 10 May 2019
Lab Number: 19-A15075
Work Order #: 31-0140
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 15 Apr 2019 13:14
Sampled By: MVTL FIELD PERSONNEL
Date Received: 15 Apr 2019 19:17
PO #: 48680

Temp at Receipt: 0.7C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Apr 19	JMS
pH, Field	7.20	units	1.00	SM4500-H+-2011	15 Apr 19 13:14	JLH
pH	* 7.1	units	1.0	SM 4500 H+ B-2000	16 Apr 19 13:20	NB
Sulfate	283 @	mg/L	5.0	ASTM D516-07	18 Apr 19 10:24	KCD
Chloride	4.7	mg/L	3.0	SM 4500 Cl E	18 Apr 19 11:07	SS
Solids, Total Dissolved	963	mg/L	10	SM 2540 C-97	16 Apr 19 16:08	NB
Calcium	125.0 @	mg/L	0.500	SW6010C	19 Apr 19 14:15	KAM
Boron	3.380 @	mg/L	0.100	SW6010C	19 Apr 19 14:15	KAM
Fluoride	0.570 @	mg/L	0.020	EPA 300.0	17 Apr 19 15:37	RMV

* Holding Time Exceeded

RL = Reporting Limit
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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: WELL H9

Report Date: 10 May 2019
Lab Number: 19-A15076
Work Order #: 31-0140
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 15 Apr 2019 14:21
Sampled By: MVTL FIELD PERSONNEL
Date Received: 15 Apr 2019 19:17
PO #: 48680

Temp at Receipt: 0.7C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Apr 19	JMS
pH, Field	6.71	units	1.00	SM4500-H+-2011	15 Apr 19 14:21	JLH
pH	* 6.6	units	1.0	SM 4500 H+ B-2000	16 Apr 19 13:20	NB
Sulfate	1550 ~	mg/L	5.0	ASTM D516-07	18 Apr 19 10:24	KCD
Chloride	19.6	mg/L	3.0	SM 4500 Cl E	18 Apr 19 11:07	SS
Solids, Total Dissolved	2630	mg/L	10	SM 2540 C-97	16 Apr 19 16:08	NB
Calcium	550.0 ~	mg/L	0.500	SW6010C	19 Apr 19 14:15	KAM
Boron	1.030 #	mg/L	0.100	SW6010C	19 Apr 19 14:15	KAM
Fluoride	0.420 @	mg/L	0.020	EPA 300.0	17 Apr 19 15:37	RMV

* Holding Time Exceeded

~ Sample diluted due to result above calibration of linear range.

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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INORGANIC & METALS ANALYSES:
No problems were encountered with these analyses.

MVTL

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1201 Lincoln Highway ~ Nevada, IA 50201 ~ 800-362-0855 ~ Fax 515-382-3885
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Quality Control Report

Lab IDs: 19-A15072 to 19-A15076 **Project:** BIG STONE PLANT CCR **Work Order:** 201931-0140

Analyte	LCS Spike Amt	LCS Rec %	LCS % Rec Limits	Matrix Spike Amt	Matrix Spike ID	Matrix Spike Orig Result	Matrix Spike Result	Matrix Spike Rec %	Matrix Spike % Rec Limits	MSD/ Dup Orig Result	MSD/ Dup Result	MSD Rec %	MSD/ Dup RPD	MSD/ Dup RPD Limit (<)	Known Rec (%)	Known % Rec Limits	Method Blank
Boron mg/L	1.000	102	85-115	1.00	19A15040q	0.855	1.870	102	75-125	1.870	1.880	102	0.5	10	97	90-110	< 0.1
Calcium mg/L	50.00	110	85-115	50.0	19A15040q	191.0	248.0	114	75-125	248.0	249.0	116	0.4	10	106	90-110	< 0.5
Chloride mg/L	-	-	-	60.0	19-A15402	4.9	63.7	98	86-117	63.7	64.4	99	1.1	5	101	90-110	< 3
Fluoride mg/L	0.20	98	85-115	1.00 0.40	a15072qc 19-A14618	0.410 0.980	1.57 1.39	116 102	75-125 75-125	1.57 1.39	1.59 1.40	118 105	1.3 0.7	10 10	97	90-110	< 0.02
pH units	- -	- -	- -	- -	- -	- -	- -	- -	- -	7.2 8.3	7.2 8.3	- -	0.0 0.0	2.5 2.5	101 101	90-110 90-110	- -
Solids, Total Dissolved mg/L	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	- - -	1160 734 650	1190 733 628	- - -	2.6 0.1 3.4	7 7 7	102 103	85-115 85-115	< 10 < 10
Sulfate mg/L	-	-	-	50.0	19-A15018	17.8	76.6	118	68-132	76.6	75.8	116	1.0	5	111	80-120	< 5

Approved by:

This is an exact copy of the original document
By AS Date 15 Apr 19
pages 1-7

Minnesota Valley Testing Laboratories

1126 North Front Street New Ulm, MN 56003
Phone: 800 782 3557 Fax: 507 359 2890

Field Service Chain of Custody Record

Project Otter Tail Power Company	**Project Type:** Big Stone Plant CCR	**Name of Samplers:** MS, BW, JJT
Report Otter Tail Power Company	**Carbon Copy:** Barr Engineering	
Attn: Paul Vukonich	Attn:	Quote Number:
Address P.O. Box 496	Address:	Work Order Number: 31-0140
Fergus Falls, MN 56538-0496		Lab Numbers:
Phone: 218-739-8349		

Sample Information | **Bottle Type** | **Analysis**

Lab Number	Sample ID	Unique Station ID	Date	Time	Sample Type	Sample Location	1000 HNO3 Inner Mountain	500 None	1000 none	500 HNO3	Filter? Y or N	500 H2SO4	Filter? Y or N	1000 Amber none	1000 Amber H2SO4	500 NaOH	Other: 150 H2SO4	Other 150 None	Analysis Required
~~A1502~~	H2OX		15 Apr 19	1114	GW				1	1	N								CCR 3
~~77~~	H3OX			~~NS~~	GW				~~1~~	~~1~~	~~N~~								~~CCR 3~~
73	H4OX			1156	GW				1	1	N								CCR 3
74	H-6			1225	GW				1	1	N								CCR 3
75	H-8			1314	GW				1	1	N								CCR 3
76	H-9			1421	GW				1	1	N								CCR 3

Comments:

Samples Relinquished By:			Samples Received By:		
Date: 15 Apr 19	Time: 1917	Temp: 0.7	Date: 15 Apr 19	Time: 1917	Temp: 0.7C
Samples Relinquished into:	Fridge	Log in Cart Other:			
Samples Relinquished By:			Samples Received By:		
Date:	Time:	Temp:	Date:	Time:	Temp:
Delivery: ~~Samplers~~	Other:		Seal Number(s) - If Used		
Transport: Ambient	Ice	Other:	Seals Intact? Yes	No	

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Ben Wolf

Facility ID:

Date: 15 Apr 19

Unique Station ID:

Sample ID: Well H2OX

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	Yes	(No)
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	32.83	Well Casing Elevation:	1103.91
Constructed Depth:	32.20	Static Water Elevation:	1098.36
Casing Diameter:	2"	Previous Static:	1095.21
Water Level Before Purge:	5.55	Water Level After Sample:	Below pump
Well Volume:	4.45 Gallons	Measurement Method:	(Elec. WLI) Steel Tape

Sampling Information

Weather Conditions: Temp: 45 Wind: S@15 Sky: Cloudy

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	.75 gpm
Well Purged Dry?	(Yes) No	Time Pump Began:	1056 (am) / pm
Time Purged Dry?	1114	Time of Sampling:	1119 (am) / pm
Duplicate Sample?	Yes (No) ID: —	Sample EH:	65.5

Sample Appearance: General: Clear Color: None Phase: None Odor: None

Time (18)	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1114	6.79	3953	6.63	NA	NA	4.5	1	
							2	
1119	6.77	3952	7.04			—	3	Recharge
							4	
							5	

Stabilized? Yes (No) Amount Water Removed: 4.5 Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Ben Wolf

Facility ID:

Date: 15 Apr 19

Unique Station ID:

Sample ID: Well H4OX

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	Yes	(No)
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	27.48	Well Casing Elevation:	1108.22
Constructed Depth:	27.20	Static Water Elevation:	1094.09
Casing Diameter:	2"	Previous Static:	1091.33
Water Level Before Purge:	14.13	Water Level After Sample:	Below pump
Well Volume:	2.18 Gallons	Measurement Method:	(Elec. WL) Steel Tape

Sampling Information

Weather Conditions: Temp: 46 Wind: S@15 Sky: cloudy

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	.25 gpm
Well Purged Dry?	(Yes) No	Time Pump Began:	1142 (am) / pm
Time Purged Dry?	1151	Time of Sampling:	1156 (am) / pm
Duplicate Sample?	Yes (No) ID: —	Sample EH:	-25.5

Sample Appearance: General: Clear Color: None Phase: None Odor: None

Time	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1151	6.84	2689	7.99	NA	NA	2.25	1	
							2	
1156	6.88	2690	7.94	"	"	—	3	
							4	
							5	

Stabilized? Yes (No) Amount Water Removed: 2.25 Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Jeff Hoffman

Facility ID:

Date: 15 Apr 19

Unique Station ID:

Sample ID: Well H6

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	(Yes)	No
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	Yes	(No)

Repairs Necessary:

Well Information

Well Depth:	17.92	Well Casing Elevation:	NA
Constructed Depth:	17.70	Static Water Elevation:	↓
Casing Diameter:	2"	Previous Static:	
Water Level Before Purge:	6.64	Water Level After Sample:	7.08
Well Volume:	1.84 Gallons	Measurement Method:	(Elec. WLI) Steel Tape

Sampling Information

Weather Conditions: Temp: 40° Wind: SE 10 Sky: FAIR

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	0.25 gpm
Well Purged Dry?	Yes (No)	Time Pump Began:	1201 am / (pm)
Time Purged Dry?	—	Time of Sampling:	1225 am / (pm)
Duplicate Sample?	Yes (No) ID: —	Sample EH:	86.8

Sample Appearance: General: Clear Color: None Phase: None Odor: None

Time	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1209	7.30	1248	5.96	NA	NA	2.00	1	
1217	7.30	1247	6.03	1	1	4.00	2	
1225	7.30	1248	6.09			6.00	3	
							4	
							5	

Stabilized? (Yes) No Amount Water Removed: 6.00 Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Jeff Hoffman

Facility ID:

Date: 15 Apr 19

Unique Station ID:

Sample ID: Well H8

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	(Yes)	No
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	22.33	Well Casing Elevation:	1081.23
Constructed Depth:	22.05	Static Water Elevation:	1077.91
Casing Diameter:	2"	Previous Static:	1074.00
Water Level Before Purge:	3.32	Water Level After Sample:	4.03
Well Volume:	3.10 Gallons	Measurement Method:	(Elec. WLI) Steel Tape

Sampling Information

Weather Conditions: Temp: 40 Wind: SE 10 Sky: FAIR

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	0.25 gpm
Well Purged Dry?	Yes (No)	Time Pump Began:	12:35 am / (pm)
Time Purged Dry?	—	Time of Sampling:	13 14 am / (pm)
Duplicate Sample?	Yes (No) ID: —	Sample EH:	86.1

Sample Appearance: General: Clear Color: none Phase: none Odor: none

13 Time	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1248	7.20	1413	6.94	NA	NA	3.25	1	
1301	7.20	1409	6.98	1	1	6.50	2	
1314	7.20	1414	7.00	1	1	9.75	3	
							4	
							5	

Stabilized? (Yes) No Amount Water Removed: 9.75 Gallons

Comments:

not in notes

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Jeff Hoffman

Facility ID:

Date: 15 Apr 19

Unique Station ID:

Sample ID: Well H9

Well Condition

Well Locked?	~~Yes~~	No	Protective Posts?	(Yes)	No
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	~~Yes~~	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	30.71	Well Casing Elevation:	1086.21
Constructed Depth:	30.20	Static Water Elevation:	1081.93
Casing Diameter:	2"	Previous Static:	1075.23
Water Level Before Purge:	4.28	Water Level After Sample:	5.31
Well Volume:	4.31 Gallons	Measurement Method:	(Elec. WL) Steel Tape

Sampling Information

Weather Conditions: Temp: 40 Wind: SE 10 Sky: FNLR

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment: (Yes) No		Pumping Rate:	0.25 gpm
Well Purged Dry? Yes (No)		Time Pump Began:	13:27 am (pm)
Time Purged Dry? ~		Time of Sampling:	14:21 am (pm)
Duplicate Sample? Yes (No) ID: ~		Sample EH:	119.1

Sample Appearance: General: Slightly Cloudy Color: none Phase: None Odor: None

18 Time	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1345	6.71	2857	8.33	NA	NA	4.5	1	
1403	6.71	2885	8.35	1	1	9.0	2	
1421	6.71	2887	8.36	1	1	13.5	3	
							4	
							5	

Stabilized? (Yes) No Amount Water Removed: 13.5 Gallons

Comments:

Not in Notes

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Ben Wolf

Facility ID:

Date: 15 Apr 19

Unique Station ID:

Sample ID: Well H3OX

Well Condition

Well Locked?	Yes	No	Protective Posts?	Yes	No
Well Labeled?	Yes	No	State ID Tag?	Yes	No
Casing Straight?	Yes	No	Grout Seal Intact?	Yes	No

Repairs Necessary:

Well Information

Well Depth:	22.68	Well Casing Elevation:	1095.19
Constructed Depth:	22.55	Static Water Elevation:	—
Casing Diameter:	2"	Previous Static:	1096.14
Water Level Before Purge:	—	Water Level After Sample:	Below pump
Well Volume:	— Gallons	Measurement Method:	Elec. WLI Steel Tape

Sampling Information

Weather Conditions: Temp: 46 Wind: S@15 Sky: Cloudy

Sampling Method: Grundfos Bladder SS/T Disp. Bailer Whale Grab Other:

Dedicated Equipment:	Yes No	Pumping Rate:	.25 gpm
Well Purged Dry?	Yes No	Time Pump Began:	— am / pm
Time Purged Dry?		Time of Sampling:	1610 am / pm
Duplicate Sample?	Yes No ID: —	Sample EH:	—

Sample Appearance: General: — Color: — Phase: — Odor: —

Time	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
							1	
							2	
							3	
							4	
							5	

Stabilized? Yes No Amount Water Removed: Gallons

Comments:

* Unable to purge well due to Hazardous condition around well.

Exceptions to Protocol:

OTP and Josh Holland approved.

* NO Sample!

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FINAL REPORT COMPLETION DATE: 29Oct19 ak

Date Reported: 22 Oct 2019

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Work Order #: 31-0488
Account #: 006106
PO #: 48680

Project Name: BIG STONE PLANT CCR

Jeff Hoffman 28Oct19
Field Service Manager/Date Reviewed

28Oct19
Chemistry Lab Manager/Date Reviewed

26Oct19
Quality Assurance Director/Date Reviewed

RL = Reporting Limits
NQ = Not Present, Qualitative Only
PQ = Present, Qualitative Only
ND = Not Determined

All data for this report has been approved by MVTL Laboratory Management.

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Report Date: 22 Oct 2019
Lab Number: 19-A52166
Work Order #: 31-0488
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 14 Oct 2019 11:18
Sampled By: MVTL FIELD PERSONNEL
Date Received: 14 Oct 2019 17:38
PO #: 48680

Project Name: BIG STONE PLANT CCR

Sample Description: H2OX

Temp at Receipt: 0.3C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Oct 19	JMS
pH, Field	6.66	units	1.00	SM4500-H+-2011	14 Oct 19 11:18	BMW
pH	* 6.9	units	1.0	SM 4500 H+ B-2000	15 Oct 19 12:20	AL
Sulfate	2370 ~	mg/L	5.0	ASTM D516-07	17 Oct 19 11:26	SS
Chloride	4.1	mg/L	3.0	SM 4500 Cl E	17 Oct 19 13:43	AKF
Solids, Total Dissolved	3900	mg/L	10	SM 2540 C-97	16 Oct 19 14:40	AL
Calcium	502.0 ~	mg/L	0.500	SW6010C	18 Oct 19 13:25	KAM
Boron	0.235	mg/L	0.100	SW6010C	18 Oct 19 13:25	KAM
Fluoride	0.200 @See Narrative	mg/L	0.020	EPA 300.0	17 Oct 19 17:56	RMV

* Holding Time Exceeded

~ Sample diluted due to result above calibration of linear range.

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: H3OX

Report Date: 22 Oct 2019
Lab Number: 19-A52167
Work Order #: 31-0488
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 14 Oct 2019 11:50
Sampled By: MVTL FIELD PERSONNEL
Date Received: 14 Oct 2019 17:38
PO #: 48680

Temp at Receipt: 0.3C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Oct 19	JMS
pH, Field	6.74	units	1.00	SM4500-H+-2011	14 Oct 19 11:50	BMW
pH	* 6.9	units	1.0	SM 4500 H+ B-2000	15 Oct 19 12:38	AL
Sulfate	1770 ~	mg/L	5.0	ASTM D516-07	17 Oct 19 11:26	SS
Chloride	74.6	mg/L	3.0	SM 4500 Cl E	17 Oct 19 13:43	AKF
Solids, Total Dissolved	3470	mg/L	10	SM 2540 C-97	16 Oct 19 14:40	AL
Calcium	432.0 ~	mg/L	0.500	SW6010C	18 Oct 19 13:25	KAM
Boron	5.880	mg/L	0.100	SW6010C	18 Oct 19 13:25	KAM
Fluoride	0.410	mg/L	0.020	EPA 300.0	17 Oct 19 17:56	RMV
	@See Narrative					

* Holding Time Exceeded

~ Sample diluted due to result above calibration of linear range.

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: H4OX

Report Date: 22 Oct 2019
Lab Number: 19-A52168
Work Order #: 31-0488
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 14 Oct 2019 12:43
Sampled By: MVTL FIELD PERSONNEL
Date Received: 14 Oct 2019 17:38
PO #: 48680

Temp at Receipt: 0.3C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Oct 19	JMS
pH, Field	6.81	units	1.00	SM4500-H+-2011	14 Oct 19 12:43	BMW
pH	* 7.0	units	1.0	SM 4500 H+ B-2000	15 Oct 19 12:38	AL
Sulfate	1170 ~	mg/L	5.0	ASTM D516-07	17 Oct 19 11:26	SS
Chloride	48.3	mg/L	3.0	SM 4500 Cl E	17 Oct 19 13:43	AKF
Solids, Total Dissolved	2300	mg/L	10	SM 2540 C-97	16 Oct 19 14:40	AL
Calcium	305.0	mg/L	0.500	SW6010C	18 Oct 19 13:25	KAM
Boron	0.430	mg/L	0.100	SW6010C	18 Oct 19 13:25	KAM
Fluoride	0.640	mg/L	0.020	EPA 300.0	17 Oct 19 17:56	RMV
	@See Narrative					

* Holding Time Exceeded

~ Sample diluted due to result above calibration of Linear range.

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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2616 East Broadway Ave. ~ Bismarck, ND 58501 ~ 800-279-6885 ~ Fax 701-258-9724
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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Project Name: BIG STONE PLANT CCR

Sample Description: H6

Report Date: 22 Oct 2019
Lab Number: 19-A52169
Work Order #: 31-0488
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 14 Oct 2019 13:45
Sampled By: MVTL FIELD PERSONNEL
Date Received: 14 Oct 2019 17:38
PO #: 48680

Temp at Receipt: 0.3C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Oct 19	JMS
pH, Field	7.23	units	1.00	SM4500-H+-2011	14 Oct 19 13:45	DGF
pH	* 7.4	units	1.0	SM 4500 H+ B-2000	15 Oct 19 12:38	AL
Sulfate	64.5	mg/L	5.0	ASTM D516-07	17 Oct 19 11:26	SS
Chloride	3.5	mg/L	3.0	SM 4500 Cl E	17 Oct 19 14:02	AKF
Solids, Total Dissolved	542	mg/L	10	SM 2540 C-97	16 Oct 19 14:40	AL
Calcium	45.90	mg/L	0.500	SW6010C	18 Oct 19 13:25	KAM
Boron	2.810	mg/L	0.100	SW6010C	18 Oct 19 13:25	KAM
Fluoride	0.380	mg/L	0.020	EPA 300.0	17 Oct 19 17:56	RMV
	@See Narrative					

* Holding Time Exceeded

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Report Date: 22 Oct 2019
Lab Number: 19-A52170
Work Order #: 31-0488
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 14 Oct 2019 14:28
Sampled By: MVTL FIELD PERSONNEL
Date Received: 14 Oct 2019 17:38
PO #: 48680

Project Name: BIG STONE PLANT CCR

Sample Description: H8

Temp at Receipt: 0.3C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Oct 19	JMS
pH, Field	7.14	units	1.00	SM4500-H+-2011	14 Oct 19 14:28	DGF
pH	* 7.3	units	1.0	SM 4500 H+ B-2000	15 Oct 19 12:38	AL
Sulfate	193 @	mg/L	5.0	ASTM D516-07	17 Oct 19 11:26	SS
Chloride	4.5	mg/L	3.0	SM 4500 Cl E	17 Oct 19 14:02	AKF
Solids, Total Dissolved	830	mg/L	10	SM 2540 C-97	16 Oct 19 14:40	AL
Calcium	106.0	mg/L	0.500	SW6010C	18 Oct 19 13:25	KAM
Boron	3.940	mg/L	0.100	SW6010C	18 Oct 19 13:25	KAM
Fluoride	0.550 @See Narrative	mg/L	0.020	EPA 300.0	17 Oct 19 17:56	RMV

* Holding Time Exceeded

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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CERTIFICATE of ANALYSIS - CCR

MEGAN LISBURG
OTTER TAIL POWER CO
PO BOX 496
FERGUS FALLS MN 56538-0496

Report Date: 22 Oct 2019
Lab Number: 19-A52171
Work Order #: 31-0488
Account #: 006106
Sample Matrix: GROUNDWATER
Date Sampled: 14 Oct 2019 14:27
Sampled By: MVTL FIELD PERSONNEL
Date Received: 14 Oct 2019 17:38
PO #: 48680

Project Name: BIG STONE PLANT CCR

Sample Description: H9

Temp at Receipt: 0.3C

	As Received Result		Method RL	Method Reference	Date Analyzed	Analyst
Water Digestions					17 Oct 19	JMS
pH, Field	6.66	units	1.00	SM4500-H+-2011	14 Oct 19 14:27	BMW
pH	* 6.7	units	1.0	SM 4500 H+ B-2000	15 Oct 19 12:38	AL
Sulfate	1510 ~	mg/L	5.0	ASTM D516-07	17 Oct 19 11:26	SS
Chloride	48.0	mg/L	3.0	SM 4500 Cl E	17 Oct 19 14:02	AKF
Solids, Total Dissolved	2870	mg/L	10	SM 2540 C-97	16 Oct 19 14:40	AL
Calcium	598.0 ~	mg/L	0.500	SW6010C	18 Oct 19 13:25	KAM
Boron	1.080	mg/L	0.100	SW6010C	18 Oct 19 13:25	KAM
Fluoride	0.300	mg/L	0.020	EPA 300.0	17 Oct 19 17:56	RMV
	@See Narrative					

* Holding Time Exceeded

~ Sample diluted due to result above calibration of linear range.

RL = Reporting Limit
Analyses performed under our Minnesota Department of Health Accreditation conform to the current TNI standards.
The reporting limit was elevated for any analyte requiring a dilution as coded below:
@ = Due to sample matrix # = Due to concentration of other analytes
! = Due to sample quantity + = Due to internal standard response
CERTIFICATION: MN LAB # 027-015-125 WI LAB # 999447680 ND MICRO # 1013-M ND WW/DW # R-040

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INORGANIC ANALYSES:
Due to the high concentration of fluoride in the spiked sample, the recovery of fluoride was outside of acceptance range in the matrix spike for samples 19-A52166 through 19-A52171. The data was reported based on the acceptable recovery of fluoride in the knowns and the relative percent difference between the matrix spikes.

No other problems were encountered.

MVTL

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Quality Control Report

Lab IDs: 19-A52166 to 19-A52171 **Project:** BIG STONE PLANT CCR **Work Order:** 201931-0488

Analyte	LCS Spike Amt	LCS Rec %	LCS % Rec Limits	Matrix Spike Amt	Matrix Spike ID	Matrix Spike Orig Result	Matrix Spike Result	Matrix Spike Rec %	Matrix Spike % Rec Limits	MSD/ Dup Orig Result	MSD/ Dup Result	MSD Rec %	MSD/ Dup RPD	MSD/ Dup RPD Limit (<)	Known Rec (%)	Known % Rec Limits	Method Blank
Boron mg/L	1.000	96	85-115	1.00	19-A52171	1.080	2.130	105	75-125	2.130	2.220	114	4.1	10	98	90-110	< 0.1
Calcium mg/L	50.00	103	85-115	50.0	19-A52171	598.0	637.0	78	75-125	637.0	643.0	90	0.9	10	101	90-110	< 0.5
Chloride mg/L	-	-	-	60.0	19-A52168	48.3	107	98	86-117	107	106	96	0.9	5	97	90-110	< 3
	-	-	-	60.0	19-A52310	28.7	86.9	97	86-117	86.9	85.5	95	1.6	5	97	90-110	< 3
Fluoride mg/L	-	-	-	2.00	19-D3390	5.18	6.70	76	80-120	6.70	6.78	80	1.2	10	93	90-110	< 0.02
pH units	-	-	-	-	-	-	-	-	-	6.9	6.9	-	0.0	2.5	101	90-110	-
	-	-	-	-	-	-	-	-	-	6.7	6.7	-	0.0	2.5	101	90-110	-
Solids, Total Dissolved mg/L	-	-	-	-	-	-	-	-	-	556	568	-	2.1	7	101	85-115	< 10
	-	-	-	-	-	-	-	-	-	1760	1750	-	0.6	7			
Sulfate mg/L	-	-	-	500	19-A52171	1510	1960	90	68-132	1960	1960	90	0.0	5	100	80-120	< 5
	-	-	-	500	19-A52133	947	1360	83	68-132	1360	1390	89	2.2	5			

Fluoride Matrix spike recover outside of limits, see narrative.

Approved by: _____

Minnesota Valley Testing Laboratories

1126 North Front Street New Ulm, MN 56003
Phone: 800 782 3557 Fax: 507 359 2890

Field Service Chain of Custody Record

This is an exact copy of the original document
By AS Date 15 Oct 19
pages 1-10

Project Otter Tail Power Company	**Project Type:** Big Stone Plant CCR	**Name of Samplers:** MS DF DS BW
Report Otter Tail Power Company	**Carbon Copy:** Barr Engineering	
Attn: Paul Vukonich	Attn:	Quote Number:
Address P.O. Box 496	Address:	Work Order Number: 31-0488
Fergus Falls, MN 56538-0496		Lab Numbers:
Phone: 218-739-8349		

Sample Information | **Bottle Type** | **Analysis**

Lab Number	Sample ID	Unique Station ID	Date	Time	Sample Type	Sample Location	1000 HNO3 Inner Mountain	500 None	1000 none	500 HNO3	Filter? Y or N	500 H2SO4	Filter? Y or N	1000 Amber none	1000 Amber H2SO4	500 NaOH	Other: 150 H2SO4	Other 150 None	Analysis Required
AS21666	H2OX		14 Oct 19	1115	GW				1	1	N								CCR 3
67	H3OX			1150	GW				1	1	N								CCR 3
68	H4OX			1243	GW				1	1	N								CCR 3
69	H-6			1345	GW				1	1	N								CCR 3
70	H-8			1425	GW				1	1	N								CCR 3
71	H-9			1427	GW				1	1	N								CCR 3

Comments:

Samples Relinquished By:			Samples Received By: A. Ruden		
Date: 14 Oct 19	Time: 1736	Temp: 0.3	Date: 15 Oct 19	Time: 830	Temp: 3.0C
Samples Relinquished into:	Fridge Log in Cart	Other:			
Samples Relinquished By:			Samples Received By:		
Date:	Time:	Temp:	Date:	Time:	Temp:
Delivery:	~~Samplers~~ Other:		Seal Number(s) - If Used		
Transport:	~~Ambient~~ Ice	Other:	Seals Intact?	Yes	No

23 Aug 19
JH

Big Stone Sampling - CCR Fall 2019

Landfill or ADA wells

Site	Parameter List	Well Depth	Diameter (Inches)	Well Elevation	Sample Equipment	Dedicated?	Pump Rate (ml/minute)	Goes Dry?	Sampling Seasons**
H2OX	CCR 3	32.20	2	1103.91	Bladder	Yes	100	Yes	April & Oct
H3OX	CCR 3	22.55	2	1095.19	Bladder	Yes	100	Yes	April & Oct
H4OX	CCR 3	27.20	2	1108.22	Bladder	Yes	100	No	April & Oct
H6	CCR 3	15.00	2	1097.76	Bladder	Yes	100	Yes	April & Oct
H8	CCR 3	22.05	2	1081.23	Bladder	Yes	100	No	April & Oct
H9	CCR 3	30.20	2	1086.21	Bladder	Yes	100	No	April & Oct

Note: CCR sampling is for total recoverable metals. They are not filtered in the field.

CCR 3 & 4 see the first two tabs labeled CCR 3 and CCR 4

CCR3

CCR - Appendix III Detection Monitoring

Field Parameters

pH*

* Field and Laboratory Measurements

Total Concentration Parameters	**Method**
Boron	6010
Calcium	6010
Chloride	SM4500 CL E
Fluoride	EPA 300
pH	SM 4500 H+B-96
Sulfate	ASTM D516
Dissolved Solids, Total	SM 2540 C-97

Note: These are non-filtered samples.

1000 None

500 HNO_3

CCR 4

CCR - Appendix IV - Assessment Monitoring

Total Concentration Parameters	**Method**
Antimony	SW6020A
Arsenic	SW602A
Barium	SW6010C
Beryllium	SW6020A
Cadmium	SW6020A
Chromium, Total	SW6020A
Cobalt	SW6010C
Fluoride	EPA 300
Lead	SW6020A
Lithium	SW6010C
Mercury	EPA 245.7
Molybdenum	SW6020A
Selenium	SW6020A
Thallium	SW6020A
Radium 226 + 228	

Note: These are non-filtered samples.

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Ben Wolf

Facility ID:

Date: 14 oct 19

Unique Station ID:

Sample ID: Well H2OX

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	Yes	(No)
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	32.83	Well Casing Elevation:	1103.91
Constructed Depth:	32.20	Static Water Elevation:	1096.46
Casing Diameter:	2"	Previous Static:	1098.36
Water Level Before Purge:	7.45	Water Level After Sample:	Beiger pump
Well Volume:	4.14 Gallons	Measurement Method:	(Elec. WL) Steel Tape

Sampling Information

Weather Conditions: Temp: 41 Wind: LLV Sky: Fair

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	.25 gpm
Well Purged Dry?	(Yes) No	Time Pump Began:	1056 (am) / pm
Time Purged Dry?	1113	Time of Sampling:	1118 am / pm
Duplicate Sample?	Yes (No) ID: —	Sample EH:	-158.2

Sample Appearance: General: Sl. cloudy Color: grey Phase: Light Sed. Odor: Earthy

Time (17)	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1113	6.56	3842	10.21	NA	NA	4.25	1	
							2	
1118	6.66	3997	9.38			—	3	Recharge
							4	
							5	

Stabilized? Yes (No) Amount Water Removed: 4.25 Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Ben Wolf

Facility ID:

Date: 14 Oct 19

Unique Station ID:

Sample ID: Well H3OX

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	Yes	(No)
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	Yes	(No)

Repairs Necessary:

Well Information

Well Depth:	22.68	Well Casing Elevation:	1095.19
Constructed Depth:	22.55	Static Water Elevation:	1091.29
Casing Diameter:	2"	Previous Static:	—
Water Level Before Purge:	3.90	Water Level After Sample:	Below pump
Well Volume:	3.06 Gallons	Measurement Method:	(Elec. WL) Steel Tape

Sampling Information

Weather Conditions: Temp: 44 Wind: LGV Sky: Fair

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	.25 gpm
Well Purged Dry?	(Yes) No	Time Pump Began:	1132 (am) / pm
Time Purged Dry?	1145	Time of Sampling:	1150 (am) / pm
Duplicate Sample?	Yes (No) ID: —	Sample EH:	109.5

Sample Appearance: General: Clear Color: None Phase: None Odor: None

Time (13)	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1145	6.80	3916	12.79	NA	NA	3.25	1	
							2	
1150	6.74	4017	12.17			—	3	
							4	
							5	

Stabilized? Yes (No) Amount Water Removed: 3.25 Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Ben Wolf

Facility ID:

Date: 14 Oct 19

Unique Station ID:

Sample ID: Well H4OX

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	Yes	(No)
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	27.48	Well Casing Elevation:	1108.22
Constructed Depth:	27.20	Static Water Elevation:	1090.87
Casing Diameter:	2"	Previous Static:	1094.09
Water Level Before Purge:	17.35	Water Level After Sample:	Below pump
Well Volume:	1.65 Gallons	Measurement Method:	(Elec. WL) Steel Tape

Sampling Information

Weather Conditions: Temp: 47 Wind: LW Sky: Fair

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	.25 gpm
Well Purged Dry?	(Yes) No	Time Pump Began:	1231 am / (pm)
Time Purged Dry?	1238	Time of Sampling:	1243 am / (pm)
Duplicate Sample?	Yes (No) ID: —	Sample EH:	-153.8

Sample Appearance: General: Clear Color: None Phase: None Odor: None

Time 7	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1238	6.78	2810	8.82	NA	NA	1.75	1	
							2	
1243	6.81	2815	8.86			—	3	Recharge
							4	
							5	

Stabilized? Yes (No) Amount Water Removed: Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Sampling Personnel: DF

Site: Otter Tail Power Co./ Big Stone

Facility ID: —

Date: 14Oct19

Unique Station ID: —

Sample ID: Well H6

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	(Yes)	No
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	Yes	(No)

Repairs Necessary:

Well Information

Well Depth: 17.92

Constructed Depth: 17.70

Casing Diameter: 2"

Water Level Before Purge: 11.59

Well Volume: 1.03 Gallons

Well Casing Elevation: NA

Static Water Elevation: 1

Previous Static: 1

Water Level After Sample: 12.14

Measurement Method: (Elec. WL) Steel Tape

Sampling Information

Weather Conditions: Temp: 39 Wind: SSE 4 Sky: Sunny

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment: (Yes) No

Well Purged Dry? Yes (No)

Time Purged Dry? —

Duplicate Sample? Yes (No) ID: —

Pumping Rate: 0.25 gpm

Time Pump Began: 1330 am / (pm)

Time of Sampling: 1345 am / (pm)

Sample EH: -102.5

Sample Appearance: General: Clear Color: None Phase: None Odor: None

Time (5)	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1335	7.23	948	11.37	NA	NA	1.25	1	
1340	7.23	949	11.36	|	|	2.5	2	
1345	7.23	950	11.32	|	|	3.75	3	
				|	|		4	
				|	|		5	

Stabilized? (Yes) No

Amount Water Removed: 3.75 Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: DF

Facility ID: —

Date: 140619

Unique Station ID: —

Sample ID: Well H8

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	(Yes)	No
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	(Yes)	No

Repairs Necessary:

Well Information

Well Depth:	22.33	Well Casing Elevation:	1081.23
Constructed Depth:	22.05	Static Water Elevation:	1075.63
Casing Diameter:	2"	Previous Static:	1077.91
Water Level Before Purge:	5.60	Water Level After Sample:	6.68
Well Volume:	2.73 Gallons	Measurement Method:	(Elec. WL) Steel Tape

Sampling Information

Weather Conditions: Temp: 39 Wind: SSE 4 Sky: Sunny

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	0.25 gpm
Well Purged Dry?	Yes (No)	Time Pump Began:	1355 am / (pm)
Time Purged Dry?	—	Time of Sampling:	1428 am / (pm)
Duplicate Sample?	Yes (No) ID: —	Sample EH:	0.2

Sample Appearance: General: Clear Color: None Phase: None Odor: None

Time 11	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1406	7.14	1304	10.33	NA	NA	2.75	1	
1417	7.14	1305	10.33			5.5	2	
1428	7.14	1307	10.30			8.25	3	
							4	
							5	

Stabilized? (Yes) No Amount Water Removed: 8.25 Gallons

Comments:

Exceptions to Protocol:

Minnesota Valley Testing Laboratories, Inc.

New Ulm, MN 56073 507 354 8517

Groundwater Assessment

Site: Otter Tail Power Co./ Big Stone

Sampling Personnel: Ben Wolf

Facility ID:

Date: 14 Oct 19

Unique Station ID:

Sample ID: Well H9

Well Condition

Well Locked?	(Yes)	No	Protective Posts?	(Yes)	No
Well Labeled?	(Yes)	No	State ID Tag?	Yes	(No)
Casing Straight?	(Yes)	No	Grout Seal Intact?	Yes	(No)

Repairs Necessary:

Well Information

Well Depth:	30.71	Well Casing Elevation:	1086.21
Constructed Depth:	30.20	Static Water Elevation:	1077.29
Casing Diameter:	2"	Previous Static:	1081.93
Water Level Before Purge:	8.92	Water Level After Sample:	9.66
Well Volume:	3.55 Gallons	Measurement Method:	(Elec. WLI) Steel Tape

Sampling Information

Weather Conditions: Temp: 56 Wind: Llv Sky: Fair

Sampling Method: Grundfos (Bladder SS/T) Disp. Bailer Whale Grab Other:

Dedicated Equipment:	(Yes) No	Pumping Rate:	2.5 gpm
Well Purged Dry?	Yes (No)	Time Pump Began:	1342 am / (pm)
Time Purged Dry?	—	Time of Sampling:	1427 am / (pm)
Duplicate Sample?	Yes (No) ID: —	Sample EH:	85.5

Sample Appearance: General: clear Color: none Phase: none Odor: none

Time (15)	pH	Specific Cond.	Temp °C	D. O. mg/L	Turbidity NTU	Gallons Removed	SEQ #	Comments:
1357	6.67	3255	9.77	NA	NA	3.75	1	
1412	6.66	3258	9.78			7.50	2	
1427	6.66	3260	9.76			11.25	3	
							4	
							5	

Stabilized? (Yes) No Amount Water Removed: 11.25 Gallons

Comments:

Exceptions to Protocol:

Appendix B

Big Stone Plant, Ash Disposal Area: Coal Combustion Residuals Alternative Source Demonstration

resourceful. naturally.
engineering and environmental consultants

BARR

Technical Memorandum

To: Josh Hollen, Otter Tail Power Company
From: Paul Swenson
Subject: Big Stone Plant, Ash Disposal Area: Coal Combustion Residuals Alternative Source Demonstration
Date: March 14, 2019
Project: 41251005.05 CR19 001

Introduction

Otter Tail Power Company's (OTP) Big Stone Plant near Big Stone City, SD, has implemented a Detection Monitoring Program in accordance with the U.S. Environmental Protection Agency (EPA) Coal Combustion Residuals (CCR) Rule (40 CFR Parts 257 and 261). As part of the Detection Monitoring Program, a statistically significant increase (SSI) in fluoride concentration was identified at Ash Disposal Area monitoring well H8 during the fall 2018 event.

Sampling for the monitoring event was conducted on November 6, 2018. The laboratory data received from OTP's laboratory (Minnesota Valley Testing Laboratories, Inc. (MVTL)) were reviewed and deemed acceptable on January 11, 2019. The analytical results indicated a potential SSI for fluoride at monitoring well H8, so resampling was conducted on February 1, 2019, to verify the analytical results. Based on the results of the resampling, the fluoride SSI was verified on February 11, 2019, with the determination of the SSI communicated to you by email from Justin Soberaski on that date. The SSI determination occurred within 90 days after completing the fall 2018 sampling and analysis, as required by the CCR Rule (§257.93 (h)(2)).

Purpose

This memorandum was prepared to provide written documentation of an alternative source demonstration (ASD) and certification of accuracy as described in the CCR Rule (§257.94 (e)(2)).

Statistical Significant Increases

The intrawell prediction limit (PL) for fluoride for monitoring well H8 is 0.63 mg/L. The concentration measured in monitoring well H8 during the fall 2018 detection monitoring event was 0.69 mg/L. The verification resample concentration was 0.66 mg/L, which is above the background intrawell PL.

Rule Requirements

The requirements for written documentation and certification of accuracy for an ASD are included in §257.94(e)(2):

The owner or operator may demonstrate that a source other than the CCR unit caused the statistically significant increase over background levels for a constituent or that the statistically significant increase resulted from error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The owner or operator must complete the written demonstration within 90 days of detecting a statistically significant increase over background levels to include obtaining a certification from a qualified professional engineer verifying the accuracy of the information in the report.

Laboratory Methods

- **Hypothesis**: The "error in analysis" supports an ASD for fluoride at monitoring well H8. The "error" in this context refers to uncertainty of the monitoring results, not a mistake in analysis.

- **Analysis**: Analysis included evaluating laboratory measurement methods for measurement uncertainty, and comparing the reported fluoride resample concentration and the background PL to determine if they were distinguishable within the calculated measurement uncertainty. The two values would be considered not distinguishable if the PL falls within the analytical method measurement uncertainty associated with the measured fluoride concentration.

  Barr requested that MVTL calculate the measurement uncertainty associated with the fluoride verification resample concentration. MVTL's standard operating procedure for method uncertainty is to use results from a laboratory calibration standard for multiple calibration results, and then to calculate two standard deviations, representing a 95% confidence interval, in percent recovery of the calibration standard. The calculation incorporated the results of the 20 most recent fluoride calibration verification check standards, up to and including the standard measured on the same day as the verification resample. The calibration check standard used for the calculation (0.2 mg/L) was the concentration closest to that measured in the verification resample, accounting for any dilution.

  Result: MVTL calculated a measurement uncertainty of 10.33% for the fluoride resample. Based on the resample result of 0.66 mg/L, the lower and upper confidence interval were calculated by MVTL at 0.59 mg/L and 0.73 mg/L, respectively. Figure 1 shows the resample result of 0.66 mg/L with the measurement uncertainty (black error bar). The lower threshold of measurement uncertainty of 0.59 mg/L is below the intrawell PL of 0.63 mg/L. Therefore, the PL falls within the analytical method uncertainty associated with the measured fluoride concentration and the two values are not distinguishable.

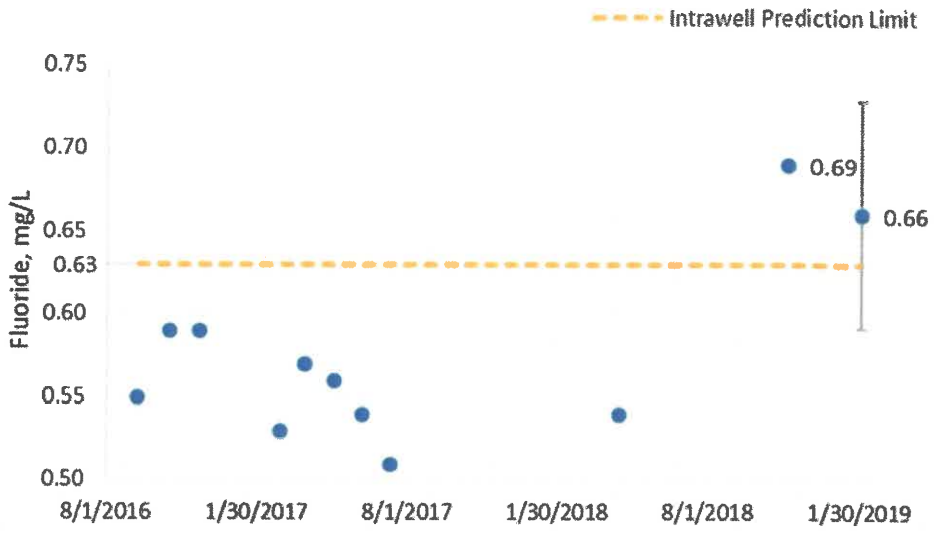
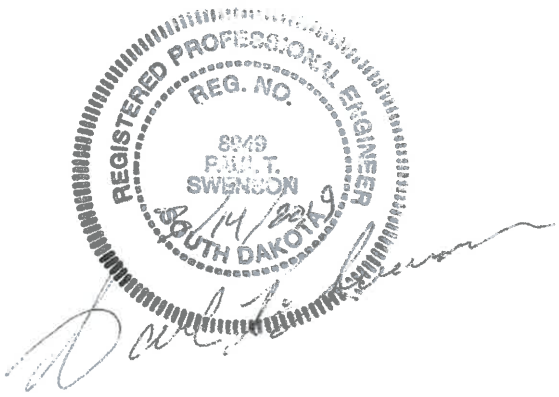


Figure 1 Monitoring Well H8 Fluoride Data with Intrawell Prediction Limit (0.63 mg/L)

Certification

The results described above indicate that the SSI identified from the fall 2018 detection monitoring event for fluoride in monitoring well H8 can be attributed to measurement uncertainty in the analytical results. I certify that the written demonstration provided (above) for fluoride at monitoring well H8 and supported by the data in Figure 1 is consistent with our review of the groundwater data collected to date and as required under the CCR Rule ((§257.94(e)(2)). Furthermore, I certify that the information presented in this memorandum is accurate, based on our records of CCR unit monitoring results and communications with MVTL.



Paul T. Swenson 2019.03.14 15:23:57 -06'00'

Paul T. Swenson, P.E.
Vice President