2018 ANNUAL
COAL COMBUSTION RESIDUALS (CCR)
GROUNDWATER MONITORING AND
CORRECTIVE ACTION REPORT

LANDFILL AND SURFACE IMPOUNDMENTS

R.D. MORROW, SR. GENERATING STATION
304 OLD OKAHOLA SCHOOL ROAD
PURVIS, LAMAR COUNTY, MISSISSIPPI

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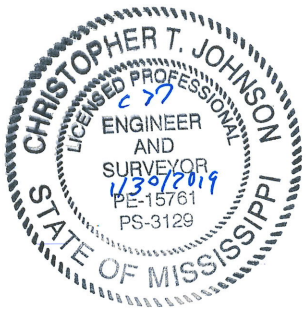
ENGINEERING CERTIFICATION

This 2018 Annual CCR Groundwater Monitoring and Corrective Action Report for the Cooperative Energy, R.D. Morrow, Sr. Generating Station located in Purvis, Mississippi, was prepared by Environmental Management Services, Inc. (EMS). The data provided in this report is for the period January 1 through December 31, 2018. This Statement of Professional Opinion is based on information available to EMS and technical understanding of the United States Environmental Protection Agency's "Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments," published in the Federal Register on April 17, 2015 with an effective date of October 19, 2015 (CCR Rule).

On the basis of and subject to the foregoing it is my professional opinion as a Professional Engineer licensed in the State of Mississippi that this 2018 Annual CCR Groundwater Monitoring and Corrective Action Report has been prepared in accordance with the CCR Rule. It is my professional opinion based on my understanding of the technical requirements of the CCR Rule and good and accepted engineering practices that this report and its contents meet the technical requirements and/or intent of the CCR Rule (40 CFR 257.90). This Statement of Professional Opinion is not and shall not be interpreted or construed as a guarantee, warranty or legal opinion.

Environmental Management Services, Inc.



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Date: 1/30/2019 Seal

1.0 INTRODUCTION

Cooperative Energy operates the R. D. Morrow, Sr. Generating Station in the community of Okahola, near Purvis, Mississippi. The facility uses coal as an energy source for two steam generating units with a net capacity of 195 megawatts each. By-products from the coal combustion process include coal combustion residuals (CCR) that are managed on-site within the regulated CCR Landfill and CCR Surface Impoundments.

The U.S. Environmental Protection Agency published a final rule to regulate the disposal of CCR as a solid waste under subtitle D of the Resource Conservation and Recovery Act (*Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities* (Federal Register Vol. 80, No. 74, April 17, 2015). The information contained herein presents the measures implemented to comply with groundwater monitoring and data analysis requirements outlined in 40 CFR 257.90 through 257.94 for semi-annual sampling events conducted in the reporting period for January through December 2018.

1.1 Regulatory Requirements

In accordance with Section 257.90(e), an annual groundwater monitoring and corrective action report (the Annual Report) must be prepared for existing CCR landfills and existing CCR surface impoundments, no later than January 31, 2018, and annually thereafter. Section 257.90(e) outlines the contents of the Annual Report, which are provided herein:

(1) A map, aerial image, or diagram showing the CCR unit and all background (or upgradient) and downgradient monitoring wells, to include the well identification numbers, that are part of the groundwater monitoring program for the CCR unit;

(2) Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a narrative description of why those actions were taken;

(3) In addition to all the monitoring data obtained under §§ 257.90 through 257.98, a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs;

(4) A narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase (SSI) over background levels); and

(5) Other information required to be included in the annual report as specified in §§257.90 through 257.98.

1.2 Background

A total of nine sampling events were conducted between October 2015 and August 2017 at the CCR Landfill and CCR Surface Impoundments monitoring systems to establish baseline conditions in the upgradient and downgradient wells. Although the monitoring requirements of Section 257.94 require a minimum of eight samples to establish baseline for statistical analysis, an additional set of samples was collected and analyzed at each CCR unit in the event any results were anomalous or otherwise unusable. Once the baseline was established, the data from each CCR unit were evaluated to determine if Appendix III constituents exhibited a statistically significant increase over background levels.

Cooperative Energy's Annual Report for 2017 described the baseline groundwater sampling and statistical analyses for the CCR Landfill and the CCR Surface Impoundments. The CCR Landfill statistical evaluation indicated that pH, sulfate, and total dissolved solids concentrations detected in one or more downgradient wells exceeded the background threshold values calculated from upgradient well data. However, an Alternative Source Demonstration for Appendix III constituents had not been completed at the time of the January 2018 Annual Report to determine if the CCR Landfill would transition to assessment monitoring.

Cooperative Energy also reported that the evaluation of data from the CCR Surface Impoundments baseline groundwater sampling events found that there were no statistically significant exceedances of Appendix III constituents over background.

2.0 SITE SETTING

The Site is located at 304 Old Okahola School Road in the community of Okahola, a rural area of Lamar County, approximately 4.5-miles north of the City of Purvis and 8 miles southwest of the City of Hattiesburg. The facility occupies portions of Sections 15, 21, and 22 of Township 3 North, Range 14 West, Lamar County, Mississippi. The approximate coordinates for the generating building are 31° 13' 04.87" North Latitude, 89° 23' 38.31" West Longitude. A Site Location Map derived from the USGS 1982 Purvis, MS 7.5 Minute Topographic Quadrangle Map is presented as Figure 1. The Old Okahola School Road bisects the property into a northern and southern parcel. The generating plant and CCR Surface Impoundments are located on the north parcel, and the CCR Landfill, stormwater treatment area, and cooling tower blowdown pond are located on the southern parcel.

The elevation north of Old Okahola School Road in the vicinity of the generating plant is typically 250 feet and greater. South of the road in the vicinity of the Landfill the elevation is 230 to 240 feet. The main drainage feature in the vicinity of the subject site is Black Creek, which is part of the Pascagoula River Basin. Black Creek traverses northwest to southeast across Lamar County and forms the southern property boundary of the subject property. Stormwater drainage and NPDES discharge from the site are routed to Black Creek.

3.0 GROUNDWATER MONITORING PROGRAM

Section 257.90(e) specifies that the Annual Report include a summary including the number of groundwater samples that were collected for analysis for each background and downgradient well, the dates the samples were collected, and whether the sample was required by the detection monitoring or assessment monitoring programs. In addition, the Annual Report should include a narrative discussion of any transition between monitoring programs (e.g., the date and circumstances for transitioning from detection monitoring to assessment monitoring in addition to identifying the constituent(s) detected at a statistically significant increase (SSI) over background levels).

3.1 CCR LANDFILL

Monitor Wells MW-2, MW-3, MW-4, MW-5, and MW-6 were installed February 1 – 6, 2005 at the locations shown on Figure 2 to satisfy requirements of the facility's Mississippi Department of Environmental Quality (MDEQ) Solid Waste Permit No. SW0370020308. MW-2 is located on the north side of the landfill and serves as the upgradient monitor well. Monitor Wells MW-3 through MW-6 are downgradient monitoring wells for the landfill. There is no monitor well numbered MW-1 at this time. There were no changes to the CCR Landfill monitoring systems or sampling programs in 2018. No monitoring wells were installed or decommissioned.

3.2 SURFACE IMPOUNDMENTS

Monitor Well "Impoundment" (designated MWI-X) wells were installed March 22-24, 2017 at the locations shown on Figure 2. MWI-1 is located on the north side of the CCR impoundments and serves as the upgradient monitor well. Monitor Wells MWI-2, MWI-3, and MWI-4 are downgradient monitoring wells for the CCR impoundments. There were no changes to the CCR Surface Impoundment monitoring systems or sampling programs in 2018. No monitoring wells were installed or decommissioned.

3.3 2018 CCR EVENT SUMMARY

The dates for groundwater sampling, statistical analyses, and other events occurring within the 2018 reporting period to satisfy the above-referenced requirements are summarized below:

CCR Unit	Date	Description
Landfill	1/15/2018	Unverified SSI based on baseline data and initiation of alternative source demonstration
	4/15/2018	No alternative source identified and transition to Assessment Monitoring
	4/3/2018	Appendix III Detection Monitoring Semiannual Sampling Event
	6/14/2018	Appendix IV Assessment Monitoring Annual Sampling Event

CCR Unit	Date	Description
Landfill	10/12/2018	Appendix III Detection Monitoring Semiannual Sampling Event
	10/12/2018	Appendix IV Assessment Monitoring Semiannual Sampling Event
Surface Impoundments	1/15/2018	No SSI based on baseline data and continue Detection Monitoring
	4/3/2018	Appendix III Detection Monitoring Semiannual Sampling Event
	10/12/2018	Appendix III Detection Monitoring Semiannual Sampling Event

The evaluation of groundwater sampling results from the above events are discussed in Section 4.0.

3.4 TRANSITIONS BETWEEN MONITORING PROGRAMS

In the first quarter of 2018, an Alternative Source Demonstration was performed for the Appendix III constituents detected at the CCR Landfill that exceeded background. The monitoring results, gradients, and other available information were evaluated. Evidence was insufficient to make a successful demonstration that there is an alternative defined source of the detected Appendix III concentrations within the time frame specified in the CCR regulations. Accordingly, the CCR Landfill transitioned to the Assessment Monitoring program (Section 257.95). Cooperative Energy initiated work on subsequent applicable requirements in Sections 257.96 to 257.98.

4.0 SAMPLE RESULTS AND DATA ANALYSIS

Analytical results for samples collected during 2018 semiannual monitoring events for the CCR Landfill and CCR Surface Impoundments are discussed in the following sections.

4.1 CCR LANDFILL

Appendix III constituents were analyzed semiannually with events conducted in April 2018 and October 2018. Appendix IV constituents were sampled and analyzed in June 2018 and October 2018 in accordance with 257.95(b) and (d).

Tables 1 and 2 provide complete analytical summaries of all Appendix III and Appendix IV constituents analyzed at the CCR Landfill. The concentration ranges of Appendix III constituents detected in the CCR Landfill monitoring wells are summarized below:

Well	pH*	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS
	s.u.	mg/L					
MW-2	3.35 - 4.75	1.43 - 1.87	113 - 142	162 - 223	<0.22 - 0.57	389 - 672	862 - 1412
MW-3	3.44 - 4.63	7.87 - 10.7	272 - 497	218 - 399	0.31 - 1.04	754 - 3120	3080 - 4180
MW-4	3.33 - 4.61	12.9 - 19.8	323 - 501	144 - 364	0.29 - 1.14	1600 - 2910	2164 - 4108
MW-5	6.12 - 7.11	25.1 - 41.6	354 - 885	320 - 693	0.71 - 1.43	1980 - 3800	4842 - 7668
MW-6	3.51 - 5.00	0.065 - 8.86	1.63 - 59.7	6.85 - 142	<0.15 - 0.22	8.56 - 330	42 - 757

*Outliers due to instrument malfunction have been removed.

The concentration ranges of detected Appendix IV constituents in CCR Landfill monitoring wells during the nine baseline and two assessment monitoring events are summarized below:

Well	Barium	Beryllium	Chromium	Cobalt	Fluoride	Lead
	mg/L					
MW-2	0.022 - 0.025	0.006 - 0.007	<0.01	0.115 - 0.154	0.25 - 0.73	0.003 - 0.006
MW-3	0.027 - 0.035	<0.004	<0.01 - 0.010	0.045 - 0.077	0.31 - 1.02	0.007 - 0.056
MW-4	0.028 - 0.040	<0.004	<0.01	0.059 - 0.110	0.29 - 1.14	0.00754 - 0.017
MW-5	0.042 - 0.062	<0.004	<0.01 - 0.011	0.006 - 0.012	0.71 - 1.43	<0.001 - 0.002
MW-6	0.094 - 0.427	<0.004	<0.01 - 0.014	0.001 - 0.032	<0.15 - 0.22	<0.001 - 0.002

Well	Lithium	Mercury	Molybdenum	Thallium	Ra-226 + Ra-228
	mg/L				
MW-2	<0.050	<0.002	<0.005	<0.002	0.293 - 1.699
MW-3	0.440 - 0.907	<0.002	<0.005	<0.002	2.288 - 6.278
MW-4	0.440 - 1.42	<0.002	<0.005 - 0.009	<0.002	1.64 - 4.891
MW-5	4.99 - 9.21	<0.002	5.28 - 8.13	<0.002 - 0.003	0.321 - 2.09
MW-6	<0.050	<0.002 -0.0028	<0.005 - 0.005	<0.002	0.693 - 4.80

Statistical analyses of Appendix IV constituents detected in CCR Landfill monitoring program wells to determine if there is an exceedance of groundwater protection standards will be completed in 2019.

4.2 CCR SURFACE IMPOUNDMENTS

4.2.1 Data Summary

Detection monitoring was implemented for the CCR Surface Impoundments with semiannual sampling events conducted in April 2018 and October 2018. Table 3 provides a complete analytical summary of all Appendix III constituents analyzed at the CCR Surface Impoundments. No additional Appendix IV sampling was conducted in 2018.

The concentration ranges of Appendix III constituents detected in the CCR Surface Impoundments monitoring wells during the baseline and semiannual detection monitoring events are summarized in the following table:

Well	pH*	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS
	s.u.	mg/L					
MWI-1	6.28 - 6.91	0.098 - 0.139	27.3 - 35.4	31.2 - 38.8	<0.15 - 0.3	17.4 - 36.8	252 - 353
MWI-2	5.76 - 6.39	0.070 - 0.131	6.24 - 10.8	12.2 - 13.8	0.15 - 0.24	<5.0 - 11.5	143 - 208
MWI-3	5.78 - 6.50	0.066 - 0.109	3.98 - 9.65	2.86 - 10.7	<0.15 - 0.24	2.32 - 21.6	139 - 199
MWI-4	5.84 - 7.02	0.058 - 0.105	9.32 - 14.0	7.97 - 12.2	0.16 - 0.33	5.36 - 13.9	62 - 214

*Outliers due to instrument malfunction have been removed.

4.2.2 Statistical Analysis

A statistical analysis was conducted on the April 2018 semiannual event groundwater data. The evaluation of the October 2018 results will be completed in the first quarter of 2019.

The detection monitoring SSI determinations were performed using an interwell comparison between the background results from monitoring well MWI-1 and the downgradient results from wells MWI-2, MWI-3 and MWI-4. Statistical analysis consisted of both graphical (Box Plots) and formal (Prediction Limits) methods in accordance with the Statistical Methods Certification for this site. The box plots included in Appendix A demonstrate that boron, calcium, chloride, sulfate, and total dissolved solids concentrations in the upgradient well MWI-1 are higher than the downgradient concentrations. Therefore, no formal prediction limit testing was performed.

An upper prediction limit was calculated to evaluate fluoride; whereas, pH was evaluated by means of a two-sided upper and lower prediction interval in which future values are expected to fall. If any concentration exceeds the upper limit or falls outside the prediction interval, this is statistically significant evidence that the concentration is not representative (i.e., less than or within range) of background (upgradient).

Prediction limit and interval results for both CCR Surface Impoundments detection monitoring data are summarized below.

Parameter	Limit or Interval	Sample Results (4/3/2018) MWI-2, MWI-3, MWI-4
Fluoride	0.330 mg/L	0.22, <0.22, 0.30 mg/L
pH	[5.80 – 7.26]	5.98, 6.14, 6.32

The evaluation of fluoride and pH detection monitoring results indicates there is no statistically significant variation from background for these constituents.

5.0 CONCLUSIONS

The following sections summarize the 2018 analysis results and compliance status of each CCR regulated unit.

5.1 CCR LANDFILL

In 2018, Cooperative Energy transitioned from detection to assessment monitoring for this CCR regulated unit. Cooperative Energy complied with the groundwater monitoring requirements for Assessment Monitoring in 2018.

5.2 CCR SURFACE IMPOUNDMENTS

In 2018, Cooperative Energy remained in detection monitoring for this CCR regulated unit. Cooperative Energy complied with the groundwater monitoring requirements for detection monitoring. Analytical and statistical analysis results from the monitoring network for the CCR Surface Impoundments continue to indicate that there is no identified SSI in calendar year 2018.

TABLES

Table 1
CCR Landfill Appendix III Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	pH	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS
			std units	mg/L					
MW-2 (upgradient)	BL 1	10/29/2015	3.35	1.87	134	187	0.38	405	966
	BL 2	4/27/2016	4.54	1.71	124	189	0.54	505	1412
	BL 3	6/14/2016	4.27	1.86	138	201	0.57	483	1136
	BL 4	8/24/2016	4.30	1.45	113	223	0.38	602	1264
	BL 5	10/25/2016	4.21	1.75	128	206	0.47	643	1116
	BL 6	12/12/2016	4.75	1.74	139	197	0.47	520	1084
	BL 7	2/15/2017	4.60	1.86	134	199	0.50	672	862
	BL 8	4/20/2017	3.79	1.70	141	212	0.42	642	1062
	BL 9	8/22/2017	3.96	1.73	142	189	<0.22	389	1152
	1 AM	4/3/2018	4.54	1.67	137	178	0.53	626	1098
	2 AM	10/12/2018	3.20#	1.43	136	162	0.25	463	1376
MW-3	BL 1	10/29/2015	3.44	10.6	465	318	0.31	1660	3476
	BL 2	4/27/2016	4.57	10.1	452	350	0.98	2250	4064
	BL 3	6/14/2016	4.43	10.7	474	304	0.98	2020	3772
	BL 4	8/24/2016	4.56	10.0	482	296	0.94	2190	4180
	BL 5	10/25/2016	4.52	9.52	442	310	0.85	2870	3308
	BL 6	12/12/2016	4.37	9.37	440	399	0.90	754	3248
	BD		--	9.29	447	313	0.90	2710	3360
	BL 7	2/15/2017	4.26	9.26	400	285	0.93	2220	3316
	BL 8	4/20/2017	4.01	9.25	272	282	0.85	3120	3488
	BL 9	8/22/2017	4.63	8.66	411	261	0.63	1860	3792
	1 AM	4/3/2018	4.60	8.62	464	231	1.04	2340	3080
	2 AM	10/12/2018	4.93#	7.87	497	218	0.74	2050	3856

Table 1
CCR Landfill Appendix III Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	pH	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS
			std units	mg/L					
MW-4	BL 1	10/29/2015	3.33	19.8	403	294	0.70	2200	3688
	BD		--	19.3	407	296	1.13	2140	3368
	BL 2	4/27/2016	3.98	19.0	408	348	1.01	2240	4108
	BD		--	19.0	413	364	1.14	2400	3936
	BL 3	6/14/2016	4.11	19.1	402	346	0.87	1950	4028
	BL 4	8/24/2016	4.39	17.8	416	286	0.89	2700	4004
	BL 5	10/25/2016	4.12	16.2	397	266	0.92	2340	3204
	BD		--	16.2	379	264	0.98	2470	3320
	BL 6	12/12/2016	4.06	15.8	393	282	0.89	2910	3056
	BL 7	2/15/2017	4.11	15.2	445	275	0.91	2370	3256
	BD		--	16.1	501	251	0.82	2590	3058
	BL 8	4/20/2017	3.55	15.6	323	254	0.80	1600	3360
	BD		--	14.8	382	274	0.82	2620	3276
	9	8/22/2017	4.61	13.8	420	203	0.30	1850	3576
	1 AM	4/3/2018	4.19	13.8	400	211	1.03	2290	2976
	2 AM	10/12/2018	3.27#	14.3	393	321	1.03	1710	2164
	BD		--	12.9	393	144	0.29	2330	3028
MW-5	BL 1	10/29/2015	6.17	39.2	625	590	0.71	2550	6232
	BL 2	4/27/2016	6.41	37.8	614	647	1.43	2640	6656
	BL 3	6/14/2016	6.61	40.3	657	693	1.32	2720	7668
	BL 4	8/24/2016	6.66	40.5	619	637	1.40	2910	7120
	BL 5	10/25/2016	6.71	36.1	560	559	1.30	2560	5208
	BL 6	12/12/2016	7.11	35.7	586	628	1.26	3800	6420
	BL 7	2/15/2017	6.50	41.6	885	628	1.29	3630	6670
	BL 8	4/20/2017	6.12	34.2	354	623	1.13	2970	6712
	BL 9	8/22/2017	6.73	31.5	581	458	1.05	2710	7028
	BD		--	32.5	582	472	1.13	2290	6180
	1 AM	4/3/2018	6.77	25.1	537	338	1.40	2300	5064
	BD		--	25.5	543	336	1.35	2500	4842
	2 AM	10/12/2018	10.34#	29.0	585	320	1.03	1980	5560

Table 1
CCR Landfill Appendix III Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	pH	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS
			std units	mg/L					
MW-6	BL 1	10/29/2015	3.51	8.86	59.7	142	<0.15	330	757
	BL 2	4/27/2016	4.58	0.129	2.17	9.89	<0.15	9.23	82
	BL 3	6/14/2016	4.69	0.223	2.41	11.4	<0.15	9.15	43
	BL 4	8/24/2016	4.69	0.118	1.83	9.08	<0.16	8.56	42
	BL 5	10/25/2016	4.57	0.181	2.29	19.3	<0.16	11.9	68
	BL 6	12/12/2016	5.00	2.5	15.5	59.5	0.22	102	269
	BL 7	2/15/2017	4.93	0.202	2.60	10.2	<0.16	12.1	109
	BL 8	4/20/2017	4.17	0.087	2.37	9.19	<0.22	10.9	59
	BL 9	8/22/2017	4.24	0.077	1.63	6.85	<0.22	8.7	80
	1 AM	4/3/2018	4.66	<0.05	2.30	6.97	<0.22	13.1	43
	2 AM	10/12/2018	5.37#	0.065	2.02	7.87	<0.22	8.67	69

Notes:
BL - Baseline
AM - Assessment Monitoring
BD - Blind Duplicate of specified well
- Outlier due to instrument malfunction

Table 2
CCR Landfill Appendix IV Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Fluoride
			mg/L							
MW-2 (upgradient)	BL 1	10/29/2015	<0.002	<0.002	0.023	0.006	<0.005	<0.010	0.115	0.38
	BL 2	4/27/2016	<0.002	<0.002	0.023	0.007	<0.005	<0.010	0.124	0.54
	BL 3	6/14/2016	<0.002	<0.002	0.022	0.007	<0.005	<0.010	0.154	0.57
	BL 4	8/24/2016	<0.002	<0.002	0.022	0.006	<0.005	<0.010	0.123	0.38
	BL 5	10/25/2016	<0.002	<0.002	0.025	0.007	<0.005	<0.010	0.141	0.47
	BL 6	12/12/2016	<0.002	<0.002	0.025	0.007	<0.005	<0.010	0.146	0.47
	BL 7	2/15/2017	<0.002	<0.002	0.025	0.007	<0.005	<0.010	0.149	0.50
	BL 8	4/20/2017	<0.002	<0.002	0.023	0.007	<0.005	<0.010	0.142	0.42
	BL 9	8/22/2017	<0.002	<0.002	0.022	0.007	<0.005	<0.010	0.141	<0.22
	1 AM	6/14/2018	<0.002	<0.002	0.022	0.006	<0.005	<0.010	0.124	0.73
	2 AM	10/12/2018	<0.002	<0.002	0.022	0.00679	<0.005	<0.010	0.154	0.25
MW-3	BL 1	10/29/2015	<0.002	<0.002	0.033	<0.004	<0.005	<0.010	0.052	0.31
	BL 2	4/27/2016	<0.002	<0.002	0.033	<0.004	<0.005	0.010	0.064	0.98
	BL 3	6/14/2016	<0.002	<0.002	0.030	<0.004	<0.005	<0.010	0.077	0.98
	BL 4	8/24/2016	<0.002	<0.002	0.032	<0.004	<0.005	<0.010	0.065	0.94
	BL 5	10/25/2016	<0.002	<0.002	0.035	<0.004	<0.005	<0.010	0.064	0.85
	BL 6	12/12/2016	<0.002	<0.002	0.035	<0.004	<0.005	<0.010	0.067	0.90
	BD	12/12/2016	<0.002	<0.002	0.035	<0.004	<0.005	<0.010	0.067	0.90
	BL 7	2/15/2017	<0.002	<0.002	0.032	<0.004	<0.005	<0.010	0.068	0.93
	BL 8	4/20/2017	<0.002	<0.002	0.031	<0.004	<0.005	<0.010	0.056	0.85
	BL 9	8/22/2017	<0.002	<0.002	0.027	<0.004	<0.005	<0.010	0.057	0.63
	1 AM	6/14/2018	<0.002	<0.002	0.030	<0.004	<0.005	<0.010	0.045	1.02
	2 AM	10/12/2018	<0.002	<0.002	0.029	<0.004	<0.005	<0.010	0.0468	0.74

Table 2
CCR Landfill Appendix IV Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Fluoride
			mg/L							
MW-4	BL 1	10/29/2015	<0.002	<0.002	0.034	<0.004	<0.005	<0.010	0.059	0.70
	BD		<0.002	<0.002	0.034	<0.004	<0.005	<0.010	0.061	1.13
	BL 2	4/27/2016	<0.002	<0.002	0.040	<0.004	<0.005	<0.010	0.110	1.01
	BD		<0.002	<0.002	0.038	<0.004	<0.005	<0.010	0.107	1.14
	BL 3	6/14/2016	<0.002	<0.002	0.032	<0.004	<0.005	<0.010	0.108	0.87
	BL 4	8/24/2016	<0.002	<0.002	0.034	<0.004	<0.005	<0.010	0.083	0.89
	BL 5	10/25/2016	<0.002	<0.002	0.035	<0.004	<0.005	<0.010	0.069	0.92
	BD		<0.002	<0.002	0.035	<0.004	<0.005	<0.010	0.068	0.98
	BL 6	12/12/2016	<0.002	<0.002	0.034	<0.004	<0.005	<0.010	0.067	0.89
	BL 7	2/15/2017	<0.002	<0.002	0.031	<0.004	<0.005	<0.010	0.078	0.91
	BD		<0.002	<0.002	0.033	<0.004	<0.005	<0.010	0.080	0.82
	BL 8	4/20/2017	<0.002	<0.002	0.031	<0.004	<0.005	<0.010	0.075	0.80
	BD		<0.002	<0.002	0.031	<0.004	<0.005	<0.010	0.076	0.82
	BL 9	8/22/2017	<0.002	<0.002	0.028	<0.004	<0.005	<0.010	0.067	0.30
	1 AM	6/14/2018	<0.002	<0.002	0.029	<0.004	<0.005	<0.010	0.064	1.02
	BD		<0.002	<0.002	0.029	<0.004	<0.005	<0.010	0.065	1.03
	2 AM	10/12/2018	<0.002	<0.002	0.031	<0.004	<0.005	<0.010	0.0627	1.03
	BD		<0.002	<0.002	0.029	<0.004	<0.005	<0.010	0.0595	0.29
MW-5	BL 1	10/29/2015	<0.002	<0.002	0.056	<0.004	<0.005	<0.010	0.012	0.71
	BL 2	4/27/2016	<0.002	<0.002	0.062	<0.004	<0.005	0.011	0.010	1.43
	BL 3	6/14/2016	<0.002	<0.002	0.060	<0.004	<0.005	<0.010	0.010	1.32
	BL 4	8/24/2016	<0.002	<0.002	0.061	<0.004	<0.005	<0.010	0.009	1.40
	BL 5	10/25/2016	<0.002	<0.002	0.054	<0.004	<0.005	<0.010	0.008	1.30
	BL 6	12/12/2016	<0.002	<0.002	0.053	<0.004	<0.005	<0.010	0.010	1.26
	BL 7	2/15/2017	<0.002	<0.002	0.049	<0.004	<0.005	<0.010	0.010	1.29
	BL 8	4/20/2017	<0.002	<0.002	0.049	<0.004	<0.005	<0.010	0.008	1.13
	BL 9	8/22/2017	<0.002	<0.002	0.042	<0.004	<0.005	<0.010	0.008	1.05
	BD		<0.002	<0.002	0.042	<0.004	<0.005	<0.010	0.008	1.13
	1 AM	6/14/2018	<0.002	<0.002	0.046	<0.004	<0.005	<0.010	0.006	1.30
	2 AM	10/12/2018	<0.002	<0.002	0.055	<0.004	<0.005	<0.010	0.00701	1.03

Table 2
CCR Landfill Appendix IV Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Fluoride
			mg/L							
MW-6	BL 1	10/29/2015	<0.002	<0.002	0.233	<0.004	<0.005	0.014	0.032	<0.15
	BL 2	4/27/2016	<0.002	<0.002	0.128	<0.004	<0.005	<0.010	0.001	<0.15
	BL 3	6/14/2016	<0.002	<0.002	0.143	<0.004	<0.005	<0.010	0.001	<0.15
	BL 4	8/24/2016	<0.002	<0.002	0.118	<0.004	<0.005	<0.010	0.001	<0.16
	BL 5	10/25/2016	<0.002	<0.002	0.142	<0.004	<0.005	<0.010	0.001	<0.16
	BL 6	12/12/2016	<0.002	<0.002	0.427	<0.004	<0.005	<0.010	0.011	0.22
	BL 7	2/15/2017	<0.002	<0.002	0.141	<0.004	<0.005	<0.010	0.002	<0.16
	BL 8	4/20/2017	<0.002	<0.002	0.125	<0.004	<0.005	<0.010	0.002	<0.22
	BL 9	8/22/2017	<0.002	<0.002	0.094	<0.004	<0.005	<0.010	0.001	<0.22
	1 AM	6/14/2018	<0.002	<0.002	0.114	<0.004	<0.005	<0.010	0.001	<0.22
	2 AM	10/12/2018	<0.002	<0.002	0.114	<0.004	<0.005	<0.010	0.00148	<0.22

Notes:

BL - Baseline

AM - Assessment Monitoring

BD - Blind Duplicate of specified well

Table 2
CCR Landfill Appendix IV Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Ra-226 + Ra-228
			mg/L						pC/L
MW-2 (upgradient)	BL 1	10/29/2015	0.005	<0.050	<0.002	<0.001	<0.050	<0.001	0.293
	BL 2	4/27/2016	0.003	<0.050	<0.002	<0.005	<0.050	<0.001	0.707
	BL 3	6/14/2016	0.004	<0.050	<0.002	<0.005	<0.050	<0.001	0.985
	BL 4	8/24/2016	0.003	<0.050	<0.002	<0.005	<0.050	<0.001	1.220
	BL 5	10/25/2016	0.006	<0.050	<0.002	<0.005	<0.050	<0.001	1.699
	BL 6	12/12/2016	0.006	<0.050	<0.002	<0.005	<0.050	<0.001	1.379
	BL 7	2/15/2017	0.004	<0.050	<0.002	<0.005	<0.050	<0.001	1.270
	BL 8	4/20/2017	0.003	<0.050	<0.002	<0.005	<0.050	<0.001	0.612
	BL 9	8/22/2017	0.004	<0.050	<0.002	<0.005	<0.050	<0.001	1.240
	1 AM	6/14/2018	0.003	<0.050	<0.002	<0.005	<0.050	<0.001	1.110
	2 AM	10/12/2018	0.00465	<0.050	<0.002	<0.005	<0.050	<0.001	1.618
MW-3	BL 1	10/29/2015	0.037	0.907	<0.002	<0.001	<0.050	<0.001	3.823
	BL 2	4/27/2016	0.056	0.897	<0.002	<0.005	<0.050	<0.001	2.744
	BL 3	6/14/2016	0.013	0.785	<0.002	<0.005	<0.050	<0.001	4.286
	BL 4	8/24/2016	0.016	0.816	<0.002	<0.005	<0.050	<0.001	5.408
	BL 5	10/25/2016	0.012	0.794	<0.002	<0.005	<0.050	<0.001	6.278
	BL 6	12/12/2016	0.024	0.834	<0.002	<0.005	<0.050	<0.001	6.202
	BD	12/12/2016	0.024	0.830	<0.002	<0.005	<0.050	<0.001	4.564
	BL 7	2/15/2017	0.020	0.730	<0.002	<0.005	<0.050	<0.001	5.216
	BL 8	4/20/2017	0.011	0.727	<0.002	<0.005	<0.050	<0.001	2.288
	BL 9	8/22/2017	0.007	0.542	<0.002	<0.005	<0.050	<0.001	3.636
	1 AM	6/14/2018	0.012	0.525	<0.002	<0.005	<0.050	<0.001	2.471
	2 AM	10/12/2018	0.00814	0.440	<0.002	<0.005	<0.050	<0.001	2.399

Table 2
CCR Landfill Appendix IV Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Ra-226 + Ra-228
			mg/L						pC/L
MW-4	BL 1	10/29/2015	0.017	1.19	<0.002	<0.001	<0.050	<0.001	4.127
	BD		0.016	1.24	<0.002	<0.001	<0.050	<0.001	4.587
	BL 2	4/27/2016	0.014	1.42	<0.002	<0.005	<0.050	<0.001	3.004
	BD		0.014	1.40	<0.002	<0.005	<0.050	<0.001	3.375
	BL 3	6/14/2016	0.012	0.98	<0.002	<0.005	<0.050	<0.001	2.436
	BL 4	8/24/2016	0.014	1.05	<0.002	0.009	<0.050	<0.001	3.165
	BL 5	10/25/2016	0.015	1.07	<0.002	<0.005	<0.050	<0.001	3.591
	BD		0.014	1.01	<0.002	<0.005	<0.050	<0.001	3.332
	BL 6	12/12/2016	0.013	0.933	<0.002	0.006	<0.050	<0.001	4.891
	BL 7	2/15/2017	0.009	0.836	<0.002	<0.005	<0.050	<0.001	3.586
	BD		0.009	0.875	<0.002	<0.005	<0.050	<0.001	3.131
	BL 8	4/20/2017	0.008	0.832	<0.002	<0.005	<0.050	<0.001	2.108
	BD		0.008	0.826	<0.002	<0.005	<0.050	<0.001	2.240
	BL 9	8/22/2017	0.010	0.564	<0.002	<0.005	<0.050	<0.001	4.758
	1 AM	6/14/2018	0.008	0.552	<0.002	<0.005	<0.050	<0.001	1.640
	BD		0.008	0.530	<0.002	<0.005	<0.050	<0.001	2.210
	2 AM	10/12/2018	0.00778	0.464	<0.002	<0.005	<0.050	<0.001	2.823
	BD		0.008	0.440	<0.002	<0.005	<0.050	<0.001	2.449
MW-5	BL 1	10/29/2015	<0.001	7.71	<0.002	5.28	<0.050	0.002	0.547
	BL 2	4/27/2016	0.002	9.21	<0.002	7.83	<0.050	0.003	0.321
	BL 3	6/14/2016	<0.001	7.45	<0.002	8.13	<0.050	0.002	1.617
	BL 4	8/24/2016	<0.001	8.77	<0.002	6.95	<0.050	0.002	2.090
	BL 5	10/25/2016	<0.001	7.89	<0.002	6.76	<0.050	0.003	1.447
	BL 6	12/12/2016	<0.001	7.67	<0.002	6.63	<0.050	0.003	1.294
	BL 7	2/15/2017	<0.001	7.25	<0.002	6.78	<0.050	0.003	1.085
	BL 8	4/20/2017	<0.001	7.99	<0.002	6.46	<0.050	0.002	0.886
	BL 9	8/22/2017	<0.001	5.61	<0.002	6.57	<0.050	0.003	1.920
	BD		<0.001	5.49	<0.002	6.65	<0.050	0.003	1.342
	1 AM	6/14/2018	<0.001	4.99	<0.002	7.61	<0.050	0.003	1.190
	2 AM	10/12/2018	<0.001	5.16	<0.002	7.09	<0.050	0.00245	0.833

Table 2
CCR Landfill Appendix IV Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium	Ra-226 + Ra-228
			mg/L						pC/L
MW-6	BL 1	10/29/2015	0.002	<0.050	0.0028	<0.001	<0.050	<0.001	2.365
	BL 2	4/27/2016	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	0.693
	BL 3	6/14/2016	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	0.943
	BL 4	8/24/2016	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	1.276
	BL 5	10/25/2016	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	2.826
	BL 6	12/12/2016	0.001	<0.050	<0.002	<0.005	<0.050	<0.001	4.800
	BL 7	2/15/2017	<0.001	<0.050	<0.002	0.005	<0.050	<0.001	1.289
	BL 8	4/20/2017	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	0.879
	BL 9	8/22/2017	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	1.491
	1 AM	6/14/2018	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	1.251
	2 AM	10/12/2018	<0.001	<0.050	<0.002	<0.005	<0.050	<0.001	1.348

Notes:

BL - Baseline

AM - Assessment Monitoring

BD - Blind Duplicate of specified well

Table 3
CCR Surface Impoundments Appendix III Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

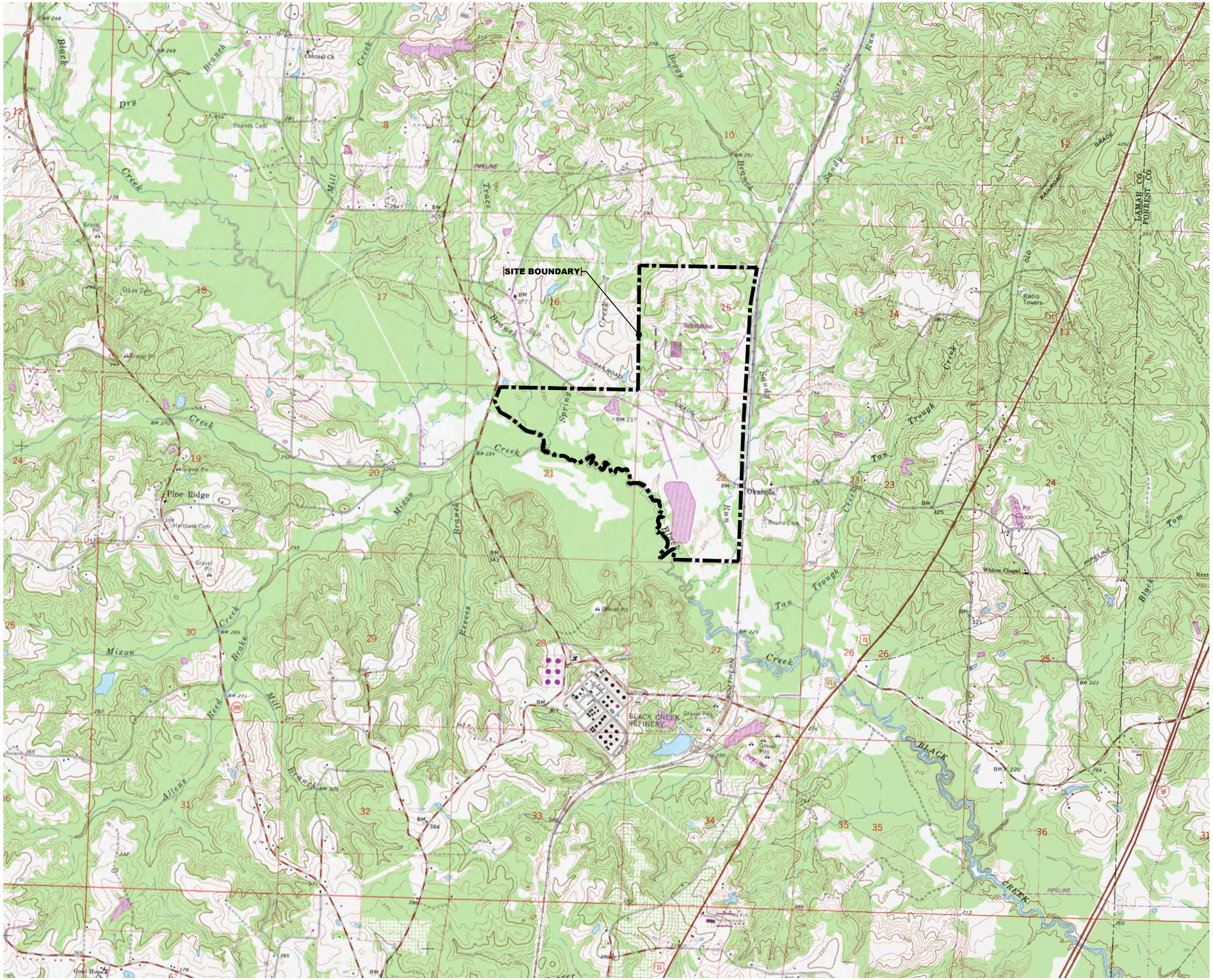
Monitoring Well No.	Sampling Event No.	Sample Date	pH std units	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS
				mg/L					
MWI-1 (upgradient)	BL 1	4/26/2016	6.91	0.098	29.4	31.2	0.18	18.6	270
	BL 2	6/13/2016	6.71	0.098	29.5	32.7	0.18	18.8	270
	BD-1		--	0.099	29.1	33.4	<0.15	19.6	271
	BL 3	8/23/2016	6.30	0.098	29.7	31.7	0.19	17.4	269
	BD-1		--	0.100	29.3	36.4	0.18	19.5	252
	BL 4	10/24/2016	6.71	0.102	29.3	33.5	<0.16	17.5	264
	BL 5	12/12/2016	6.32	0.102	29.5	38.8	0.19	31.4	268
	BL 6	2/15/2017	11.74#	0.122	27.3	34.3	0.30	29.5	353
	BL 7	4/20/2017	6.65	0.101	30.1	37.5	0.23	23.0	292
	BL 8	6/20/2017	6.42	0.109	31.0	37.2	0.26	35.6	315
	BD-1		--	0.123	31.3	36.3	0.26	33.3	314
	BL 9	8/22/2017	6.53	0.139	32.6	35.6	<0.22	32.4	296
	DM 1	4/3/2018	6.28	0.105	33.6	35.0	<0.22	36.8	293
	DM 2	10/12/2018	6.57	0.111	35.4	35.8	0.29	27.8	321
MWI-2	BL 1	4/26/2016	6.39	0.079	10.8	13.1	0.20	11.5	196
	BL 2	6/13/2016	6.03	0.077	8.54	12.9	0.15	8.26	165
	BL 3	8/23/2016	6.36	0.071	7.72	12.7	0.24	6.87	143
	BL 4	10/24/2016	6.09	0.075	7.19	12.5	<0.16	5.68	159
	BL 5	12/12/2016	5.76	0.079	7.07	12.6	0.22	6.73	155
	BL 6	2/15/2017	10.24#	0.081	6.24	12.2	<0.16	6.73	164
	BL 7	4/20/2017	6.23	0.070	6.71	13.2	<0.22	6.81	150
	BL 8	6/20/2017	5.89	0.131	6.63	13.1	<0.22	6.81	156
	BL 9	8/22/2017	5.81	0.076	6.99	12.4	<0.22	5.64	161
	DM 1	4/3/2018	5.98	0.073	7.18	13.8	0.22	5.79	150
	DM 2	10/12/2018	6.01	0.072	6.81	13.3	<0.22	<5.00	208

Table 3
CCR Surface Impoundments Appendix III Analytical Summary
Cooperative Energy
R.D. Morrow, Sr. Generation Facility
Purvis, MS

Monitoring Well No.	Sampling Event No.	Sample Date	pH std units	Boron	Calcium	Chloride	Fluoride	Sulfate	TDS
				mg/L					
MWI-3	BL 1	4/26/2016	6.50	0.066	9.65	10.7	<0.15	21.6	198
	BL 2	6/13/2016	6.28	0.066	8.88	10.5	0.17	18.8	199
	BL 3	8/23/2016	6.43	0.066	6.14	7.30	<0.16	6.53	175
	BL 4	10/24/2016	6.19	0.066	4.85	7.03	<0.16	5.13	151
	BL 5	12/12/2016	5.78	0.072	4.77	6.67	<0.16	5.15	163
	BL 6	2/15/2017	12.38#	0.075	4.40	5.06	<0.16	4.56	149
	BL 7	4/20/2017	6.32	0.069	4.87	4.70	<0.22	2.53	162
	BL 8	6/20/2017	6.15	0.109	4.21	4.51	0.24	2.32	174
	BL 9	8/22/2017	6.30	0.076	4.26	4.09	<0.22	<1.99	159
	DM 1	4/3/2018	6.14	0.072	3.98	3.33	<0.22	<5.00	139
	DM 2	10/12/2018	6.25	0.068	3.99	2.86	<0.22	<5.00	164
MWI-4	BL 1	4/26/2016	7.02	<0.050	9.32	7.97	0.16	12.2	62
	BL 2	6/13/2016	6.32	0.058	12.2	8.47	0.17	13.9	117
	BL 3	8/23/2016	6.50	0.066	14.0	9.62	0.23	11.5	164
	BL 4	10/24/2016	6.61	0.071	10.0	9.90	0.24	7.81	169
	BL 5	12/12/2016	6.28	0.077	10.6	9.53	0.17	9.39	172
	BL 6	2/15/2017	9.29#	0.084	11.5	9.15	0.33	8.27	164
	BL 7	4/20/2017	6.58	0.076	13.0	10.5	<0.22	9.69	170
	BL 8	6/20/2017	5.84	0.105	10.4	12.2	<0.22	12.4	179
	BL 9	8/22/2017	6.49	0.093	9.70	11.3	<0.22	10.4	183
	DM 1	4/3/2018	6.32	0.101	9.93	9.89	0.30	7.06	214
	DM 2	10/12/2018	6.41	0.081	10.7	10.9	<0.22	5.36	168

Notes:
BL - Baseline
DM - Detection Monitoring
BD - Blind Duplicate of specified well
- Outlier due to instrument malfunction

FIGURES



LEGEND

COOPERATIVE ENERGY PROPERTY BOUNDARY

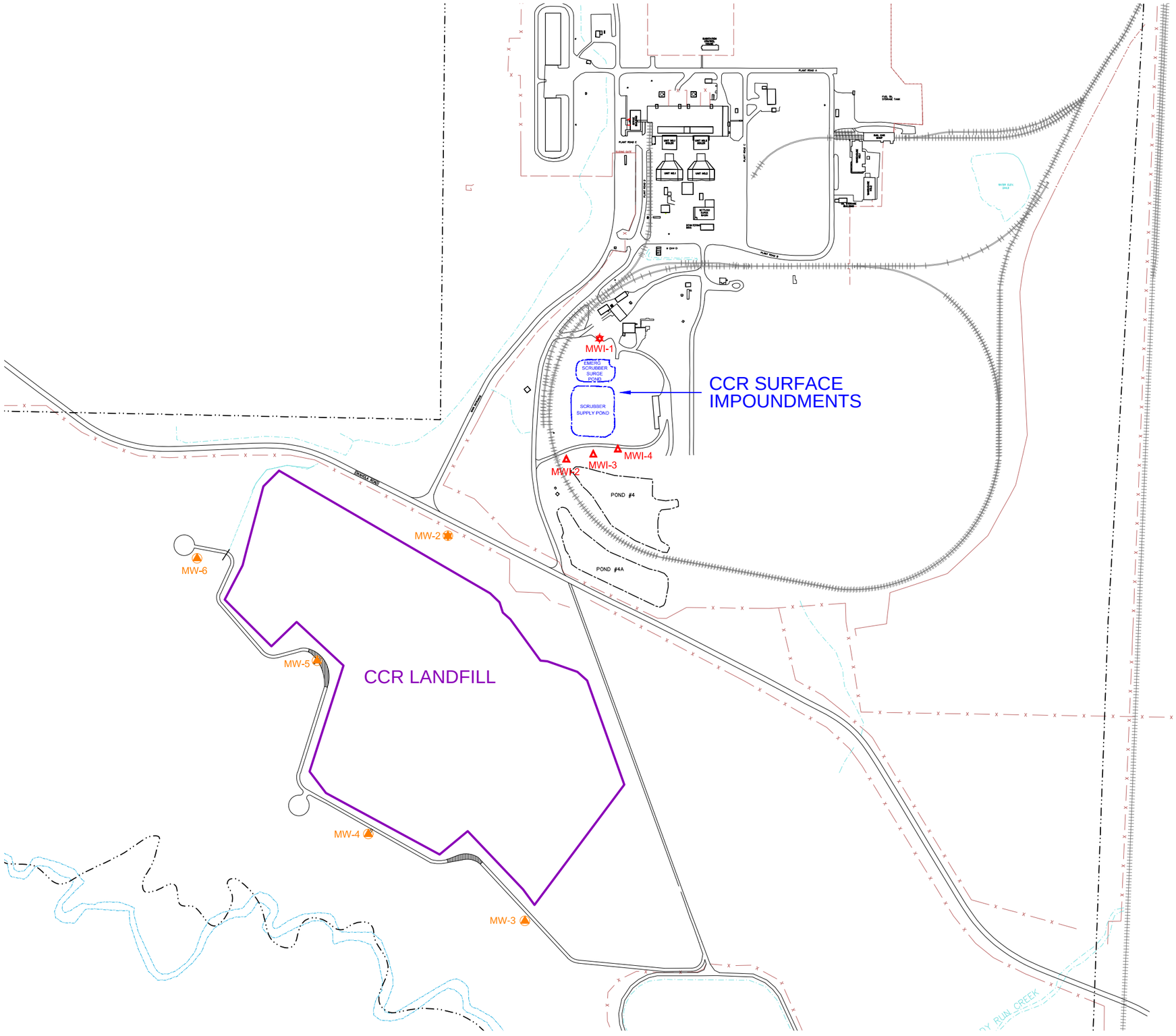
REFERENCE: 7.5 MIN. SERIES TOPOGRAPHIC MAP
PURVIS, MISSISSIPPI
DIXIE, MISSISSIPPI

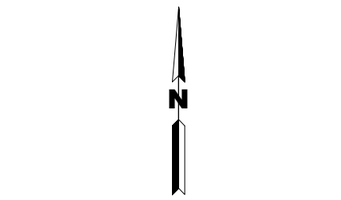
ENVIRONMENTAL MANAGEMENT SERVICES, INC.
P.O. BOX 15369
HATTIESBURG, MS 39404
601-544-3674 • 601-544-0504 (fax)

PREPARED FOR
Cooperative ENERGY
P.O. BOX 15849
HATTIESBURG, MS 39404-5849

SHEET TITLE
SITE LOCATION TOPOGRAPHIC MAP
COOPERATIVE ENERGY
R.D. MORROW SR. GENERATING STATION
PURVIS, MISSISSIPPI

DATE	12/20/2018
SCALE	1" = 3000'
DRAWN BY	PDM
PROJECT NO.	SOU2-18-001
SHEET NO.	1





LEGEND

- LANDFILL UPGRADIENT WELL
- LANDFILL DOWNGRADIENT WELLS
- IMPOUNDMENT UPGRADIENT WELL
- IMPOUNDMENT DOWNGRADIENT WELLS
- CHAIN LINK FENCE
- CREEK/DITCH
- CCR LANDFILL BOUNDARY
- CCR SURFACE IMPOUNDMENTS
- COOPERATIVE ENERGY PROPERTY BOUNDARY

ENVIRONMENTAL MANAGEMENT SERVICES, INC.
P.O. BOX 15369
HATTIESBURG, MS 39404
601-544-3674 • 601-544-0504 (fax)

PREPARED FOR

Cooperative ENERGY
P.O. BOX 15849
HATTIESBURG, MS 39404-5849

SHEET TITLE

SITE LAYOUT

COOPERATIVE ENERGY
R.D. MORROW SR. GENERATING STATION
PURVIS, MISSISSIPPI

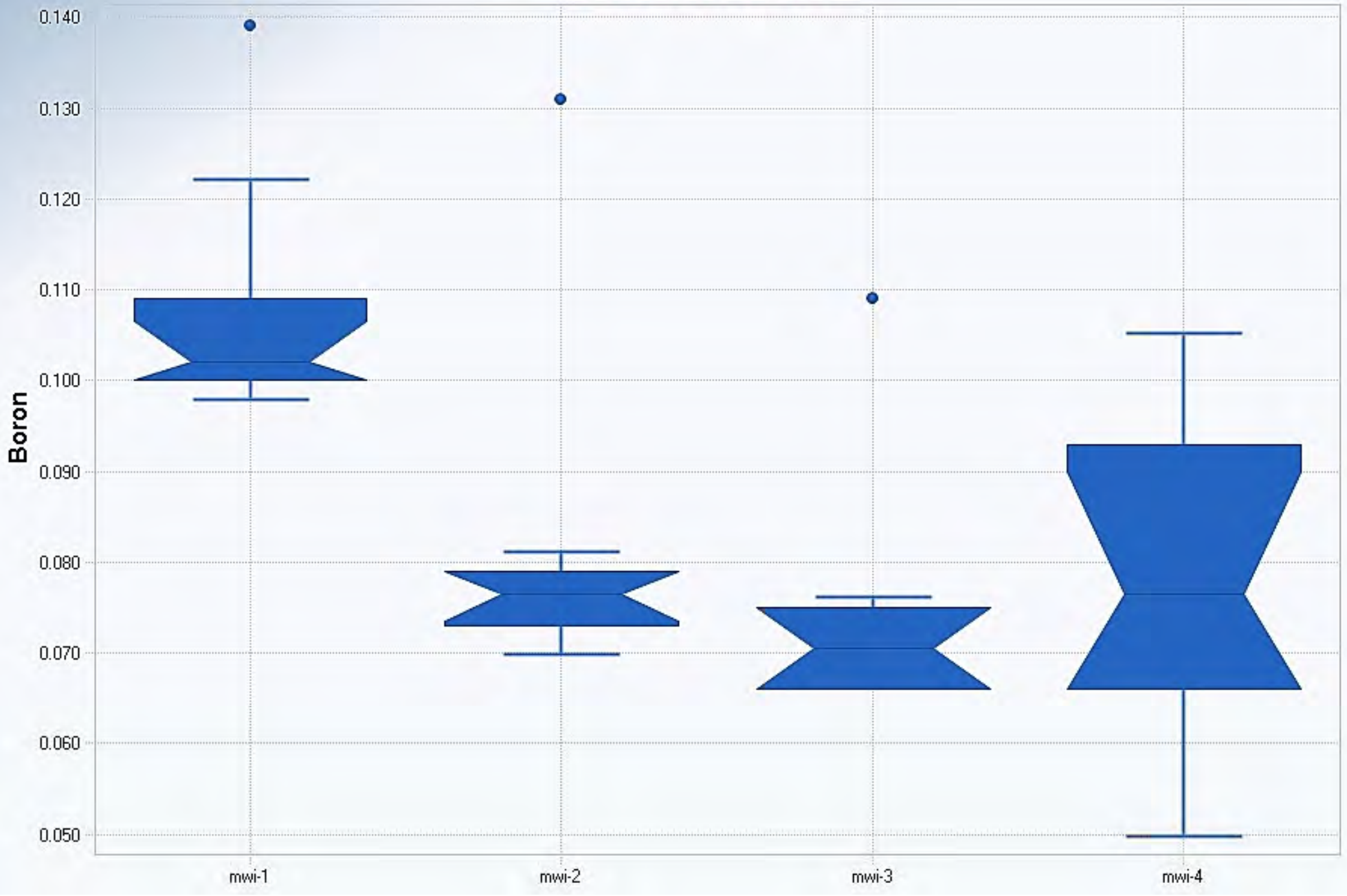
DATE	12/20/2018
SCALE	1" = 500'
DRAWN BY	PDM/LMM
PROJECT NO.	SOU2-18-001
SHEET NO.	2

APPENDIX A

SURFACE IMPOUNDMENTS
APPENDIX III DATA BOX PLOTS

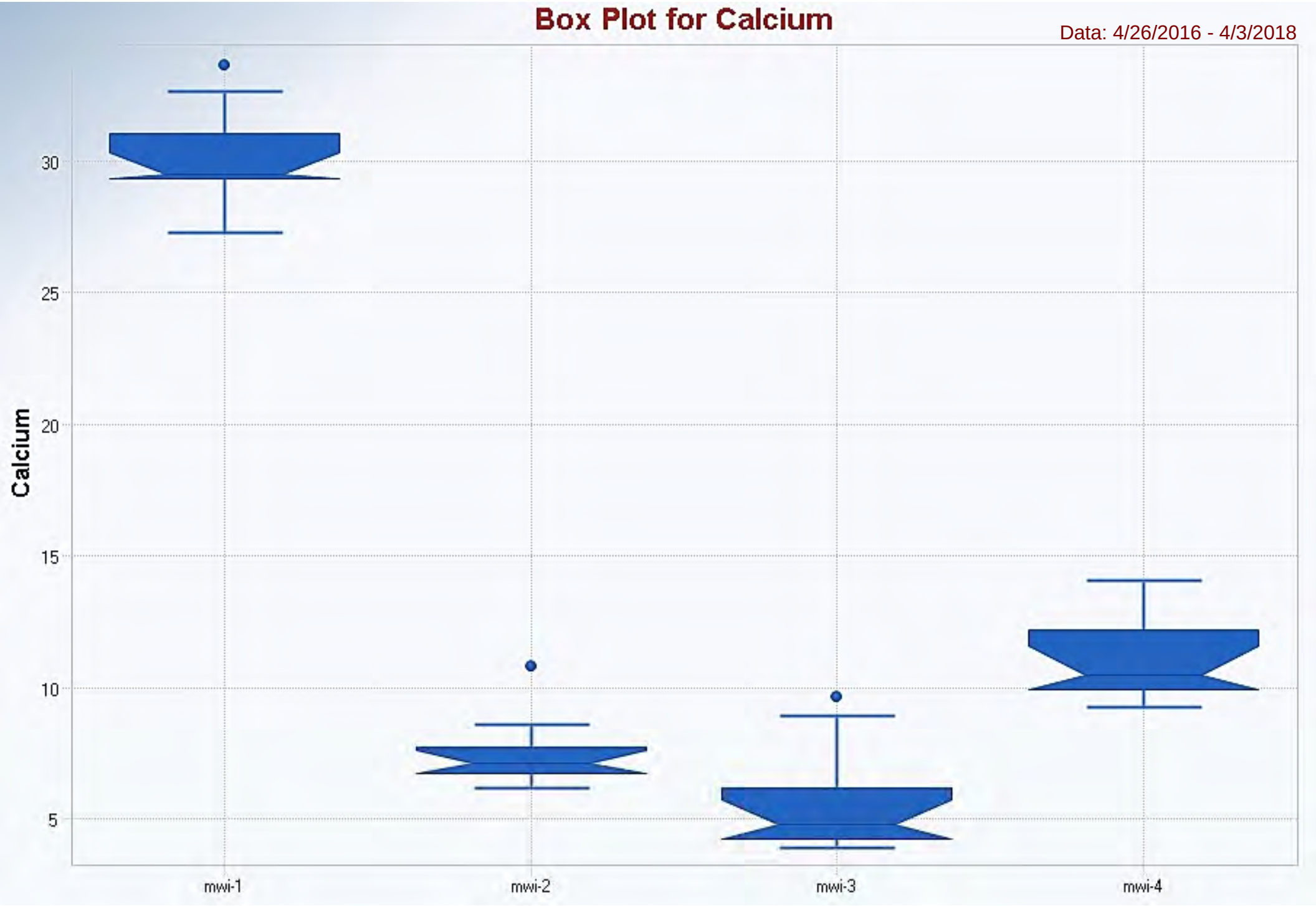
Box Plot for Boron

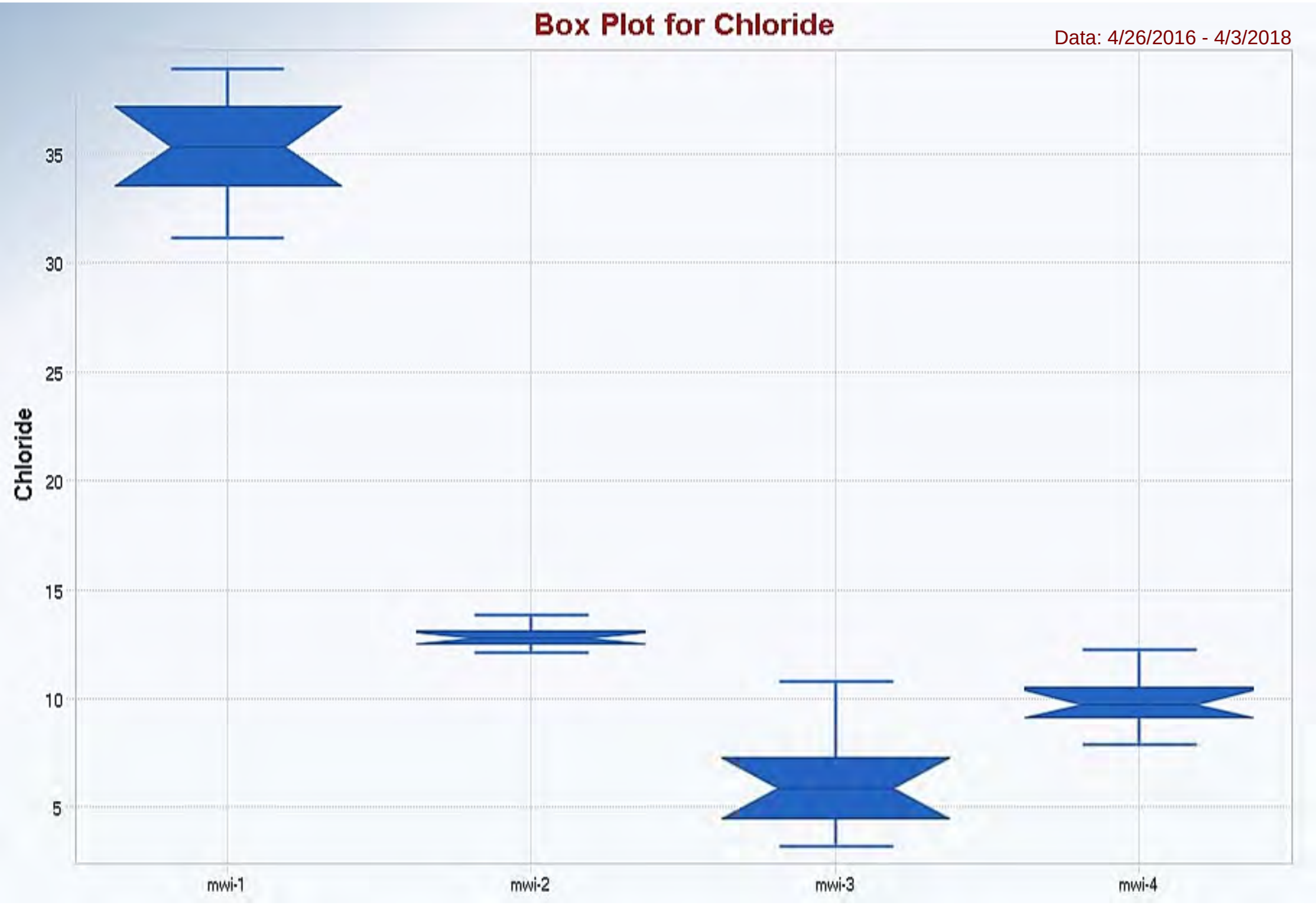
Data: 4/26/2016 - 4/3/2018

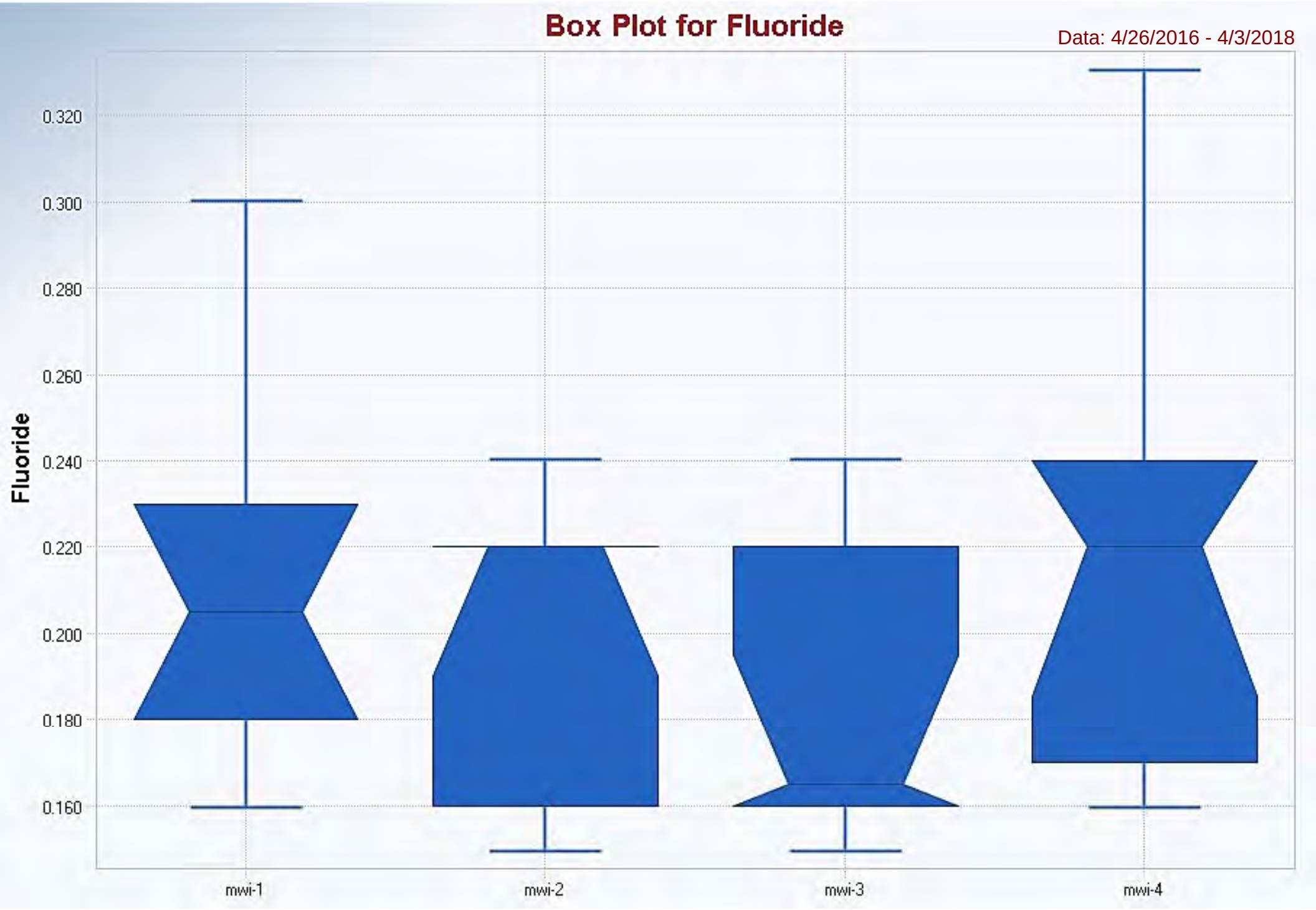


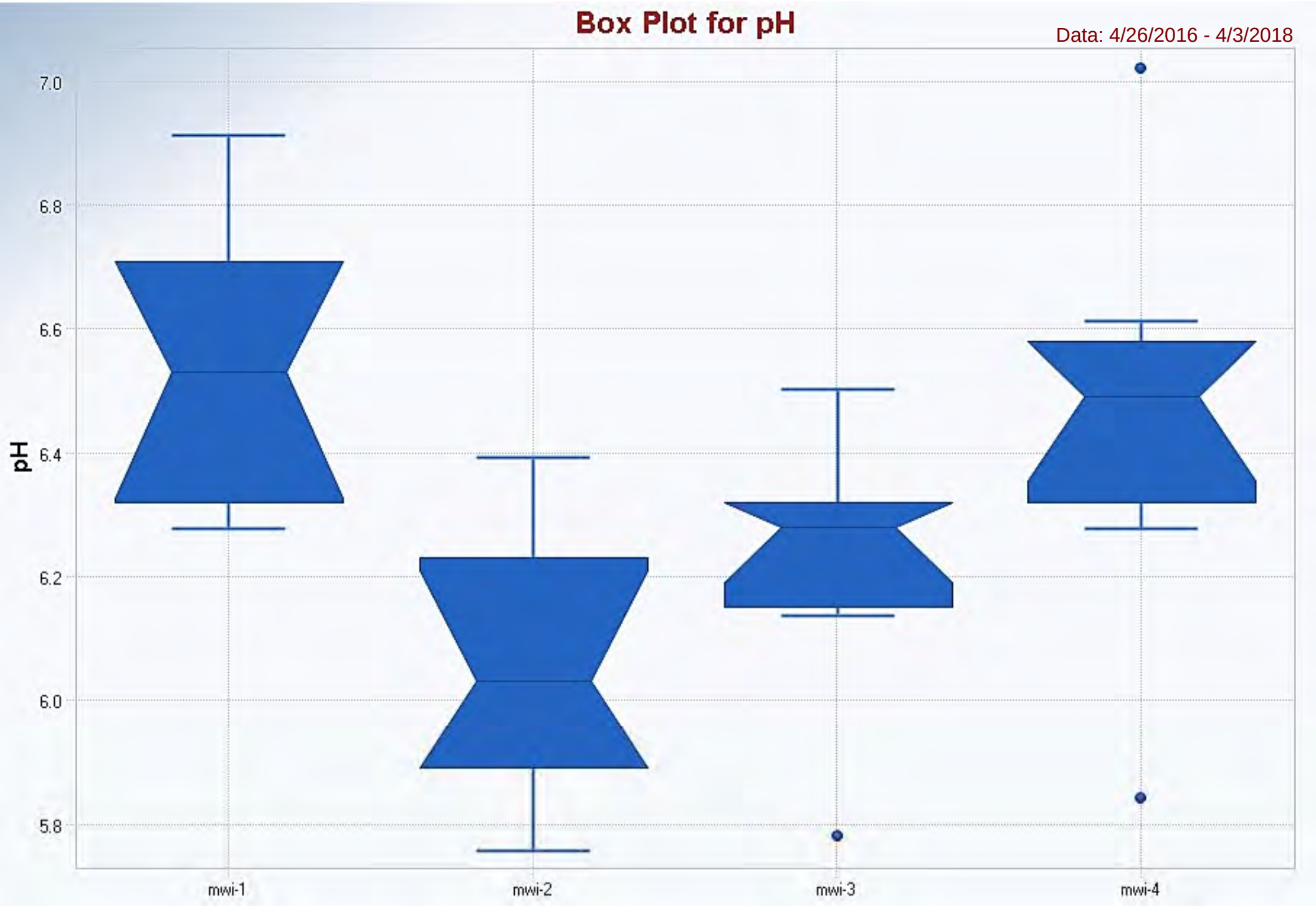
Box Plot for Calcium

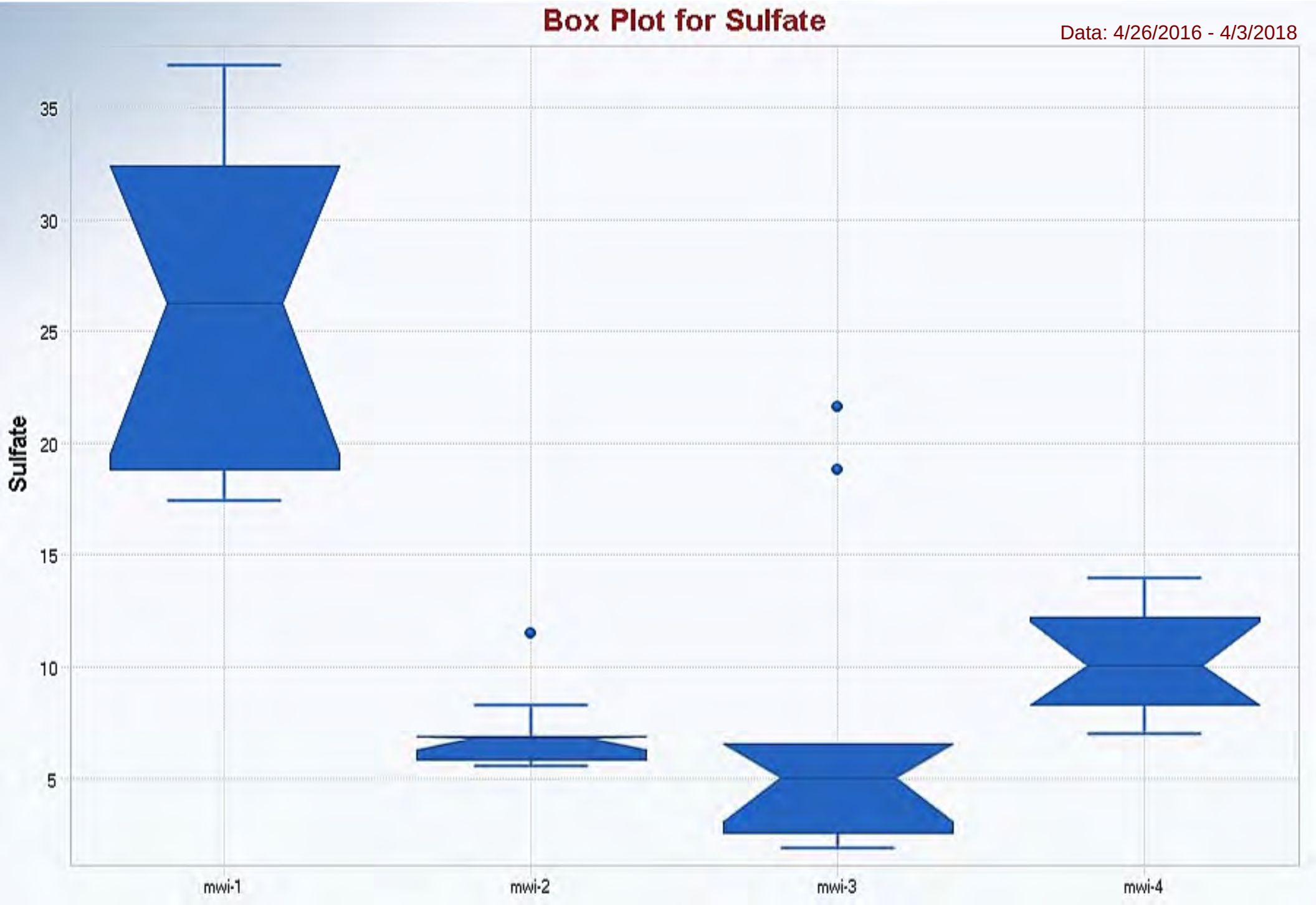
Data: 4/26/2016 - 4/3/2018

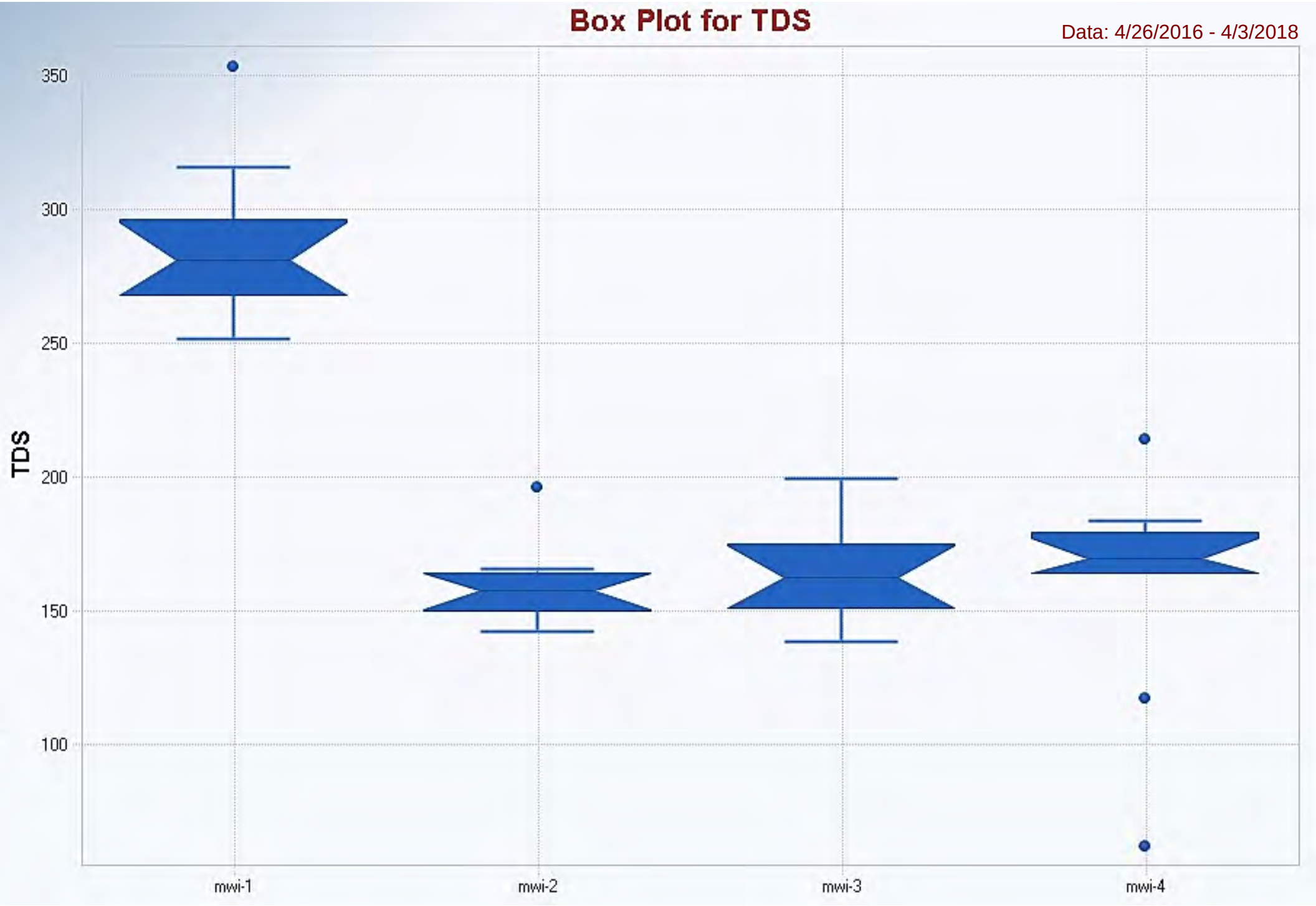



Box Plot for Chloride
Data: 4/26/2016 - 4/3/2018
Chloride
35
30
25
20
15
10
5
mwi-1
mwi-2
mwi-3
mwi-4


Box Plot for Fluoride
Data: 4/26/2016 - 4/3/2018
Fluoride
0.320
0.300
0.280
0.260
0.240
0.220
0.200
0.180
0.160
mwi-1
mwi-2
mwi-3
mwi-4


Box Plot for pH
Data: 4/26/2016 - 4/3/2018
pH
7.0
6.8
6.6
6.4
6.2
6.0
5.8
mwi-1
mwi-2
mwi-3
mwi-4


Box Plot for Sulfate
Data: 4/26/2016 - 4/3/2018
Sulfate
35
30
25
20
15
10
5
mwi-1
mwi-2
mwi-3
mwi-4


Box Plot for TDS
Data: 4/26/2016 - 4/3/2018
TDS
350
300
250
200
150
100
mwi-1
mwi-2
mwi-3
mwi-4