2023
ANNUAL GROUNDWATER QUALITY REPORT

OF

THE CEDAR RAPIDS WPCF ASH MONOFILL
57-SDP-07-85P
CEDAR RAPIDS, IOWA

by:
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December, 2023

HLW Engineering Group
Engineering *Management*

3422-21A.320

TABLE OF CONTENTS

December 18, 2023

Mr. Brian Rath, P.E.
Environmental Engineer Senior
IDNR – Land Quality Bureau
Wallace State Office Building
502 East 9th Street
Des Moines, Iowa 50319-0034

RE: CEDAR RAPIDS WATER POLLUTION CONTROL FACILITIES ASH MONOFILL
2023 ANNUAL WATER QUALITY REPORT
SDP PERMIT #57-SDP-07-85P

Dear Mr. Rath:

This letter forwards the results of water quality testing at the Cedar Rapids Water Pollution Control Facility (WPCF) Ash Monofill that was performed in accordance with Special Provision X.4 of the SDP Permit (Appendix A).

1. BACKGROUND INFORMATION

Site Facilities - Two lagoons with bentonite/clay liners were constructed in 1985 to receive ash slurry from the sludge incinerator at the Cedar Rapids WPCF. The industrial monofill (consisting of the two lagoons) operated under IDNR SDP Permit #57-SDP-07-85P. The ash slurry was deposited in the lagoons, allowed to dewater, and the dewatered ash was periodically removed from the lagoons for disposal.

Due to groundwater quality concerns, Special Provision 2a of the October 6, 2008 SDP Permit required that "A waste disposal unit shall be constructed in accordance with the liner requirements pursuant to Subparagraph 115.26(1)"d"(2) by September 23, 2011; and waste disposal shall cease in the North and South Cells." Ash disposal in the original lagoons ceased prior to September 23, 2011. Accumulated ash was removed from the south lagoon in 2011. Accumulated ash was removed from the north lagoon in 2013.

Two lined disposal areas have been constructed on site to replace the original lagoons. The design of the lined disposal areas exceeds the requirements of IAC 567-115 "Sanitary Landfills: Industrial Monofills" and IAC 567-113 "Sanitary Landfills for Municipal Solid Waste: Groundwater Protection Systems for the Disposal of Nonhazardous Wastes". The liner in each area consists of a Subtitle D compliant composite liner, a leachate collection layer, and an additional 60 mil HDPE flexible membrane liner over the top of the leachate collection layer/Subtitle D compliant composite liner. The objective of the additional 60 mil HDPE flexible membrane liner is to limit the liquid level that is directly in contact with the Subtitle D composite liner.

Construction of the lined South Disposal Area in the former south lagoon footprint was completed in 2011. The Quality Control and Assurance Report for the South Disposal Area was submitted on December 16, 2011 (Doc #67950). Ash deposition in the South Disposal Area was authorized in Special Provision X.2 of the SDP Permit dated February 9, 2012 and began in April, 2012.

Construction of the lined North Disposal Area in a portion of the former north lagoon footprint was completed in 2016. The Quality Control and Assurance Report for the North Disposal Area was submitted on October 13, 2016 (Doc #87418). Ash deposition in the North Disposal Area was authorized in Permit Amendment #2 dated November 15, 2016 and began in March, 2017.

Variance Applied to the Site - IAC 567-115.27(8) prohibits the disposal of free liquids or waste containing free liquid in a landfill. A variance from IAC 567-115.27(8) to allow the ash slurry to be deposited in the lined disposal area(s) was approved by IDNR on May 12, 2011 (Doc #65122). The variance is included in Appendix A.

IAC 567-115.26(4)"d" and "e" require sampling for dissolved metals and IAC 567-115.26(4)"f" requires annual sampling for total organic halogens and phenols. A variance from IAC 567-115.26(4) to allow sampling for total recoverable metals and from IAC 567-115.26(4)"f" to discontinue sampling for total organic halogens and phenols was approved by IDNR on September 12, 2018 (Doc #93200). The variance is included in Appendix A. Based on an email from IDNR on November 20, 2018 (Appendix A), total metals testing is currently required for arsenic, barium, iron, and magnesium.

The geology of the site has been documented in past Annual Water Quality Reports (AWQR) as well as the 2015 Permit Renewal Documentation (Doc #82547) and is not reiterated in this AWQR.

Impending HMSP Modifications - The Hydrologic Monitoring System Plan (HMSP) was approved in Special Provision X.4 of the SDP Permit (Appendix A). The approved HMSP includes the following nine (9) monitoring wells:

- upgradient, MW-26
- downgradient, MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, and MW-24.

Table 1 and 2 summarize the HMSP and the implementation schedule as approved in the Permit. The currently approved monitoring network is illustrated on Figures 1 and 2.

It has been recognized that the current HMSP is not appropriate to adequately monitor the site and incorporates a single background well (MW-26). Spatial variability exists throughout the site and cannot be quantified with the use of

a single background well. Further, it is recognized that MW-26 is located remote to the area of interest.

The 2022 Annual Water Quality Report (Doc #104680) asserted that an intrawell statistical approach is best suited to the site. In a December 15, 2022 letter (Doc #105288), IDNR required additional justification prior to use of an intrawell statistical approach and required reevaluation of the HMSP by adding various supplemental background wells and then again applying an interwell statistical approach.

On July 18, 2023, the requested reevaluation of the HMSP was submitted to IDNR (Doc #107315). This reevaluation recommended that the background wells for the site should include MW-1, MW-4, and MW-21. It was also proposed that MW-26 be plugged and abandoned. IDNR commented on August 23, 2023 (Doc #107546) and August 28, 2023 (Doc #107579) requesting additional information comparing the subsurface conditions at MW-26 to the proposed background wells and requesting information to validate the intrawell statistical approach.

On August 30, 2023 a response was filed (Doc #107587) that included the supplemental information required by IDNR. The August 30, 2023 response also requested that the intrawell statistical approach be preserved for future validation and use once sufficient background data was collected (greater than 13 datapoints) in late 2024.

On September 7, 2023, IDNR was notified of the intent to construct significant modifications to the WPCF in 2024. The proposed modifications will include closure of the South Disposal Area, construction of a new disposal area east of the North Disposal Area, abandonment of some of the monitoring wells that are included in the current HMSP, and installation of monitoring wells that will be included in a future HMSP. A request to postpone changes to the HMSP was filed by the Cedar Rapids WPCF (Doc #107650). The request asked that the HMSP be modified after construction of the WPCF upgrades is completed. The request was approved September 7, 2023 (Doc #107650).

Implied Significance of Water Quality Findings (2023) – Water quality is reported herein according to the current HMSP approved in the Permit. Given that the current HMSP approved in the Permit is recognized as inadequate by all parties and given that changes to the HMSP are warranted and are pending completion of the future plant modifications, it is requested that no binding conclusions be made with regard to water quality at this time.

Conclusions related to water quality should be suspended until such time as the plant modifications are completed, the HMSP is defined in the future, and the use of intrawell statistics and/or interwell statistic combined with intrawell statistics are employed in the future.

Additional Documentation Required in the December 15, 2022 IDNR Letter –

The purge and sample method is currently the primary sample collection method at this facility.

Monitoring well purging will be performed using a Waterra inertial lift pumping system consisting of a Hydrolift 2 pump head, 0.5 inch inside diameter or 0.375 inch inside diameter tubing fitted with a D-25 or D-13 footvalve, respectively. The pump rate using the 0.5 inch tubing approximates 2,500 mL per minute, while the 0.375 inch tubing yields approximately 1,000 mL per minute.

A static water level (and the time) will be obtained and recorded for each well prior to commencement of any sampling in the well. The water level (to the nearest 0.01 ft) will be obtained using a Solinst water level tape measured from the top of PVC casing.

Based on the length of the water column in the well, three well volumes will be calculated. The purging using the inertial pump will then commence and will continue until three (3) well volumes have been removed, or the well becomes dry.

In wells that continue to yield more than three (3) well volumes of water, the sample volume will be collected by directly discharging the sample water from the tubing into the laboratory supplied containers.

In wells that become dry during purging before three (3) well volumes of water have been removed, the monitoring wells will be allowed to recover before sample collection commences.

Upon completion of purging, the water level (and the time) will be measured and recorded for reference at the next sampling event and in order to meet IAC 567-115.21(2).

The 1:1 verification method is currently being utilized in accordance with the 2009 Unified Guidance for Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities by US EPA.

2. WATER QUALITY

The Spring and Fall 2023 semi-annual water sampling events were conducted in accordance with Special Provision X.4 of the SDP Permit (Appendix A).

Statistical Evaluations are prepared by Otter Creek Environmental Services annually. Results of the Ground Water Statistics for Ash Monofill Facility, Semi-Annual Monitoring Events in 2023 dated November, 2023 is included in Appendix B.

The laboratory Analytical Reports for the Spring and Fall sampling events as well as the supplemental sampling at MW-22 in May are included in Appendix C. Field Sampling forms for the sampling events are included in Appendix D.

A comprehensive summary of Analytical Data for the episodes between April 26, 2018 and October 23, 2023 is included in Table 8.

3. BACKGROUND DATA VALIDATION

Background data for the facility is based on sampling results from April 26, 2018 to October 23, 2023 exclusively from MW-26. As noted above, the background for the interwell statistical approach needs to be modified by adding/or substituting supplemental background wells. As noted above, the background for the intrawell statistical approach needs to be modified by adding additional data points (13 total at a minimum) to the background of each well.

4. STATISTICALLY SIGNIFICANT INCREASES (SSI)

The detected concentrations of each compound are compared to the prediction limit for each respective compound calculated based on the background data set from MW-26 (Table 5). A compound detected at a concentration that is in excess of the calculated prediction limit is recorded as a Statistically Significant Increase (SSI).

Table 6 is a summary of SSI recorded based on background established in MW-26. Every downgradient well has recorded SSI when the current HMSP is utilized and interwell statistics are employed.

Using the prediction limits developed based on potential background wells MW-1, MW-4, and MW-21 (through the Spring 2023 event), SSI are recorded only at MW-3R1, MW-22, and MW-24.

Using an intrawell statistical approach there are no SSI recorded at the site in 2023 (based on the May 24, 2023 resample at MW-22).

5. STATISTICALLY SIGNIFICANT LEVELS (SSL)

An evaluation of the Confidence Intervals is not completed herein, as such an evaluation is not considered appropriate at this time due to the significant changes in the HMSP that are anticipated to occur in 2024. It follows that the SSI for the site are subject to significant changes based on the background wells included in the future HMSP. It is unclear which potential SSI merit evaluation for SSL. Additionally, there has been no consideration given to what site-specific GWPS may, or may not, apply to the site based on future

prediction limit calculations if a different background set is ultimately approved.

Further, if an intrawell statistical approach is approved in the future then it appears that SSI may not exist, and an evaluation of potential SSL would not be required.

It is concluded that evaluation of potential SSL through a confidence interval evaluation should only be completed in the future when the HMSP is established and the statistical approach is established.

6. WELL MAINTENANCE AND REEVALUATION PLAN

Monitoring well hydraulic conductivity data was assessed in 1992, 2000, 2005, 2014, and 2019. A Monitoring Well Performance Reevaluation was completed in 2019 and was included in the 2019 AWQR (Doc #96348). The 2019 reevaluation (most recent) concluded that all monitoring wells were in satisfactory condition and that no changes in the Hydrogeologic Monitoring System Plan monitoring wells were recommended. Monitoring Well Maintenance and Performance Reevaluation information is summarized in Table 3, Table 4, and Table 4A. Note that as per IAC 567-115.21 a Monitoring Well Performance Reevaluation should be completed every 5 years.

The frequency of groundwater level measurements was reduced from quarterly to semi-annually as per Special Provision X.4.h of the SDP Permit (Attachment A). Water elevation measurements were collected at each well during semi-annual sampling events (April, 2023 and October, 2023). The water elevations from each monitoring well are included in Table 4. Review of the water elevation data for 2023 does not indicate excessive variability compared to historic water elevation data. Based on the available water elevation data, the assessment of well conditions during sampling, and the hydrologic conditions at the site, the semi-annual water level measurements are interpreted to be sufficient to gauge notable changes in the site hydrology. The October, 2023 Water Table Contour Map (Figure 2) is included herein and illustrates groundwater flow paths across the site. As requested in the IDNR December 15, 2022 comment letter, the influence of the groundwater underdrain for the South Disposal Area has been incorporated into the Water Table Contour Map.

7. LCS PERFORMANCE

The leachate control system (LCS) in each disposal area consists of a drainage layer of a geonet composite (slopes) or clean sand (base) and leachate collection pipes that underlie the top flexible membrane liner of the double liner system. The LCS drains back to the WPCF for treatment and disposal.

A groundwater diversion system was installed under the South Disposal Area. The groundwater diversion system consists of a layer of geonet under the Subtitle D composite liner and a groundwater collection pipe. The groundwater diversion system drains back to the WPCF for treatment and disposal. Due to historical data documenting over a 5' separation between the base of waste elevation in the North Disposal Area and the groundwater elevations recorded in the site monitoring wells, a groundwater diversion system was not required for the North Disposal Area.

Two leachate head monitoring points were installed in the South Disposal Area. One point was installed in the drainage media to monitor the liquid level on the Subtitle D compliant liner, the other was installed in the leachate pipe trench. Note that approval to stop measuring "leachate head levels at the monitoring point in the South Cell located in the leachate pipe trench" was included in the IDNR letter dated August 28, 2017 (Doc #90204). A groundwater head monitoring point was also installed in the South Disposal Area.

One leachate head monitoring point was installed in the drainage media in the North Disposal Area to monitor the liquid level on the Subtitle D compliant liner.

Leachate levels in the leachate head monitoring point in the South Disposal Area were less than 12" in 2023 during all monthly measurements. The measurements are included on Table 11.

As discussed in previous AWQR's, levels in the leachate head monitoring point in the North Disposal Area were consistently recorded as greater than 12". The Spring Semi-Annual Engineer's Report (Doc #106153) contained the following regarding the historic elevated leachate levels: "In late 2022 a valve in the leachate conveyance system for the North Disposal Area was found to be inadvertently closed. The valve was opened and a subsequent drop in recorded leachate levels in the North Disposal Area was noted." As a result, leachate levels in the leachate head monitoring point in the North Disposal Area were less than or equal to 12" during all monthly measurements in 2023. The measurements are included on Table 11.

Groundwater levels in the groundwater head monitoring point in the South Disposal Area were less than 12" during all monthly measurements in 2023. The measurements are included on Table 11.

The leachate collection pipes in the North and South Disposal Areas were cleaned in March, 2021. The lines should be cleaned again in 2024, at the latest, to maintain the 3 year cleaning interval required by IAC 567-115.26(11)a.8.

Based on available data, it appears that the existing Leachate Collection

System (North and South Disposal Areas) and Groundwater Diversion System (South Disposal Area only) is effective in maintaining groundwater quality standards at compliance monitoring points.

8. RECOMMENDATIONS

a. Continue to perform monthly leachate head and groundwater head measurements and continue to reevaluate levels in the Annual Water Quality Report in November of each year.

b. Continue to perform semi-annual sampling episodes from site monitoring wells in accordance with Special Provision X.4 of the SDP Permit.

c. Following completion of CRWPCF improvements, the HMSP should be revised and the statistical approach for evaluation of water quality data should be established and approved.

d. Continue to perform semi-annual water level measurements in site monitoring wells in accordance with Special Provision X.4.h of the SDP Permit.

e. Continue to perform semi-annual Engineer's inspections as per the General Conditions of the SDP Permit.

f. Continue to clean leachate collection lines on a three (3) year interval, at a minimum, in accordance with IAC 567-115.26(11)a.8. The next cleaning should be conducted in 2024 at the latest.

g. Perform Monitoring Well Maintenance Performance Reevaluation in 2024.

Please feel free to contact our office at (515) 733-4144 with any questions you may have.

DOUGLAS J. LUZBETAK LICENSED 12654 IOWA PROFESSIONAL ENGINEER

I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

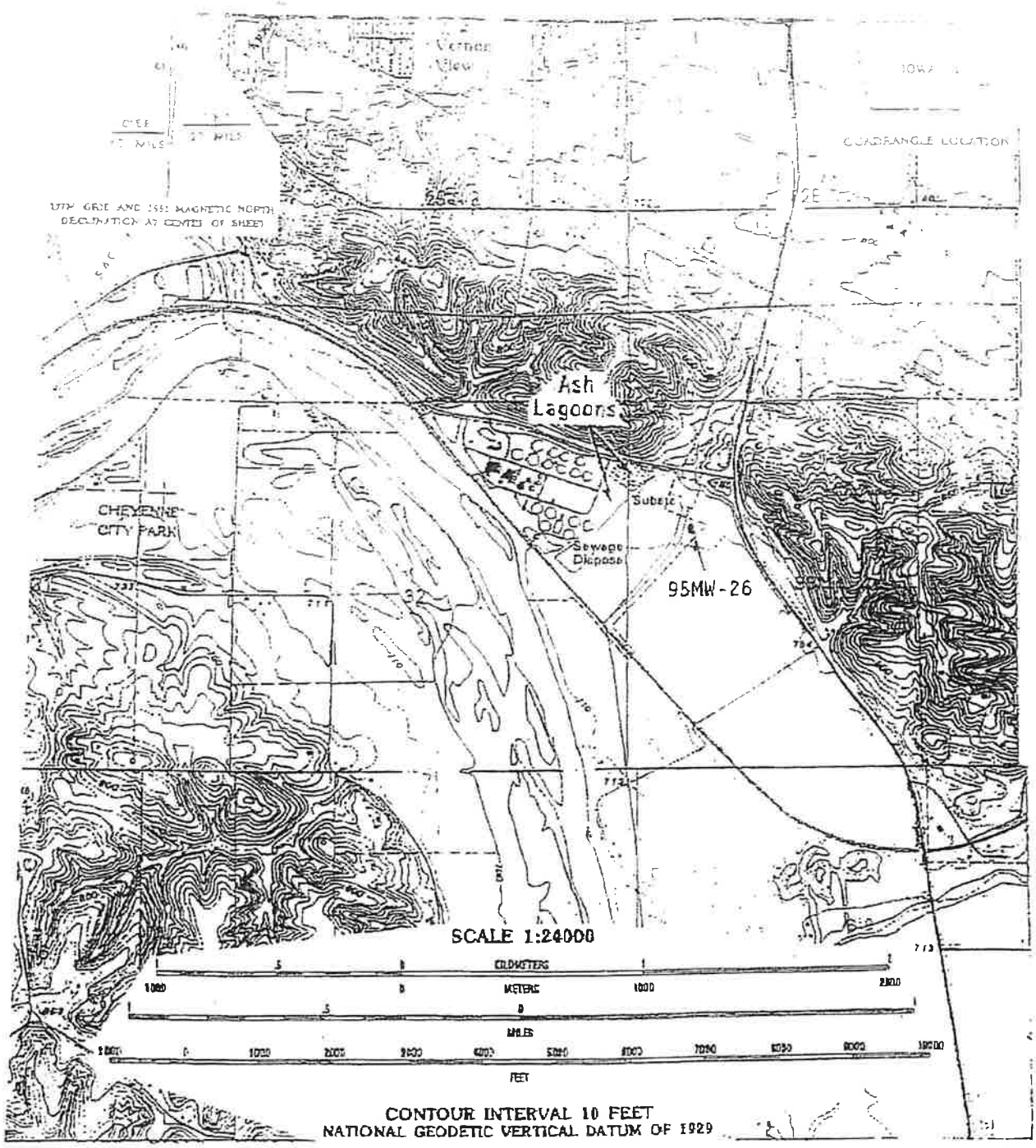
12/18/23

DOUGLAS J. LUZBETAK, P.E. DATE
License number 12654

My license renewal date is December 31, 2024.

Pages or sheets covered by this seal: All except Appendices

cc: *Jason Decker, Environmental and Compliance Program Manager, Cedar Rapids WPCF (electronic copy)*



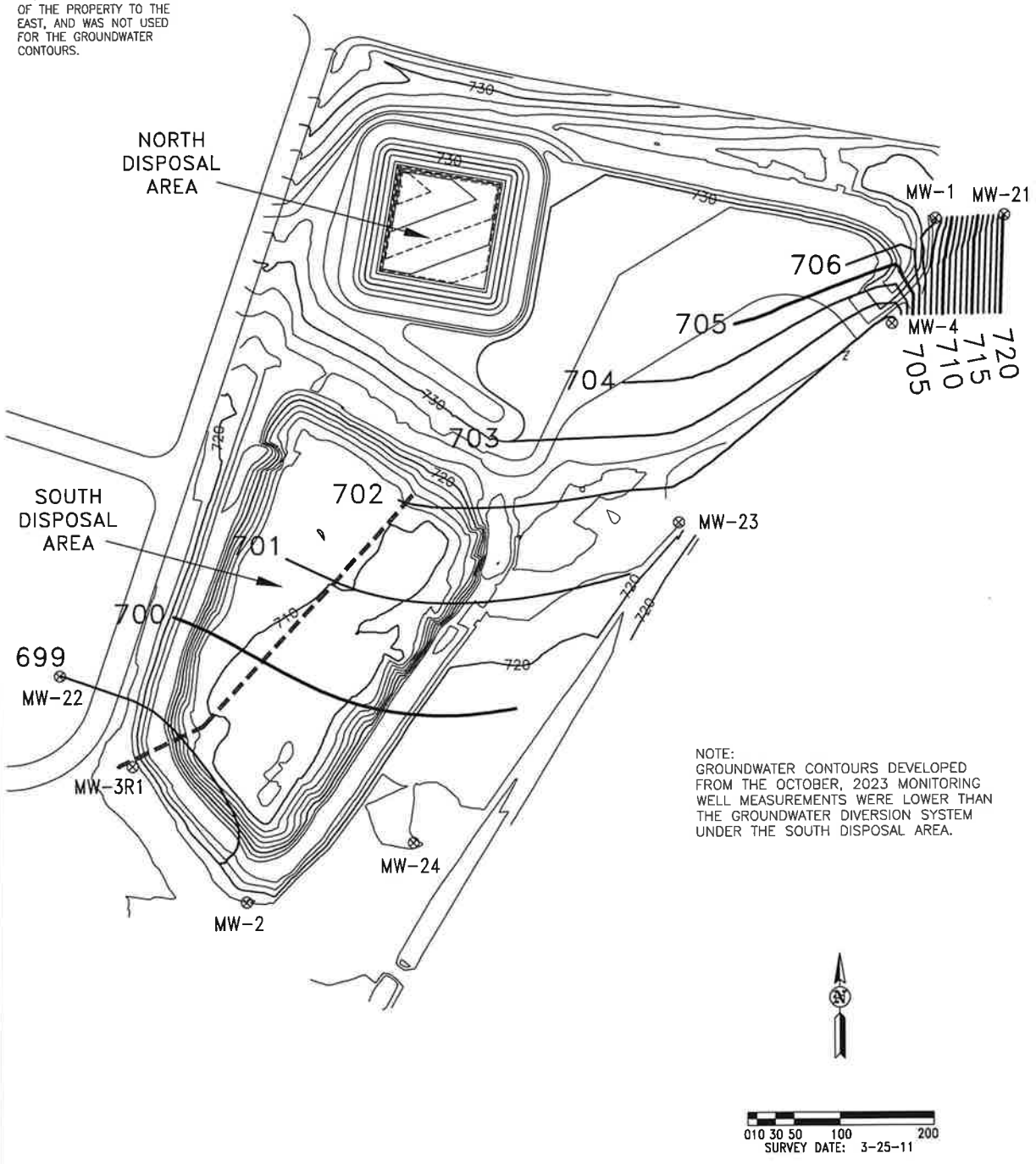
Map showing location of 95MW-26, the new background monitor well for Cedar Rapids Water Pollution Control Facility ash lagoons. Adapted from U.S. Geological Survey (1993) 7.5-minute Bertram Quadrangle.

Figure taken from 11/3/1995 letter from
Midwest Environmental Consulting to IDNR

FIGURE: 1

WATER ELEVATION OCT 18–23, 2023	
WELL	ELEV.
MW–1	706.79
MW–2	699.24
MW–3R1	698.32
MW–4	701.53
MW–21	720.11
MW–22	698.99
MW–23	701.36
MW–24	699.00
MW–26	700.62

TABLE NOTES:
MW–26 IS LOCATED OFF OF THE PROPERTY TO THE EAST, AND WAS NOT USED FOR THE GROUNDWATER CONTOURS.



NOTE:
GROUNDWATER CONTOURS DEVELOPED FROM THE OCTOBER, 2023 MONITORING WELL MEASUREMENTS WERE LOWER THAN THE GROUNDWATER DIVERSION SYSTEM UNDER THE SOUTH DISPOSAL AREA.

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GROUNDWATER CONTOURS

ASH LAGOONS
CEDAR RAPIDS WATER POLLUTION CONTROL
CEDAR RAPIDS, IOWA

FIGURE: 2

REVISION	NO.	DATE
DRAWN DRA	PROJECT NO. 3422	DATE 12–3–23

Table 1
Monitoring Program Summary
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

Water Table System

Monitoring Well	Formation	Current Monitoring Program	Change for next sampling event	Historic - Constituents that exceed a control limit	Current Year - Constituents that exceed a control limit	Historic - Constituents w/95% LCL over GWPS	2023 - Constituents w/95% LCL over GWPS	Total # of Samples in each monitoring program		
								Detection	Assessment	Corrective Action
MW-26	Glacial Till	Background	NC	See Table 6	See Table 6	NA	NA	12	0	0
MW-1	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	12	0	0
MW-2	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	12	0	0
MW-3R1	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	12	0	0
MW-4	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	12	0	0
MW-21	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	12	0	0
MW-22	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	13	0	0
MW-23	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	12	0	0
MW-24	Glacial Till	Detection	NC	See Table 6	See Table 6	NA	NA	12	0	0

Table 2
Monitoring Program Implementation Schedule
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

Monitoring Well	Recent Sampling Dates and Constituents	Current Year Sampling Dates and Constituents		Supplemental Sampling	
		April, 2024	October, 2024	Previously Collected	Next Event
MW-26 (b)	4/26/18, 10/15/18, 4/23/19, 10/22/19, 4/21/20, 10/12/20, 4/14/21, 10/19/21, 4/14/22, 10/13/22, 4/19/23, 10/20/23	List 1	List 1	N/A	N/A
MW-1	4/26/18, 10/15/18, 4/23/19, 10/22/19, 4/21/20, 10/13/20, 4/14/21, 10/19/21, 4/14/22, 10/13/22, 4/19/23, 10/20/23	List 1	List 1	N/A	N/A
MW-2	4/27/18, 10/16/18, 4/24/19, 10/23/19, 4/21/20, 10/13/20, 4/15/21, 10/20/21, 4/15/22, 10/14/22, 4/19/23, 10/20/23	List 1	List 1	N/A	N/A
MW-3R1	6/5/18, 10/16/18, 4/24/19, 10/23/19, 4/21/20, 10/13/20, 4/15/21, 10/20/21, 4/15/22, 10/14/22, 4/19/23, 10/20/23	List 1	List 1	N/A	N/A
MW-4	4/26/18, 10/15/18, 4/23/19, 10/22/19, 4/21/20, 10/12/20, 4/14/21, 10/19/21, 4/14/22, 10/13/22, 4/19/23, 10/18/23	List 1	List 1	N/A	N/A
MW-21	4/26/18, 10/15/18, 4/24/19, 10/22/19, 4/21/20, 10/13/20, 4/14/21, 10/20/21, 4/14/22, 10/13/22, 4/19/23, 10/24/23	List 1	List 1	N/A	N/A
MW-22	4/27/18, 10/16/18, 4/24/19, 10/23/19, 4/21/20, 10/13/20, 4/15/21, 10/20/21, 4/15/22, 10/14/22, 4/20/23, 5/24/23, 10/20/23	List 1	List 1	N/A	N/A
MW-23	4/26/18, 10/16/18, 4/24/19, 10/23/19, 4/21/20, 10/12/20, 4/14/21, 10/19/21, 4/15/22, 10/13/22, 4/19/23, 10/18/23	List 1	List 1	N/A	N/A
MW-24	4/26/18, 10/16/18, 4/24/19, 10/23/19, 4/21/20, 10/12/20, 4/14/21, 10/19/21, 4/14/22, 10/13/22, 4/19/23, 10/18/23	List 1	List 1	N/A	N/A

(b) background well

List 1 - IAC 567-115.26(4)"e" minus dissolved Fe plus total As Ba, Fe, Mg

Table 3
Monitoring Well Maintenance and Performance Revaluation Schedule
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

Compliance with:	Monitoring Calendar Years														
	1992	---	---	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
567 IAC 115.21(2)"a" - high and low water levels (biennial)	X			X	X	X	X	X	X	X	X	X	X	X	X
567 IAC 115.21(2)"b" - changes in the hydrologic setting and flow paths (biennial)	X			X	X	X	X	X	X	X	X	X	X	X	X
567 IAC 115.21(2)"c" - well depths (annual)	X			X	X	X	X	X	X	X	X	X	X	X	X
567 IAC 115.21(2)"d" - in-situ permeability testing (1 per 5 years)	X			X					X						

Compliance with:	Monitoring Calendar Years														
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
567 IAC 115.21(2)"a" - high and low water levels (biennial)	X	X	X	X	X	X	X	X	X	X	X	X	P	P	P
567 IAC 115.21(2)"b" - changes in the hydrologic setting and flow paths (biennial)	X	X	X	X	X	X	X	X	X	X	X	X	P	P	P
567 IAC 115.21(2)"c" - well depths (annual)	X	X	X	X	X	X	X	X	X	X	X	X	P	P	P
567 IAC 115.21(2)"d" - in-situ permeability testing (1 per 5 years)			X					X					P		

X = completed
P = Planned
N/A = Not Applicable

Table 4
Monitoring Well Maintenance and Performance Summary
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

Well	Top of casing	Top of Screen	Total Depth		Date of Measurements		Maximum Depth Discrepancy (ft)	Hydraulic Cond. (cm/sec)/date	Most Recent Recharge Rate	
					4/19/23-4/20/23	10/18/23-10/24/23			10/22/2019	Change
MW-26(b)	725.81	710.4	25.41	Groundwater Level (ft)	20.39	23.19	-0.39	>1.0E-03* 2000	>1.0E-03*	Not Appreciable
				Groundwater Elevation (Ft MSL)	705.42	702.62				
				Measured Well Depth (ft)	25.72	25.8				
				Submerged (+) or Exposed screen (-)	-4.98	-7.78				
MW-1	730.72	698.9	36.82	Groundwater Level (ft)	20.2	23.93	1.92	1.80E-04 1992	4.50E-05	Not Appreciable
				Groundwater Elevation (Ft MSL)	710.52	706.79				
				Measured Well Depth (ft)	34.91	34.9				
				Submerged (+) or Exposed screen (-)	11.62	7.89				
MW-2	720.04	704.4	25.64	Groundwater Level (ft)	19.49	20.8	0.05	2.80E-01 1992	>1.0E-03*	Not Appreciable
				Groundwater Elevation (Ft MSL)	700.55	699.24				
				Measured Well Depth (ft)	25.61	25.59				
				Submerged (+) or Exposed screen (-)	-3.85	-5.16				
MW-3R1	719.42	702.7	26.75	Groundwater Level (ft)	20.23	21.1	-0.46	>1.0E-03* 2019	>1.0E-03*	Not Appreciable
				Groundwater Elevation (Ft MSL)	699.19	698.32				
				Measured Well Depth (ft)	27.15	27.21				
				Submerged (+) or Exposed screen (-)	-3.51	-4.38				
MW-4	726.78	703.9	27.88	Groundwater Level (ft)	22.58	25.25	0.12	3.00E-01 1992	>1.0E-03*	Not Appreciable
				Groundwater Elevation (Ft MSL)	704.2	701.53				
				Measured Well Depth (ft)	27.82	27.76				
				Submerged (+) or Exposed screen (-)	0.3	-2.37				
MW-21	729.93	717.9	27.03	Groundwater Level (ft)	6.38	9.82	-0.39	1.10E-05 1992	1.50E-05	Not Appreciable
				Groundwater Elevation (Ft MSL)	723.55	720.11				
				Measured Well Depth (ft)	27.42	27.41				
				Submerged (+) or Exposed screen (-)	5.65	2.21				
MW-22	718.4	706.8	26.6	Groundwater Level (ft)	18.43	19.41	0.11	1.50E-01 1992	>1.0E-03*	Not Appreciable
				Groundwater Elevation (Ft MSL)	699.97	698.99				
				Measured Well Depth (ft)	26.67	26.49				
				Submerged (+) or Exposed screen (-)	-6.83	-7.81				
MW-23	725.41	701.9	33.51	Groundwater Level (ft)	21.6	24.05	-0.15	8.10E-02 1992	>1.0E-03*	Not Appreciable
				Groundwater Elevation (Ft MSL)	703.81	701.36				
				Measured Well Depth (ft)	33.66	33.64				
				Submerged (+) or Exposed screen (-)	1.91	-0.54				
MW-24	720.27	705.7	29.57	Groundwater Level (ft)	19.45	21.27	-0.11	1.60E-01 1992	>1.0E-03*	Not Appreciable
				Groundwater Elevation (Ft MSL)	700.82	699				
				Measured Well Depth (ft)	29.68	29.63				
				Submerged (+) or Exposed screen (-)	-4.88	-6.7				

* Well recovery rates were too rapid to measure so assumed a hydraulic conductivity of greater than 1.0E-03 cm/sec.

Table 4A
Supplemental Water Elevation Data
Annual Water Quality Report
Cedar Rapids WPCF Ash Lagoons
Permit No. 57-SDP-07-85P

	MW-1	MW-2	MW-3R1	MW-4	MW-21	MW-22	MW-23	MW-24	MW-26
TOC Elev. (ft)	730.72	720.04	719.42	726.78	729.93	718.4	725.41	720.27	725.81
Screened Int.	693.9-698.9	694.4-704.4	692.7-702.7	698.9-703.9	702.9-717.9	691.8-706.8	691.9-701.9	690.7-705.7	700.4-710.4
	Elev (ft)	Elev (ft)	Elev (ft)	Elev (ft)	Elev (ft)	Elev (ft)	Elev (ft)	Elev (ft)	Elev (ft)
11/6/95	710.55	700.77		704.83	724.68	701.45	704.40	702.40	704.83
3/12/96	709.47	700.35	---	702.33	724.15	700.40	702.26	701.25	703.08
6/20/96	712.02	701.77	---	704.80	724.22	702.03	704.52	702.93	705.66
10/9/96	709.48	700.10	---	702.53	723.84	700.08	702.27	---	703.71
4/9/97	710.27	702.15	---	705.13	724.49	702.20	703.43	702.55	703.08
10/9/97	708.08	698.98	---	702.67	723.68	699.23	702.53	700.67	703.46
4/15/98	710.76	700.96	---	705.18	725.11	701.04	705.16	702.82	705.27
10/16/98	711.62	702.94	---	704.45	725.60	702.86	704.52	703.58	705.71
4/7/99	711.95	701.69	---	708.33	725.71	702.86	708.38	703.88	704.63
10/1/99	710.92	701.81	---	707.83	724.71	703.01	707.64	703.86	703.40
4/26/00	709.86	701.39	---	706.79	724.94	701.96	706.45	703.01	703.51
10/13/00	711.07	703.08	---	708.80	724.79	703.80	708.49	704.75	705.26
4/20/01	715.83	706.93	---	712.51	725.05	707.15	712.23	709.06	709.85
10/4/01	711.84	703.94	---	708.94	723.68	704.20	708.57	705.40	707.10
4/18/02	711.21	702.90	---	706.87	724.22	703.11	707.53	705.04	706.69
10/9/02	712.16	704.58	---	708.25	724.42	704.41	707.93	705.59	707.51
4/4/03	709.20	701.33	---	705.66	724.43	701.40	705.37	702.97	705.13
10/10/03	709.35	702.86	---	708.24	725.62	703.10	707.75	704.32	705.71
4/15/04	712.94	---	---	711.41	723.74	---	711.83	---	707.29
10/18/04	710.47	699.69	---	705.86	723.18	700.26	705.59	702.76	705.97
4/18/05	711.10	702.46	---	707.87	724.39	702.15	708.06	705.94	707.48
10/20/05	708.02	699.79	---	703.67	722.09	699.87	703.56	701.82	704.33
4/13/06	709.42	701.34	---	704.51	724.11	701.05	704.96	703.27	704.09
10/5/06	707.67	700.20	---	703.37	722.19	700.23	703.34	701.89	703.76
4/19/07	710.31	705.23	---	705.62	724.45	704.85	706.73	705.94	704.22
10/4/07	709.25	701.71	---	704.07	723.64	701.42	704.12	703.11	704.57
4/23/08	716.87	706.35	---	714.64	725.66	705.90	713.75	709.35	712.61
10/9/08	711.70	698.57	---	704.14	723.23	698.18	703.49	701.00	705.87
4/29/09	715.60	708.12	---	714.28	725.61	707.75	713.76	709.53	711.40
10/9/09	715.02	705.23	---	711.12	725.53	705.54	711.18	707.06	709.26
4/9/10	716.73	706.54	---	711.52	725.56	706.32	710.94	707.85	709.25
10/12/10	714.02	701.38	---	708.20	724.27	701.34	707.50	703.73	707.35
4/20/11	714.25	705.17	---	708.86	725.87	704.90	708.46	705.57	708.23
10/13/11	711.51	699.23	---	704.68	723.47	699.25	704.12	701.44	705.42
4/25/12	710.84	699.13	697.93	703.02	723.69	698.63	702.76	701.07	704.42
10/3/12	707.97	697.57	696.48	701.56	719.05	697.02	701.23	699.33	702.89
1/10/13	707.64	696.99	695.74	700.74	723.52	696.16	700.48	698.53	702.05
4/11/13	708.88	697.97	697.27	702.12	725.80	696.82	703.45	701.93	702.39
7/18/13	711.53	699.09	697.87	704.47	722.67	698.53	704.03	701.51	705.66
10/10/13	707.52	697.95	696.83	702.42	722.52	697.22	702.13	699.91	703.93
1/10/14	---	697.52	696.70	701.76	713.41	697.02	701.49	699.25	703.01
4/9/14	708.30	697.99	696.95	701.79	723.91	697.10	701.86	699.93	702.72
7/17/14	712.67	699.81	698.74	704.57	724.16	699.32	704.23	701.99	706.26
10/16/14	710.35	698.45	697.82	702.99	725.68	698.25	702.51	700.31	704.78
1/16/15	709.04	697.90	697.32	701.95	723.93	697.60	701.53	699.49	703.66
4/15/15	708.72	697.69	697.06	701.69	723.98	697.35	701.33	699.30	703.30
7/15/15	710.82	698.33	697.69	702.72	722.93	698.09	702.25	700.09	704.59
10/12/15	709.52	698.15	697.46	702.13	723.14	697.77	701.77	699.75	703.81
1/14/16	---	698.56	697.98	702.99	724.41	698.40	702.53	700.38	705.04
4/7/16	711.57	698.57	697.99	702.96	725.54	698.36	702.51	700.31	704.98
7/6/16	711.72	699.01	698.44	703.32	725.08	698.78	702.82	700.70	705.27
10/11/16	713.28	700.11	699.26	704.42	723.73	699.61	703.89	701.88	706.52
1/17/17	711.70	699.24	698.69	703.73	723.64	699.03	703.24	700.98	705.48
4/20/17	712.94	699.75	699.06	704.03	725.44	699.26	703.55	701.46	706.93
7/20/17	712.08	699.41	698.92	703.93	723.53	699.25	703.42	701.16	705.71
10/18/17	710.18	698.67	---	702.47	722.93	698.46	702.09	699.18	704.06
1/18/18	709.60	698.23	---	701.62	723.59	---	701.31	698.57	703.03
4/26/18	710.21	698.44	---	702.06	723.69	698.17	701.72	698.88	703.51
7/11/18	710.22	699.02	697.81	702.53	722.61	698.90	702.16	699.40	703.83
10/16/18	711.27	700.15	698.55	703.68	725.09	699.60	703.34	700.64	705.42
1/25/19	---	699.75	698.52	703.90	723.94	698.57	703.47	700.44	705.56
4/23/19	713.12	700.63	699.03	705.43	724.93	700.22	704.83	701.45	707.26
7/15/19	713.67	701.14	699.58	705.82	722.56	700.86	705.26	701.87	707.12
10/22/19	712.71	700.49	698.96	704.74	724.63	700.09	704.19	701.06	706.42
1/8/20	711.76	700.07	698.64	704.11	724.14	699.69	703.58	700.54	705.79
4/21/20	712.37	700.73	699.13	704.35	723.96	700.10	703.85	700.94	706.01
7/23/20	712.17	699.81	699.37	704.07	722.73	699.47	703.56	700.39	705.66
10/12/20	710.31	699.99	698.09	703.10	722.81	699.11	702.71	699.82	704.56
4/14/21	711.61	700.12	698.49	704.07	724.74	700.08	703.56	700.53	706.09
10/19/21	708.87	698.70	697.60	701.87	722.09	698.49	701.57	698.84	703.18
4/14/22	709.63	699.59	698.11	702.92	724.15	698.97	702.61	699.75	703.97
10/13/22	708.32	699.39	698.29	702.16	721.82	699.06	701.91	699.33	703.25
4/19/23	710.52	700.55	699.19	704.20	723.55	699.97	703.81	700.82	705.42
10/18/23	706.79	699.24	698.32	701.53	720.11	698.99	701.36	699.00	702.62
Average	711.07	700.61	698.07	704.95	723.90	700.47	704.66	702.07	705.32
Max.	716.87	708.12	699.58	714.64	725.87	707.75	713.76	709.53	712.61
Min.	707.52	696.99	695.74	700.74	713.41	696.16	700.48	698.53	702.05
	MW-1	MW-2	MW-3R1	MW-4	MW-21	MW-22	MW-23	MW-24	MW-26

MW-3R (4/25/12 to 7/20/17) was abandoned during March, 2018 and replaced with MW-3R1 (7/11/18 to present)

Table 5
Background and GWPS Summary
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

Interwell Background Well - (MW-26)

Inorganics - Appendix I										
Constituent	**Units**	**Model Type**	**Samples - N**	**Detections**	**Mean**	**SD**	**Prediction Limit**	**Confidence**	**GWPS**	**Source**
Ammonia	mg/L	nonparametric	12	0			0.1340	0.92	30	SS
Arsenic (As)	µg/L	normal	12	6	0.4325	0.689	2.3779		10	SS
Barium (Ba)	µg/L	normal	12	12	143.75	37.5309	249.7144		2000	SS
COD	mg/L	nonparametric	12	2			8.0000	0.92	NA	NA
Chloride	mg/L	normal	12	12	48.8432	19.153	102.9196		NA	NA
Cobalt (Co)	µg/L	nonparametric	7	1			0.7500	0.84	2.1	SS
Iron (Fe)	µg/L	normal	11	9	394.1818	246.213	1104.8345		NA	NA
Magnesium (Mg)	mg/L	normal	12	12	13.0933	4.1165	24.7158		NA	NA
pH	SU	normal	12	12	6.3167	0.2106	5.64-7.00		NA	NA
Specific conductance	µS	normal	12	12	467.0833	168.6532	943.2571		NA	NA

Table 6
Summary of Well/Detected Constituent Pairs that Exceed the Prediction Limit
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

Well	Compound	Date	Result	Prediction	Monitoring Program
MW-1	Ammonia (mg/L)	04/19/23	0.61	0.1340	Assessment Monitoring
MW-1	Ammonia (mg/L)	10/20/23	0.63	0.1340	Assessment Monitoring
MW-1	Arsenic (ug/L)	04/19/23	3.32	2.5115	Assessment Monitoring
MW-1	Iron (ug/L)	04/19/23	1270	1107.8926	Assessment Monitoring
MW-1	Magnesium (mg/L)	04/19/23	28.3	25.5959	Assessment Monitoring
MW-1	Magnesium (mg/L)	10/20/23	31.9	24.7158	Assessment Monitoring
MW-1	pH (SU)	04/19/23	7.33	5.58-7.03	Assessment Monitoring
MW-1	pH (SU)	10/20/23	7.2	5.64-7.00	Assessment Monitoring
MW-2	Arsenic (ug/L)	10/20/23	2.38	2.3779	Assessment Monitoring
MW-2	Cobalt (ug/L)	04/19/23	1.25	0.7500	Assessment Monitoring
MW-2	Magnesium (mg/L)	04/19/23	27.90	25.5959	Assessment Monitoring
MW-2	Magnesium (mg/L)	10/20/23	31.40	24.7158	Assessment Monitoring
MW-3R1	Ammonia (mg/L)	04/19/23	0.40	0.1340	Assessment Monitoring
MW-3R1	Ammonia (mg/L)	10/20/23	0.30	0.1340	Assessment Monitoring
MW-3R1	Arsenic (ug/L)	04/19/23	61.2	2.5115	Assessment Monitoring
MW-3R1	Arsenic (ug/L)	10/20/23	30.0	2.3779	Assessment Monitoring
MW-3R1	Barium (ug/L)	04/19/23	294	257.5150	Assessment Monitoring
MW-3R1	Cobalt (ug/L)	04/19/23	13.0	0.7500	Assessment Monitoring
MW-3R1	Cobalt (ug/L)	10/20/23	11.4	0.7500	Assessment Monitoring
MW-3R1	Iron (ug/L)	04/19/23	14900	1107.8926	Assessment Monitoring
MW-3R1	Iron (ug/L)	10/20/23	8350	1104.8345	Assessment Monitoring
MW-3R1	Magnesium (mg/L)	04/19/23	33.2	25.5959	Assessment Monitoring
MW-3R1	Magnesium (mg/L)	10/20/23	27.10	24.7158	Assessment Monitoring
MW-4	Ammonia (mg/L)	04/19/23	0.62	0.1340	Assessment Monitoring
MW-4	Ammonia (mg/L)	10/18/23	1.6	0.1340	Assessment Monitoring
MW-4	Arsenic (ug/L)	04/19/23	11.70	2.5115	Assessment Monitoring
MW-4	Arsenic (ug/L)	10/18/23	17.40	2.3779	Assessment Monitoring
MW-4	Barium (ug/L)	10/18/23	458	249.7144	Assessment Monitoring
MW-4	Cobalt (ug/L)	04/19/23	8.29	0.7500	Assessment Monitoring
MW-4	Cobalt (ug/L)	10/18/23	7.85	0.7500	Assessment Monitoring
MW-4	Iron (ug/L)	04/19/23	3230	1107.8926	Assessment Monitoring
MW-4	Iron (ug/L)	10/18/23	3930	1104.8345	Assessment Monitoring
MW-4	Magnesium (mg/L)	10/18/23	36.9	24.7158	Assessment Monitoring
MW-21	Barium (ug/L)	04/19/23	269	257.5150	Assessment Monitoring
MW-21	Barium (ug/L)	10/24/23	301	249.7144	Assessment Monitoring
MW-21	Chloride (mg/L)	04/19/23	167	106.8866	Assessment Monitoring
MW-21	Chloride (mg/L)	10/24/23	174	102.9196	Assessment Monitoring
MW-21	Magnesium (mg/L)	04/19/23	47.0	25.5959	Assessment Monitoring
MW-21	Magnesium (mg/L)	10/24/23	53	24.7158	Assessment Monitoring
MW-21	Specific Conductance (uS)	04/19/23	1443	978.1522	Assessment Monitoring
MW-21	Specific Conductance (uS)	10/24/23	1350	943.2571	Assessment Monitoring
MW-22	Ammonia (mg/L)	04/20/23	2.6	0.1340	Assessment Monitoring
MW-22	Ammonia (mg/L)	10/20/23	2.0	0.1340	Assessment Monitoring
MW-22	Arsenic (ug/L)	04/20/23	17.8	2.5115	Assessment Monitoring
MW-22	Arsenic (ug/L)	10/20/23	22.3	2.3779	Assessment Monitoring
MW-22	Barium (ug/L)	04/20/23	900	257.5150	Assessment Monitoring
MW-22	Barium (ug/L)	10/20/23	259	249.7144	Assessment Monitoring
MW-22	COD (mg/L)	04/20/23	100	8.0000	Assessment Monitoring
MW-22	Cobalt (ug/L)	04/20/23	31.4	0.7500	Assessment Monitoring
MW-22	Cobalt (ug/L)	10/20/23	10.1	0.7500	Assessment Monitoring
MW-22	Iron (ug/L)	04/20/23	18300	1107.8926	Assessment Monitoring
MW-22	Iron (ug/L)	10/20/23	6540	1104.8345	Assessment Monitoring
MW-22	Magnesium (mg/L)	04/20/23	46.0	25.5959	Assessment Monitoring
MW-22	Magnesium (mg/L)	10/20/23	33.2	24.7158	Assessment Monitoring
MW-22	Specific Conductance (uS)	04/20/23	988	978.1522	Assessment Monitoring
MW-23	Ammonia (mg/L)	04/19/23	1.2	0.1340	Assessment Monitoring
MW-23	Ammonia (mg/L)	10/18/23	1.2	0.1	Assessment Monitoring
MW-23	Arsenic (ug/L)	04/19/23	18.1	2.5115	Assessment Monitoring
MW-23	Arsenic (ug/L)	10/18/23	10.9	2.3779	Assessment Monitoring
MW-23	Cobalt (ug/L)	04/19/23	2.0	0.7500	Assessment Monitoring
MW-23	Cobalt (ug/L)	10/18/23	1.34	0.750	Assessment Monitoring
MW-23	Iron (ug/L)	04/19/23	2460	1107.8926	Assessment Monitoring
MW-23	Iron (ug/L)	10/18/23	1330	1104.8345	Assessment Monitoring
MW-23	Magnesium (mg/L)	04/19/23	39.4	25.5959	Assessment Monitoring
MW-23	Magnesium (mg/L)	10/18/23	44.3	24.7158	Assessment Monitoring
MW-23	Specific Conductance (uS)	04/19/23	1151	978.1522	Assessment Monitoring
MW-23	Specific Conductance (uS)	10/18/23	1118	943.2571	Assessment Monitoring
MW-24	Ammonia (mg/L)	04/19/23	0.76	0.1340	Assessment Monitoring
MW-24	Ammonia (mg/L)	10/18/23	0.77	0.1340	Assessment Monitoring
MW-24	Cobalt (ug/L)	04/19/23	2.09	0.7500	Assessment Monitoring
MW-24	Magnesium (mg/L)	04/19/23	31.2	24.7158	Assessment Monitoring
MW-24	Magnesium (mg/L)	10/18/23	100.00	51.6704	Assessment Monitoring

Table 7
Summary of Ongoing and Newly Identified
Control Limit Exceedances
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

NOT REQUIRED

Table 8
Analytical Data Summary
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

ATTACHED

Analytical Data Summary for MW-1

Constituents	Units	4/26/2018	10/15/2018	4/23/2019	10/22/2019	4/21/2020	10/13/2020	4/14/2021	10/19/2021	4/14/2022	10/13/2022	4/19/2023	10/20/2023
Ammonia	mg/L	1.00	.53	1.10	.91	.58	.71	.63	.65	.74	.63	.61	.63
Arsenic, dissolved	ug/L	2.61											
Arsenic, total	ug/L	2.40	1.37	4.02	3.96	3.65	3.75	5.61	<.23	3.47	3.71	3.32	2.27
Barium, dissolved	ug/L	219											
Barium, total	ug/L	237	218	135	169	177	180	235	155	201	216	205	204
Chemical oxygen demand	mg/L	13.0	<7.0	18.0	7.0	17.0	22.0	32.0	<7.0	<5.7	<5.7	<5.7	<5.7
Chloride	mg/L	3.51	1.29	27.80	11.80	17.80	11.20	6.90	6.28	6.34	5.89	5.83	5.61
Cobalt, total	ug/L						.95	1.97	<1.25	<1.25	<.75	<.75	<.65
Iron, dissolved	ug/L	1690											
Iron, total	ug/L	2840.0	1900.0	6880.0	5820.0	45.8	5900.0	9720.0	4090.0	4100.0	4910.0	1270.0	779.0
Magnesium, dissolved	mg/L	25.9											
Magnesium, total	mg/L	29.0	32.0	20.7	25.8	23.5	24.2	29.3	20.9	28.7	29.2	28.3	31.9
pH	SU	6.50	7.22	7.03	7.21	7.23	7.03	7.40	7.40	7.50	7.17	7.33	7.20
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	684	700	554	662	641	617	685	702	704	733	711	707
Temperature	C									10.7	13.0	12.6	16.0
Total organic halogens	mg/L		<.01								<.01		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-2

Constituents	Units	4/27/2018	10/16/2018	4/24/2019	10/23/2019	4/21/2020	10/13/2020	4/15/2021	10/20/2021	4/15/2022	10/14/2022	4/19/2023	10/20/2023
Ammonia	mg/L	<.500	<.500	<.500	<.200	<.100	<.280	<.134	<.134	<.134	<.114	<.104	<.104
Arsenic, dissolved	ug/L	2.26											
Arsenic, total	ug/L	1.90	1.70	1.47	1.49	1.45	1.36	1.23	<5.75	1.34	1.39	1.19	2.38
Barium, dissolved	ug/L	124											
Barium, total	ug/L	173	153	144	182	210	220	132	229	226	262	187	197
Chemical oxygen demand	mg/L	8.0	<7.0	7.0	<7.0	7.0	<7.0	<7.0	<7.0	<5.7	<5.7	<5.7	<5.7
Chloride	mg/L	43.600	47.120	39.600	24.600	36.200	42.800	47.500	70.322	84.210	59.800	69.500	56.900
Cobalt, total	ug/L						8.63	2.18	8.80	6.18	8.06	1.25	<.65
Iron, dissolved	ug/L	<.4											
Iron, total	ug/L	229.00	172.00	712.00	679.00	5.72	348.00	<681.50	<681.50	<681.50	<67.90	1100.00	757.00
Magnesium, dissolved	mg/L	21.7											
Magnesium, total	mg/L	23.9	23.3	20.1	22.3	23.0	21.5	21.9	17.1	28.4	21.2	27.9	31.4
pH	SU	6.69	6.16	6.32	6.22	6.56	6.46	6.30	6.70	6.60	6.83	6.47	6.70
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	679	671	618	621	620	577	686	718	826	684	859	701
Temperature	C									9.0	12.9	11.9	16.2
Total organic halogens	mg/L		<.010								.017		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-3R1

Constituents	Units	6/5/2018	10/16/2018	4/24/2019	10/23/2019	4/21/2020	10/13/2020	4/15/2021	10/20/2021	4/15/2022	10/14/2022	4/19/2023	10/20/2023
Ammonia	mg/L	.820	.980	1.500	1.300	.570	.750	<.134	.560	<.134	.610	.400	.300
Arsenic, dissolved	ug/L	25.4											
Arsenic, total	ug/L	372.0	59.6	62.3	62.9	82.5	50.3	77.6	30.7	64.7	57.0	61.2	30.0
Barium, dissolved	ug/L	172											
Barium, total	ug/L	1920	484	405	388	496	375	616	248	369	377	294	219
Chemical oxygen demand	mg/L		18.0	9.0	7.0	9.0	8.0	<7.0	<7.0	8.0	<5.7	8.0	<5.7
Chloride	mg/L	61.200	66.340	63.200	43.300	51.400	50.100	55.500	59.258	53.730	74.100	71.200	50.500
Cobalt, total	ug/L						10.20	11.90	9.73	12.00	13.10	13.00	11.40
Iron, dissolved	ug/L	31300											
Iron, total	ug/L	357000	66400	54900	44700	535	43100	61000	30000	52400	46000	14900	8350
Magnesium, dissolved	mg/L	28.5											
Magnesium, total	mg/L	525.0	127.0	62.4	39.9	45.8	33.7	53.0	33.9	35.3	46.5	33.2	27.1
pH	SU	6.89	6.70	6.98	6.58	6.86	6.81	6.70	6.70	6.70	6.76	6.59	6.70
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	804	880	885	823	845	789	884	862	768	888	836	760
Temperature	C									12.2	14.8	14.2	16.6
Total organic halogens	mg/L		<.010								.028		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-4

Constituents	Units	4/26/2018	10/15/2018	4/23/2019	10/22/2019	4/21/2020	10/12/2020	4/14/2021	10/19/2021	4/14/2022	10/13/2022	4/19/2023	10/18/2023
Ammonia	mg/L	2.90	1.30	.90	1.20	.84	1.40	1.00	2.00	1.60	1.50	.62	1.60
Arsenic, dissolved	ug/L	28.3											
Arsenic, total	ug/L	25.7	26.5	13.4	26.3	14.7	15.1	14.2	18.8	31.5	22.3	11.7	17.4
Barium, dissolved	ug/L	305											
Barium, total	ug/L	372	270	282	350	301	279	343	378	500	404	235	458
Chemical oxygen demand	mg/L	17.0	<7.0	8.0	<7.0	10.0	7.0	<7.0	<7.0	14.0	<5.7	6.0	<5.7
Chloride	mg/L	103.00	79.99	86.50	48.70	55.10	60.90	75.10	84.40	90.34	85.80	64.20	76.50
Cobalt, total	ug/L						4.15	2.42	<6.25	7.14	15.10	8.29	7.85
Iron, dissolved	ug/L	4600											
Iron, total	ug/L	6740.0	6260.0	3690.0	7270.0	36.2	4910.0	4320.0	5800.0	8470.0	11600.0	3230.0	3930.0
Magnesium, dissolved	mg/L	32.7											
Magnesium, total	mg/L	35.8	27.7	30.3	22.7	23.6	23.0	28.9	25.1	32.1	32.5	25.2	36.9
pH	SU	6.25	6.72	6.63	6.45	6.75	6.64	6.70	6.90	6.90	6.83	6.69	6.80
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	986	874	895	618	709	643	1090	917	915	934	782	869
Temperature	C									11.0	13.5	13.4	13.5
Total organic halogens	mg/L		<.010								.017		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-21

Constituents	Units	4/26/2018	10/15/2018	4/24/2019	10/22/2019	4/21/2020	10/13/2020	4/14/2021	10/20/2021	4/14/2022	10/13/2022	4/19/2023	10/24/2023
Ammonia	mg/L	<.500	<.500	<.500	<.200	.100	<.280	<.134	.400	<.134	<.114	<.104	<.104
Arsenic, dissolved	ug/L	1.27											
Arsenic, total	ug/L	.98	1.83	.56	1.17	<2.00	1.52	1.58	<1.15	1.17	1.54	1.54	<1.45
Barium, dissolved	ug/L	368											
Barium, total	ug/L	406	372	413	438	401	338	347	229	325	307	269	301
Chemical oxygen demand	mg/L	10.0	8.0	10.0	7.0	9.0	11.0	8.0	6.0	9.0	<5.7	8.0	6.0
Chloride	mg/L	224.000	194.950	224.000	217.000	227.000	245.000	238.000	195.945	178.040	162.000	167.000	174.000
Cobalt, total	ug/L						.48	<1.25	<1.25	<1.25	<.75	<.75	<.65
Iron, dissolved	ug/L	24.2											
Iron, total	ug/L	194.0	323.0	193.0	460.0	<2.0	134.0	<681.5	<681.5	<681.5	147.0	162.0	126.0
Magnesium, dissolved	mg/L	52.7											
Magnesium, total	mg/L	60.1	55.3	58.7	58.0	59.6	56.8	55.4	36.9	51.5	43.9	47.0	52.7
pH	SU	6.79	6.36	6.78	6.83	6.86	6.74	6.80	6.70	6.70	6.82	6.92	6.90
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	1554	1391	1590	1532	1661	1542	1649	1480	1484	1520	1443	1350
Temperature	C									8.8	13.0	12.0	14.5
Total organic halogens	mg/L		.039								.035		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-22

Constituents	Units	4/27/2018	10/16/2018	4/24/2019	10/23/2019	4/21/2020	10/13/2020	4/15/2021	10/20/2021	4/15/2022	10/14/2022	4/20/2023	5/24/2023
Ammonia	mg/L	6.4	4.0	3.7	3.9	5.9	4.9	3.6	2.8	3.8	2.8	2.6	2.2
Arsenic, dissolved	ug/L	24.9											
Arsenic, total	ug/L	19.00	14.60	19.80	16.00	11.60	7.42	15.00	15.20	16.00	25.00	17.80	23.70
Barium, dissolved	ug/L	264											
Barium, total	ug/L	315	225	281	269	440	318	326	241	361	567	900	327
Chemical oxygen demand	mg/L	8.0	<7.0	10.0	<7.0	8.0	<7.0	<7.0	<7.0	<5.7	<5.7	100.0	<5.7
Chloride	mg/L	148.0000	108.4200	121.0000	101.0000	106.0000	108.0000	101.0000	91.8850	106.8900	99.6000	74.8000	76.8876
Cobalt, total	ug/L						8.00	8.24	7.44	9.63	10.70	31.40	14.20
Iron, dissolved	ug/L	10600											
Iron, total	ug/L	12800.0	8130.0	18200.0	13600.0	93.3	3990.0	11700.0	9990.0	12000.0	19600.0	18300.0	19400.0
Magnesium, dissolved	mg/L	30.8											
Magnesium, total	mg/L	33.6	27.9	31.6	28.5	33.1	32.6	32.9	24.6	35.1	33.2	46.0	31.7
pH	SU	6.88	6.79	6.74	6.66	6.89	7.05	6.90	6.90	7.00	6.84	6.71	6.38
Phenols, total	mg/L		<.10								.12		
Specific conductance	uS	1340	1033	1142	972	1149	1041	1090	1028	1004	1035	988	948
Temperature	C									12.5	15.9	13.4	18.7
Total organic halogens	mg/L		<.010								.028		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-22

Constituents	10/20/2023
Ammonia	2.0
Arsenic, dissolved	
Arsenic, total	22.30
Barium, dissolved	
Barium, total	259
Chemical oxygen demand	<5.7
Chloride	70.7000
Cobalt, total	10.10
Iron, dissolved	
Iron, total	6540.0
Magnesium, dissolved	
Magnesium, total	33.2
pH	6.80
Phenols, total	
Specific conductance	927
Temperature	17.4
Total organic halogens	

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-23

Constituents	Units	4/26/2018	10/16/2018	4/24/2019	10/23/2019	4/21/2020	10/12/2020	4/14/2021	10/19/2021	4/15/2022	10/13/2022	4/19/2023	10/18/2023
Ammonia	mg/L	1.7	1.6	1.7	1.8	1.1	1.5	1.1	1.3	1.4	1.3	1.2	1.2
Arsenic, dissolved	ug/L	15											
Arsenic, total	ug/L	32.2	15.2	18.8	14.6	30.4	31.8	21.9	9.4	16.5	11.5	18.1	10.9
Barium, dissolved	ug/L	115											
Barium, total	ug/L	212.0	132.0	160.0	153.0	202.0	181.0	159.0	98.6	137.0	129.0	135.0	134.0
Chemical oxygen demand	mg/L	5.0	<7.0	10.0	<7.0	<7.0	<7.0	<7.0	7.0	12.0	<5.7	6.0	<5.7
Chloride	mg/L	97.100	96.670	95.500	88.900	75.900	80.200	74.300	83.567	88.750	98.900	89.300	83.800
Cobalt, total	ug/L						2.39	1.84	<6.25	2.24	2.37	2.00	1.34
Iron, dissolved	ug/L	4860											
Iron, total	ug/L	14400	7000	8360	7430	118	12400	10300	4970	7520	5370	2460	1330
Magnesium, dissolved	mg/L	33.9											
Magnesium, total	mg/L	37.4	35.4	39.5	37.9	36.9	38.8	38.1	29.7	40.6	40.4	39.4	44.3
pH	SU	7.07	6.99	6.65	6.72	7.22	7.10	6.90	7.00	7.30	7.05	6.99	6.80
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	1201	1117	1149	1112	1093	1067	1124	1158	1177	1215	1151	1118
Temperature	C									7.2	13.1	13.5	12.6
Total organic halogens	mg/L		.010								.021		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-24

Constituents	Units	4/26/2018	10/16/2018	4/24/2019	10/23/2019	4/21/2020	10/12/2020	4/14/2021	10/19/2021	4/14/2022	10/13/2022	4/19/2023	10/18/2023
Ammonia	mg/L	2.80	2.00	1.50	1.50	1.00	1.20	1.00	1.10	1.10	.82	.76	.77
Arsenic, dissolved	ug/L	.725											
Arsenic, total	ug/L	2.10	.64	1.13	.78	.84	.68	<1.15	<5.75	<1.15	<.90	<.90	<1.45
Barium, dissolved	ug/L	134											
Barium, total	ug/L	634	307	407	271	344	305	292	129	179	466	218	158
Chemical oxygen demand	mg/L	9.0	<7.0	<7.0	<7.0	9.0	<7.0	<7.0	<7.0	<5.7	<5.7	<5.7	<5.7
Chloride	mg/L	87.900	101.180	90.800	107.000	91.100	92.300	84.900	98.878	97.990	98.700	69.200	83.200
Cobalt, total	ug/L						3.24	1.72	<6.25	2.45	4.31	2.09	<.65
Iron, dissolved	ug/L	12.6											
Iron, total	ug/L	3220.00	650.00	1430.00	936.00	9.34	524.00	<681.50	<681.50	<681.50	673.00	622.00	528.00
Magnesium, dissolved	mg/L	38.5											
Magnesium, total	mg/L	44.9	40.8	36.8	36.7	39.5	43.3	38.8	28.0	36.8	35.9	28.8	31.2
pH	SU	6.89	7.03	6.75	6.82	6.96	7.03	6.90	6.90	7.00	7.04	6.91	7.00
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	1107	1011	963	968	1105	1073	1074	1090	1077	1009	862	885
Temperature	C									12.7	13.0	11.8	13.4
Total organic halogens	mg/L		<.01								.03		

* - The displayed value is the arithmetic mean of multiple database matches.

Analytical Data Summary for MW-26

Constituents	Units	4/26/2018	10/15/2018	4/23/2019	10/22/2019	4/21/2020	10/12/2020	4/14/2021	10/19/2021	4/14/2022	10/13/2022	4/19/2023	10/20/2023
Ammonia	mg/L	<.500	<.500	<.500	<.200	<.100	<.280	<.134	<.134	<.134	<.114	<.104	<.104
Arsenic, dissolved	ug/L	<.04											
Arsenic, total	ug/L	.45	<.57	.36	<.75	2.27	.55	.47	<5.75	<1.15	1.09	<.90	<1.45
Barium, dissolved	ug/L	131											
Barium, total	ug/L	137	185	193	104	176	102	155	73	139	162	176	123
Chemical oxygen demand	mg/L	6.0	<7.0	<7.0	<7.0	8.0	<7.0	<7.0	<7.0	<5.7	<5.7	<5.7	<5.7
Chloride	mg/L	33.700	51.410	71.500	20.000	41.400	27.300	58.600	28.918	54.890	78.400	71.900	48.100
Cobalt, total	ug/L						.52	<.50	<6.25	<1.25	<.75	<.75	<.65
Iron, dissolved	ug/L	<.4											
Iron, total	ug/L	310.0	380.0	252.0	516.0	50.0	615.0	510.0	<272.6	<681.5	376.0	767.0	610.0
Magnesium, dissolved	mg/L	11											
Magnesium, total	mg/L	12.10	17.60	17.80	9.79	9.83	8.61	11.90	6.49	14.50	16.30	19.70	12.50
pH	SU	6.05	6.30	6.24	6.34	6.08	6.28	6.10	6.30	6.80	6.34	6.57	6.40
Phenols, total	mg/L		<.1								<.1		
Specific conductance	uS	143	545	649	305	389	319	546	355	538	646	709	461
Temperature	C									11.1	12.2	13.3	13.9
Total organic halogens	mg/L		<.010								.014		

* - The displayed value is the arithmetic mean of multiple database matches.

Table 9
Historic Control Limit & Action Level Exceedances
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

NOT REQUIRED

Table 10
Groundwater Quality Assessment Plan Trend Analysis
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

NOT REQUIRED

Table 11
Leachate/Groundwater Elevations
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

Date	South Disposal Area		North Disposal Area
	Groundwater Head Monitoring Point	Leachate Head Monitoring Point	Leachate Head Monitoring Point
1/5/2023	---	---	0.6'
1/6/2023	0.4'	<1'	---
2/1/2023	0.3'	<1'	0.6'
3/1/2023	0.4'	<1'	0.7'
4/3/2023	0.4'	0.3'	0.7'
5/1/2023	0.4'	0.3'	0.8'
6/1/2023	0.4'	0.2'	0.8'
7/3/2023	0.8'	0.2'	0.9'
8/1/2023	0.9'	0.1'	1.0'
9/1/2023	0.8'	0.3'	0.9'
10/2/2023	0.8'	0.4'	0.9'
11/1/2023	0.9'	0.4'	1.0'

Table 12
Gas Monitoring Summary
Annual Water Quality Report
Cedar Rapids WPCF Ash Monofill
Permit No. 57-SDP-07-85P

NOT REQUIRED

APPENDIX A

SDP Permit and Variances

April 20, 2022

ROY HESEMANN
CEDAR RAPIDS WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM ROAD SE
CEDAR RAPIDS IA 52403

RE: Cedar Rapids Water Pollution Control Facilities Ash Monofill
Permit #57-SDP-07-85P

Dear Mr. Hesemann:

Enclosed is Amendment #1 to the permit issued October 29, 2021 for the Cedar Rapids Water Pollution Control Facilities Ash Monofill. The amendment must be kept with the permit and the approved plans at the sanitary disposal project in accordance with solid waste rule 567 IAC 115.26(2)'c'. Please review this amendment with your operators, as they must become familiar with it.

The enclosed amendment authorizes the permit holder to reduce the frequency of groundwater level measurements from quarterly to semiannually, in accordance with the request contained in the 2020 AWQR, dated December 7, 2020.

Note that the amendment may contain special provisions that require a response or action by you, which if not properly complied with, may prompt enforcement action by this department.

If you have any questions, you may contact me at (515) 537-4051.

Sincerely,

Nina M. Booker

Digitally signed by
Nina M. Booker
Date: 2022.04.20
16:51:15 -05'00'

Nina M. Booker
Environmental Engineer Senior
Land Quality Bureau

IOWA DEPARTMENT OF NATURAL RESOURCES
SANITARY DISPOSAL PROJECT PERMIT
FOR INDUSTRIAL MONOFILLS

I. **Permit Number:** 57-SDP-07-85P

II. **Permitted Agency:** City of Cedar Rapids
Cedar Rapids Water Pollution Control Facilities Ash Monofill

III. **Project Location:** NE ¼, NE ¼, Sec.32, T83N, R6W
Linn County, Iowa

IV. **Responsible Official**

Name: Roy Hesemann
Address: Cedar Rapids Water Pollution Control Facilities
7525 Bertram Road SE
Cedar Rapids, IA 52403-7111
Phone: 319-286-5972
FAX: 800-980-6863

V. **Licensed Design Engineer**

Name: Douglas J. Luzbetak, P.E.
Address: HLW Engineering Group
204 West Broad Street
P.O. Box 314
Story City, Iowa 50248
Phone: 515-733-4144
FAX: 515-733-4146

Iowa License Number: 12654

VI. **Date Permit Issued:** October 29, 2021
Date Permit Revised April 20, 2022 (Amendment #1)

VII. **Permit Expiration Date:** October 29, 2024

Nina M. Booker Digitally signed by Nina M. Booker Date: 2022.04.20 16:39:52 -05'00'

VIII. **Issued by:** _____
Environmental Services Division
for the Director

IX. **General Provisions**

The above named permitted agency is hereby authorized to operate a sanitary disposal project at the described location in conformance with Iowa Code section 455B, the rules pursuant thereto existing at the time of issuance, and any subsequent new rules which may be duly adopted, and any provisions contained in Section X of this permit.

The issuance of this permit in no way relieves the applicant of the responsibility for complying with all other local, state, and federal statutes, ordinances, and rules or other requirements applicable to the establishment and operation of this sanitary disposal project.

No legal or financial responsibility arising from the construction or operation of the approved project shall attach to the State of Iowa or the Department of Natural Resources (DNR) due to the issuance of this permit.

If title to this project is transferred, the new owner must apply to the DNR for a transfer of this permit within thirty days of the date of title transfer pursuant to rule 115.9(455B). This permit is void sixty days after the date of title transfer unless the DNR has transferred the permit.

The permit holder shall file a Quarterly Solid Waste Fee Schedule and Retained Fee Report utilizing the DNR's Form 542-3276 and remit tonnage fee payment, as applicable, for all wastes disposed at the sanitary disposal project in accordance with Iowa Code section 455B.310. The Reports will be due January 1, April 1, July 1 and October 1 for the quarters ending September 30, December 31, March 31 and June 30, respectively. The permit holder shall mail the completed report to the Solid Waste Section, Wallace State Office Building, 502 East Ninth Street, Des Moines, Iowa 50319. This reporting procedure supersedes any previous conflicting permit provisions.

The permit holder shall weigh all solid waste collection vehicles and solid waste transport vehicles on a scale certified by the Iowa Department of Agriculture and Land Stewardship. If conditions are such that make it impractical to provide an on-site scale, then off-site scale facilities or an alternative method of calculating the tonnage disposed, may be used if justified and approved by the DNR. The permit holder shall comply with the waste weighing, record keeping and tonnage fee reporting requirements defined in rule 101.14(455B,455D). The scale weighing facilities shall comply with the certification and licensing requirements of the Iowa Department of Agriculture and Land Stewardship at all times. The permit holder shall maintain a current copy of the weighing scale facility licensing certificate issued by the Iowa Department of Agriculture and Land Stewardship at all times.

The permit holder shall ensure that the sanitary disposal project does not (1) cause a discharge of pollutants into waters of the United States, including wetlands, that violates any requirements of the Clean Water Act, including, but not limited to, the National Pollutant Discharge Elimination System (NPDES) requirements, pursuant to Section 402 of the Clean Water Act, and (2) cause the discharge of a nonpoint source of pollution into waters of the United States, including wetlands, that violates any requirement of an areawide or statewide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act.

The permit holder shall submit an updated Sanitary Landfill Financial Assurance Report Form no later than April 1st, annually, pursuant to rule 115.31(455B). Use of this form provides permit holders a uniform means of submitting all required documentation to ensure that closure and postclosure cost estimates and applicable financial assurance instruments are updated as required.

This facility shall be staked as necessary and inspected on a semiannual basis by a professional engineer licensed in the State of Iowa. The engineer shall prepare a brief report describing the site's conformance and nonconformance with the permit and the approved plans and specifications during the inspections. These reports shall be submitted by April 30 and October 31 each year to the Department's Main and local Field offices. The Department shall be notified if any inspection reveals any nonconformance with the permit and approved plans and specifications.

Failure to comply with Iowa Code Chapter 455B, or any rule of order promulgated pursuant thereto, or any or all provisions of this permit may result in 1) a civil penalty of up to $5000 for each day of violation, pursuant to Iowa Code section 455B.307, or 2) the suspension or revocation of this permit, pursuant to Iowa Code section 455B.305.

X. Special Provisions

1. The permit holder is authorized to accept sewage sludge incinerator ash from the Cedar Rapids Water Pollution Control Facilities for disposal. Wastes disposed at this site shall not exhibit toxic or hazardous properties. No hazardous wastes as defined by Iowa Code section 455B.411 may be disposed at this landfill.
2. The permit holder shall develop and operate the site in accordance with the *2021 Industrial Monofill Permit Renewal*, dated June 7, 2021, as submitted by HLW Engineering Group, and the following:
   a. Waste disposal is limited to the North Cell and South Cell ash monofill disposal units. Any further expansion beyond these cells shall require prior Department approval.

      The permit holder shall continually review the design of the cell with all staff on-site for excavation of the lagoons. The permit holder shall limit the use of the excavators to a few well-trained operators.

   b. The *Response to SDP Permit Amendment #1 (5/12/11)* regarding operational procedures, dated May 26, 2011, as submitted by HLW Engineering Group, and approved on February 9, 2012, is incorporated as part of the permit documents.

   c. The permit holder shall representative sample and submit TCLP metals analytical results for the waste at the time of each permit renewal, or following any process modifications that may result in changes of waste characteristics. No waste ash that exhibits hazardous characteristics shall be disposed of at this site.

   d. Surface water shall be diverted around the fill area and proper surface drainage shall be provided at all times.

   e. The Emergency Response and Remedial Action Plan (ERRAP) as included in Appendix I, of the *2021 Industrial Monofill Permit Renewal, dated June 7, 2021*, as submitted by HLW Engineering Group, in compliance with rule 115.30(455B) is incorporated as part of the permit documents. An updated ERRAP shall be submitted at the time of each permit renewal application. An updated ERRAP shall be included with any request for permit modification to incorporate a facility expansion or significant changes in facility operation that require modification of the currently approved ERRAP.

f. In accordance with the variance approval of May 12, 2011, the permit holder is authorized to accept liquids associated with ash slurry disposal at the referenced site. No other liquids are authorized for disposal without prior Department approval.

g. The *Quality Control and Assurance Report for the Ash Lagoon Liner* (South Lagoon), dated December 16, 2011 as submitted by HLW Engineering Group; and approved on February 9, 2012, is incorporated as part of the permit documents.

h. The *Quality Control and Assurance Report for the North Ash Lagoon Liner*, dated October 13, 2016, as prepared and submitted by HLW Engineering Group and approved on November 15, 2016, is incorporated as part of the permit documents.

i. The *Quality Control and Assurance Report for the FML Repair-South Cell*, dated August 15, 2017, as submitted by HLW Engineering Group, and approved on September 6, 2017, is incorporated as part of the permit documents.

3. The Department authorizes the following alternative arrangement for reduction in fees owed for sewage sludge incinerator ash that is reclaimed from the landfill for beneficial use purposes.

   a. The difference between the amount (in tons) of sewage sludge incinerator ash reclaimed for beneficial use(s) from the landfill and the amount of new waste disposed of during a quarter shall be used to calculate what/if any fees are owed at the end of each quarter. If the amount reclaimed is equal to or greater than the amount disposed, no fees are owed for that quarter.

   b. Beneficial use projects shall comply with the state's solid waste by-product beneficial use determination rules (Iowa Administrative Code 567 Chapter 108) and be tracked and reported with each Quarterly Solid Waste Fee Schedule and Retained Fees Report including:

      1. Location of beneficial use(s)
      2. Description of beneficial use(s)
      3. Quantities used for each beneficial use project

      The Department shall have the sole authority to deny approval of a reported beneficial use if the proposed use is determined to have the primary purpose as a means of disposal, and any beneficial use would be incidental in nature.

4. Hydrologic monitoring at the site shall be conducted in accordance with the Hydrologic Monitoring System Plan (HMSP) contained in the *2018 Industrial Monofill Permit Renewal*, dated April 16, 2018, as submitted by HLW Engineering Group and approved on September 13, 2018, and the following:

   a. The HMSP shall include upgradient groundwater monitoring point MW-26; and downgradient groundwater monitoring points, MW-1, MW-2, MW-3RI, MW-4, MW-21, MW-22, MW-23, and MW-24. (Monitoring points MW-1 and MW-21 are positioned upgradient, but not used for background analysis).

   b. Monitoring points not used for water quality analysis may be retained as water level measuring points.

c. Department construction documentation form 542-1277 and boring logs for all monitoring wells and piezometers shall be submitted within 30 days of installation. Department construction documentation form 542-1323 shall be submitted within 30 days of establishing surface water monitoring points.

Monitoring points MW-20 and MW-25 have been plugged and abandoned or removed.

The Abandoned Water Well Plugging Record for MW-3, dated July 28, 2011 and attached to the August 25, 2011 transmittal submitted by HLW Engineering Group, and approved on February 9, 2012, is incorporated as part of the permit documents.

The Construction Documentation form for replacement well MW-3R, dated December 19, 2011 and attached to the January 9, 2012 transmittal submitted by HLW Engineering Group, and approved on February 9, 2012, is incorporated as part of the permit document.

The Construction Documentation Form and Boring Log for replacement well MW-3RI, dated March 29, 2018 (Doc 92858), and approved on September 13, 2018, is incorporated as part of the permit documents.

The Abandoned Water Well Plugging Record for monitoring well MW-3R, as attached to the September 4, 2018 electronic mail submitted by HLW Engineering Group and approved on September 13, 2018, is incorporated as part of the permit documents.

d. Quarterly sampling of the approved monitoring points was completed in October of 1996.

Continued semiannual sampling shall take place in April and October of each year and be analyzed for the parameters listed in paragraph 115.26(4)"e". Routine annual testing for any additional necessary parameters listed in paragraph 115.26(4)"f" shall be conducted during October of each year.

Supplemental semiannual sampling and analysis of all monitoring points for arsenic, barium, and magnesium shall be conducted in addition to the routine test parameters. The additional testing may be discontinued upon all of the following: **1)** The test results and a request for elimination of the additional sampling are submitted to the Department; **and 2)** The Department approves discontinuation of the additional sampling.

e. The Method Detection Limit (MDL) for the test parameters shall not exceed action levels as defined in 567 IAC Chapter 133. If the action levels cannot be feasibly achieved using procedures described in subrule 115.26(5), then the MDL shall not exceed the lowest feasible level.

f. In accordance with the variance, dated September 12, 2018, the permit holder is authorized to conduct sampling and analysis of total recoverable metals in lieu of sampling for dissolved metals as required by 567 IAC 115.26(4)"d", and phenols and TOX, as required by 567 IAC 115.26(4)"f".

g. Surface monitoring points must be clearly marked in the field and a method for measuring the flow rate at each sampling point shall be devised.

h. In accordance with the request contained in the 2020 AWQR, dated December 7, 2020, the permit holder is authorized to reduce the frequency of groundwater level measurements from quarterly to semiannually. The measurements shall be taken in, April and October of each year, with the results submitted in the corresponding semiannual monitoring reports. (Amendment #1)

i. An Annual Water Quality Report (AWQR) summarizing the effects the facility is having on groundwater and surface water quality shall be submitted to the Department by November 30 of each year. The AWQR report shall include the results of the routine groundwater measurements conducted at the monitoring points and by using the DNR AWQR Format.

5. The permit holder is exempt from monitoring and reporting methane gas levels in site structures and at the property boundary, as required by subrule 115.26(15). This exemption is in accordance with the variance approval letter of May 5, 1995. Variance approval was based on the inert nature of the incinerator ash waste deposited at this site.

   However, in the event that methane gas is found to be present at the site, the Department's Main and Field Offices shall be notified, and gas monitoring shall be immediately implemented in accordance with subrule 115.26(15).

6. In accordance with the variance approval of April 27, 2005, the permit holder is not required to have a certified solid waste operator on duty during waste unloading, as required by rule 115.29(455B), since this site is required to have certified wastewater operators on staff. The variance approval shall hold until such time that the Department develops a certification program that relates more directly to this operation; and as long as certified wastewater operators are retained on site.

7. The permit holder shall close the landfill site in accordance with the Closure/Postclosure Plan (CPCP) as contained in Appendix H of the *2021 Industrial Monofill Permit Renewal*, dated June 7, 2021, as submitted by HLW Engineering Group, and the following:

   a. The review comments, dated May 15, 1985 from the County Soil & Water Conservation District relative to compliance with wind and soil loss limit regulations, in accordance with paragraph 115.26(1)"j" for all development areas, are incorporated as part of the permit documents.

   b. Upon closure of both the North and South Lagoons, all ash material will be removed and disposed of in accordance with regulations at the time of closure, dikes and all infrastructure will be removed and the site(s) regraded, seeded, and repurposed for other uses by CRWPCF.

Fields of Opportunities

STATE OF IOWA

TERRY E. BRANSTAD, GOVERNOR
KIM REYNOLDS, LT. GOVERNOR

DEPARTMENT OF NATURAL RESOURCES
ROGER L. LANDE, DIRECTOR

May 12, 2011

STEVE HERSHNER
CEDAR RAPIDS WATER POLLUTION CONTROL FACILITY
7525 BERTRAM ROAD SE
CEDAR RAPIDS IA 52403

Re: Cedar Rapids Water Pollution Control Facilities-Sludge Ash Storage Landfill
Permit #57-SDP-07-85P
IAC Rule Variance Request Approval

Dear Mr. Hershner:

This letter is to inform you that the rule variance request from 567 IAC 115.27(8) (455B, 455D) relative to the requirement that no free liquids or waste containing free liquid shall be disposed in a sanitary landfill, is hereby approved.

The permit holder has requested a waiver from subrule 567 IAC 115.27(8) which does not allow the disposal of free liquids or waste containing free liquids in a sanitary landfill. Approval of the variance is based on the fact that the City of Cedar Rapids is proposing to construct a liner in the south lagoon exceeding current standards for industrial waste landfills. The liner will consist of a Subtitle D compliant composite liner with an additional 60 mil HDPE liner over the top of the composite liner. The additional 60 mil HDPE liner will function to limit the liquid level on the Subtitle D compliant liner to less than 1 foot as required in 115.26(11)"a"(1). Leachate head measuring devices are being provided to measure the liquid level on the Subtitle D compliant composite liner.

If you have any questions, please contact Nina M. Koger at (515) 281-8986.

Sincerely,

Brian Tormey

Brian Tormey
Chief
Land Quality Bureau

502 EAST 9th STREET / DES MOINES, IOWA 50319-0034
PHONE 515-281-5918 FAX 515-281-8895 www.iowadnr.gov

cc: Field Office 1

Rick Yoerger, P.E.
Midwest Environmental Consulting
2441 Cimarron Drive
Marion, IA 52302-9792

Douglas J. Luzbetak, P.E.
HLW Engineering Group
204 West Broad Street
P.O. Box 314
Story City, IA 50248

September 12, 2018

Con 12-1-1
Doc # 93200

John Ernst
CEDAR RAPIDS WATER POLLUTION CONTROL FACILITY
7525 BERTRAM ROAD SE
CEDAR RAPIDS IA 52403

Re: Cedar Rapids Water Pollution Control Facilities-Sludge Ash Storage Landfill
Permit #57-SDP-07-85P
IAC Rule Variance Request Approval

Dear Mr. Ernst:

This letter is to inform you that the variance request to discontinue the collection of filtered samples for analysis of dissolved metals, as required by 567 IAC 115.26(4)"d", and phenols and TOX, as required by 567 IAC 115.26(4)"f"; and instead to conduct sampling and analysis of total recoverable metals, is approved.

This variance approval was granted based on the review of your *Petition for Variance*, dated September 12, 2018.

This variance is applicable as long as the justification for the request remains the same. The permit for the referenced facility will be revised to reflect the same under separate cover.

If you have any questions, you may contact me at (515) 725-8309.

Sincerely,

Nina M. Booker

Nina M. Booker
Environmental Engineer Senior
Land Quality Bureau

cc: Field Office 1

Douglas J. Luzbetak, P.E.
HLW Engineering Group
204 West Broad Street
P.O. Box 314
Story City, IA 50248

Gmail

Doug Luzbetak <dluzbetak@hlwengineering.com>

Cedar Rapids WPCF

4 messages

Doug Luzbetak <dluzbetak@hlwengineering.com> Tue, Nov 20, 2018 at 3:42 PM
To: "Nina Booker [DNR]" <nina.booker@dnr.iowa.gov>

Nina,

On September 12, 2018, IDNR issued a variance for this facility that allowed sampling of total metals instead of dissolved metals. I just received the results from the Fall, 2018 sampling event. The sampling was completed for total arsenic, barium, iron, and magnesium. These are the same metals (as dissolved) that were sampled for previously. Will this list be sufficient, or does the department want additional total metals added to this list during future sampling.

Thank you for your help,

Doug

Doug Luzbetak, P.E.
HLW Engineering Group
204 West Broad Street
PO Box 314
Story City, IA 50248
(515)7334144
FAX (515)7334146
Cell (515)2900247
dluzbetak@hlwengineering.com

Booker, Nina <nina.booker@dnr.iowa.gov> Tue, Nov 20, 2018 at 3:49 PM
To: Doug Luzbetak <dluzbetak@hlwengineering.com>

Doug,
Unless there becomes a reason to add additional metals, the list can stay the same for now.

Nina

NOTE NAME CHANGE

Nina Booker | Environmental Engineer Senior
Iowa Department of Natural Resources
P 515-725-8309 | F 515-725-8202 | 502 E. 9th St., Des Moines, IA 50319
www.iowadnr.gov

[Quoted text hidden]

Doug Luzbetak <dluzbetak@hlwengineering.com> Tue, Nov 20, 2018 at 3:54 PM
To: "Nina Booker [DNR]" <nina.booker@dnr.iowa.gov>

Nina,

OK, we will have them use the same list next year. Thank you for the quick response.

Doug

Doug Luzbetak, P.E.

HLW Engineering Group
204 West Broad Street
PO Box 314
Story City, IA 50248
(515)7334144
FAX (515)7334146
Cell (515)2900247
dluzbetak@hlwengineering.com

[Quoted text hidden]

Booker, Nina <nina.booker@dnr.iowa.gov> Tue, Nov 20, 2018 at 3:56 PM
To: Doug Luzbetak <dluzbetak@hlwengineering.com>

You're welcome!

NOTE NAME CHANGE

Nina Booker | Environmental Engineer Senior
Iowa Department of Natural Resources
P 515-725-8309 | F 515-725-8202 | 502 E. 9th St., Des Moines, IA 50319
www.iowadnr.gov

[Quoted text hidden]

APPENDIX B

Statistical Report

Results of the Ground Water Statistics

for Ash Monofill Facility

Semi-Annual Monitoring Events in 2023

Prepared for:
Ash Monofill – Cedar Rapids Water Pollution Control Facility
7525 Bertram Road SE
Cedar Rapids, IA 52403

Prepared by:
Jeffrey A. Holmgren
Otter Creek Environmental Services, L.L.C.
40W565 Foxwick Court
Elgin, IL 60124
(847) 464-1355

November 2023

INTRODUCTION

This report contains the results of the statistical analyses used to evaluate the ground water data obtained during the semi-annual monitoring events in 2023 at the Ash Monofill Facility. The ground water at the Ash Monofill Facility is monitored by a network of wells including MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, MW-24, and MW-26 (upgradient). Monitoring wells MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, MW-24, and MW-26 were sampled during April 19-20, 2023 and October 18-24, 2023 and analyzed for the parameters required by permit. The statistical plan is designed to detect a release from the facility at the earliest indication so that it is protective of human health and the environment. The interwell and intrawell methodologies are described and then applied to the Ash Monofill Facility data. The statistical plan conforms with IAC 567, Chapter 113.10, USEPA Guidance document ("*Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Unified Guidance"*, March 2009), and the American Society for Testing and Materials (ASTM) standard D6312-98, *Developing Appropriate Statistical Approaches for Ground-Water Detection Monitoring Programs*.

Ground Water Monitoring Program

The groundwater monitoring network for the Ash Monofill Facility includes MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, MW-24, and MW-26. Each of the groundwater monitoring wells is to be sampled at least semiannually and analyzed for arsenic, barium, iron, magnesium, ammonia, COD, chloride, pH, and specific conductivity. The ground water data obtained during the semi-annual monitoring events in 2023 are summarized in Attachment A.

STATISTICAL METHODOLOGIES FOR DETECTION MONITORING

IAC 567, Chapter 113.10(4) provides several options for statistically evaluating the ground water data at those wells that monitor the open cells or contiguous MSWLF units. The preferred methods for comparing ground water data are using either prediction limits or using control charts. The site prediction limit method was first applied to the Ash Monofill Facility data using the DUMPStat® statistical program. An intrawell method was also then utilized to determine the most appropriate statistical method for this data set. DUMPStat® is a program for the statistical analysis of groundwater monitoring data using methods described in "Statistical Methods for Groundwater Monitoring" by Dr. Robert D. Gibbons. The DUMPStat program is completely consistent with all USEPA regulations and guidance and the ASTM D6312-98 guidance.

Interwell Statistics: Upgradient versus Downgradient Comparisons

Interwell statistics are appropriate when the upgradient and downgradient wells monitor the same ground water formation and there is similar variability in the upgradient and downgradient zones. Site prediction limits are determined by pooling the historical ground water data from hydraulically upgradient wells. This statistical method compares the current downgradient determinations to site prediction limits and checks for exceedances. The type of prediction limit utilized (e.g., parametric or nonparametric) is based on the detection frequency and the data distribution of each parameter in the background data. The distribution of

the background data is tested for normality using the Shapiro-Wilk test (Gibbons, 1994 and USEPA 1992). If the constituent is normally distributed, a normal prediction limit is used. If normality is rejected by the Shapiro-Wilk test, the background data is transformed by taking the natural logarithm. The Shapiro-Wilk test is then reapplied on the transformed data. If it is not rejected, lognormal prediction limits are used. If after transforming the data, normality is still rejected, nonparametric prediction limits are used for that analyte. The nonparametric prediction limit is the largest determination in the background measurements. For constituents where the background detection frequency is greater than 0% but less than 50%, nonparametric prediction limits will be used. If the detection frequency is 0% after thirteen samples have been collected, the practical quantitation limit (PQL) becomes the nonparametric prediction limit.

Results of the Interwell Statistics: First Semi-Annual Monitoring event in 2023

The background data used in this statistical analysis includes the ground water data collected from ground water well MW-26 during the period from April 2018 through April 2023. A summary of the background data from monitoring well MW-26 is listed in Attachment B, Table 1 "Upgradient Data". This statistical method compares the current downgradient determinations to site prediction limits and checks for exceedances.

Table 2 "Most Current Downgradient Monitoring Data", summarizes the April 2023 data from downgradient wells MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, and MW-24, compared to the site prediction limits. Prediction limit exceedances are flagged with asterisks. For the most current data, the site prediction limit exceedances detected are summarized in the table below.

Prediction Limit Exceedances during the First Semi-Annual Monitoring Event in 2023

Well	Parameter	Result	Prediction Limit	Prediction Limit Type	Verified/ Awaiting verification
MW-1	Ammonia, mg/L	0.61	0.1340	Nonparametric	Verified
	Arsenic, µg/L	3.32	2.5115	Normal	Verified
	Iron, µg/L	1270	1107.8926	Normal	Verified
	Magnesium, mg/L	28.3	25.5959	Normal	Verified
	pH, SU	7.33	5.58 – 7.03	Normal	Verified
MW-2	Cobalt, µg/L	1.25	0.7500	Nonparametric	Verified
	Magnesium, mg/L	27.9	25.5959	Normal	Awaiting verification
MW-21	Barium, µg/L	269	257.5150	Normal	Verified
	Chloride, mg/L	167	106.8866	Normal	Verified
	Magnesium, mg/L	47.0	25.5959	Normal	Verified
	Specific conductance, µS	1443	978.1522	Normal	Verified

Prediction Limit Exceedances during the First Semi-Annual Monitoring Event in 2023 (cont.)

Well	Parameter	Result	Prediction Limit	Prediction Limit Type	Verified/ Awaiting verification
MW-22	Ammonia, mg/L	2.6	0.1340	Nonparametric	Verified
	Arsenic, µg/L	17.8	2.5115	Normal	Verified
	Barium, µg/L	900	257.5150	Normal	Verified
	COD, mg/L	100	8.0000	Nonparametric	Awaiting verification
	Cobalt, µg/L	31.4	0.7500	Nonparametric	Verified
	Iron, µg/L	18300	1107.8926	Normal	Verified
	Magnesium, mg/L	46.0	25.5959	Normal	Verified
	Specific conductance, µS	988	978.1522	Normal	Verified
MW-23	Ammonia, mg/L	1.2	0.1340	Nonparametric	Verified
	Arsenic, µg/L	18.1	2.5115	Normal	Verified
	Cobalt, µg/L	2.0	0.7500	Nonparametric	Verified
	Iron, µg/L	2460	1107.8926	Normal	Verified
	Magnesium, mg/L	39.4	25.5959	Normal	Verified
	Specific conductance, µS	1151	978.1522	Normal	Verified
MW-24	Ammonia, mg/L	0.76	0.1340	Nonparametric	Verified
	Cobalt, µg/L	2.09	0.7500	Nonparametric	Verified
	Magnesium, mg/L	28.8	25.5959	Normal	Verified
MW-3R1	Ammonia, mg/L	0.40	0.1340	Nonparametric	Verified
	Arsenic, µg/L	61.2	2.5115	Normal	Verified
	Barium, µg/L	294	257.5150	Normal	Verified
	Cobalt, µg/L	13.0	0.7500	Nonparametric	Verified
	Iron, µg/L	14900	1107.8926	Normal	Verified
	Magnesium, mg/L	33.2	25.5959	Normal	Verified
MW-4	Ammonia, mg/L	0.62	0.1340	Nonparametric	Verified
	Arsenic, µg/L	11.7	2.5115	Normal	Verified
	Cobalt, µg/L	8.29	0.7500	Nonparametric	Verified
	Iron, µg/L	3230	1107.8926	Normal	Verified

The detection frequencies of the parameters in the up and down gradient monitoring wells are summarized in Table 3. Arsenic, barium, chloride, iron, magnesium, pH, and specific conductance were detected at a frequency greater than or equal to 50% in the upgradient well so these parameters were tested for normality. The remainder of the parameters (ammonia and COD) are rarely detected (less than 50%) in the upgradient well so nonparametric prediction limits were be used in those cases.

Table 4 summarizes the results of the Shapiro-Wilk test. Table 5 is a summary of the statistics and prediction limits determined for the metals. Table 8 is a historical summary of the data at those wells that

have indicated an exceedance. Time series graphs of each of the parameters at each well with the corresponding prediction limits are attached.

A statistical power curve indicates the expected false assessments for the site as a whole. The false positive rate for interwell analyses is the percentage of failures when the upgradient versus downgradient true mean difference equals zero. False negative rate indicates the chance of missing contamination at a single well for a single constituent. The statistical power is a function of the number of wells included, the number of constituents compared, the detection frequencies, and the data distributions involved. For interwell analysis, the site-wide false positive rate is 11% and the test becomes sensitive to 5 standard deviation unit increases over background.

Intrawell statistics

Up-to down gradient comparisons were problematic due to (a) too few rounds of background data and (b) lack of special variability. It is recommended that a minimum of eight rounds of data are available prior to performing statistics. Also, having only one upgradient well, does not characterize the groundwater across the facility. In light of this, an intrawell approach is applied here.

Intrawell statistics are appropriate for facilities where the upgradient wells do not accurately characterize the natural ground water conditions downgradient from the facility. This may be due to different hydrogeological conditions where the wells are screened, having too few upgradient wells to account for the spatial variability, or the site exhibiting no definable hydraulic gradient. Intrawell statistics compare new measurements to the historical data at each ground water monitoring well independently. It is recommended that at least eight background samples be obtained prior to performing the statistics.

The most useful technique for intrawell comparisons is the combined Shewhart-CUSUM control chart. This control chart procedure is useful because it will detect releases both in terms of the constituent concentration and cumulative increases. This method is also extremely sensitive to sudden and gradual releases. A requirement for constructing these control charts is that the parameter is detected at a frequency greater than or equal to 25%, otherwise the data variance is not properly defined.

The combined Shewhart-CUSUM control chart assumes that the data are independent and normally distributed with a fixed mean and a constant variance. Independent data is much more critical than the normality assumption. To achieve independence, it is recommended that data are collected no more frequently than quarterly to account for seasonal variation. The combined Shewhart-CUSUM control chart is extremely robust to deviations from normality. Because the control charts do not use a specific multiplier based on a normal distribution, it is more conservative to assume normality.

It is recommended that at least eight rounds of data be available to provide a reliable estimate of the mean and standard deviation of the parameter concentration, although the control charts will be generated with as few as four data points. Having only four data points may produce greater uncertainty in the mean and standard deviation of the background data, leading to higher control limits, thus having a potentially high false negative rate.

Many groundwater monitoring parameters are not detected at a frequency great enough to generate the combined Shewhart-CUSUM control charts. For constituents that are detected less than 25% of the time

at a particular well, the data should be plotted as a time series until a sufficient number of data points are available to provide a 99% confidence nonparametric prediction limit. Thirteen independent measurements (with 1 resample) are necessary to achieve a 99% confidence (1% false positive rate) nonparametric prediction limit. Eight independent measurements (for pass 1 of 2 resamples) are necessary to achieve a 99% confidence nonparametric prediction limit. The nonparametric prediction limit is the largest determination out of the data set collected for that well and parameter. If the detection frequency is 0% after thirteen samples have been collected, the practical quantitation limit (PQL) becomes the nonparametric prediction limit.

In developing the statistical background, the historical data must be thoroughly screened for anomalous data due to sampling error, analytical error, or simply by chance alone. An erroneous data point, if not removed prior to the mean and variance computations, would yield a larger control limit thus increasing the false negative rate. The DUMPStat® program screens for outliers using the Dixon test. If the Dixon test indicates an outlier, the value is compared to three times the median value for intrawell analyses. If the value fails both criteria of the two-stage screening, the value is considered a statistical outlier and will not be used in the mean and variance determinations. Anomalous data will still be plotted on the graphs (with a unique symbol) but will not be included in the calculations.

The verification resample plan is an integral function of the statistical plan to reduce the probability that anomalous data obtained after the background has been established, is indicative of a landfill release.

The background data for each well and constituent is tested for existing trends using Sen's nonparametric estimate of trend. If contamination exists prior to completing the background, the control limits could be potentially high and this control chart method would not be able to detect an increasing trend unless the increase is severe.

Results of the Intrawell Statistics: First Semi-Annual Monitoring event in 2023

The arsenic, barium, iron, magnesium, ammonia, COD, chloride, pH, and specific conductivity data from wells MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, MW-24, and MW-26 were evaluated using the combined Shewhart-CUSUM control chart method. The previous background at each well included the five rounds of data obtained from April 2018 through April 2020. As ground water monitoring at a municipal solid waste facility proceeds, it is recommended to update background data sets periodically with valid detection monitoring results that are representative of background groundwater quality not affected by leakage from a monitored unit. Failure to update background will exclude factors such as natural temporal variation, changes in field or laboratory methodologies, and changes in the water table due to meteorological conditions or other influences. Since there have been no statistical failures attributed to the landfill, the background was updated to include data obtained from April 2018 through April 2022.

A summary of the intrawell statistics is included in Attachment C, Table 1 "Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts." The control charts or time series graphs follow the summary table. For the parameters evaluated, the statistical limit exceedances identified are summarized in the table below.

Control Limit Exceedances during the First Semi-Annual Monitoring Event in 2023

Well	Parameter	Result	CUSUM Value	Control Limit	Control Limit Type	Verified/ Awaiting verification
MW-22	Barium, µg/L	900	1027.5360	734.2578	Normal	Awaiting verification
	COD, mg/L	100	98.9862	14.1452	Normal	Awaiting verification
	Cobalt, µg/L	31.4	31.9109	14.3776	Normal	Awaiting verification

No increasing trends were detected in the background data.

A control chart factor was selected to provide a balance of the site-wide false positive and false negative rates. A statistical power curve indicates the expected false assessments for the site as a whole. For intrawell analysis, the site-wide false positive rate is 21% and the test becomes sensitive to 5 standard deviation units over background. The false positive rate is much higher than desired but will come down once more data are available.

Monitoring well MW-22 was resampled on May 24, 2023. The results of the resample analyses are summarized in the table below.

Results of the Resample analyses - May 24, 2023

Well	Parameter	Result	CUSUM Value	Control Limit	Control Limit Type	Comment
MW-22	Barium, µg/L	327	454.5360	734.2578	Normal	Exceed not verified
	COD, mg/L	<5.7	7.5556	14.1452	Normal	Exceed not verified
	Cobalt, µg/L	14.2	14.7109	14.3776	Normal	Exceedance verified

The cobalt resample confirmed the initial exceedance, however the background was obtained using only four data points which is less than the recommended eight rounds.

Results of the Interwell Statistics: Second Semi-Annual Monitoring event in 2023

Monitoring wells MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, MW-24, and MW-26 were sampled on October 18-24, 2023 and analyzed for the parameters required by permit. The background data used in this statistical analysis includes the ground water data collected from ground water well MW-26 during the period from April 2018 through October 2023. A summary of the background data from monitoring well MW-26 is listed in Attachment D, Table 1 "Upgradient Data". This statistical method compares the current downgradient determinations to site prediction limits and checks for exceedances.

Table 2 "Most Current Downgradient Monitoring Data", summarizes the October 2022 data from downgradient wells MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, and MW-24, compared to the site prediction limits. Prediction limit exceedances are flagged with asterisks. For the most current data, the site prediction limit exceedances detected are summarized in the table below.

Prediction Limit Exceedances during the Second Semi-Annual Monitoring Event in 2023

Well	Parameter	Result	Prediction Limit	Prediction Limit Type	Verified/ Awaiting verification
MW-1	Ammonia, mg/L	0.63	0.1340	Nonparametric	Verified
	Magnesium, mg/L	31.9	24.7158	Normal	Verified
	pH, SU	7.2	5.64 – 7.00	Normal	Verified
MW-2	Arsenic, µg/L	2.38	2.3779	Normal	Awaiting Verification
	Magnesium, mg/L	31.4	24.7158	Normal	Verified
MW-21	Barium, µg/L	301	249.7144	Normal	Verified
	Chloride, mg/L	174	102.9196	Normal	Verified
	Magnesium, mg/L	52.7	24.7158	Normal	Verified
	Specific conductance, µS	1350	943.2571	Normal	Verified
MW-22	Ammonia, mg/L	2.0	0.1340	Nonparametric	Verified
	Arsenic, µg/L	22.3	2.3779	Normal	Verified
	Barium, µg/L	259	249.7144	Normal	Verified
	Cobalt, µg/L	10.1	0.7500	Nonparametric	Verified
	Iron, µg/L	6540	1104.8345	Normal	Verified
	Magnesium, mg/L	33.2	24.7158	Normal	Verified
MW-23	Ammonia, mg/L	1.2	0.1340	Nonparametric	Verified
	Arsenic, µg/L	10.9	2.3779	Normal	Verified
	Cobalt, µg/L	1.34	0.7500	Nonparametric	Verified
	Iron, µg/L	1330	1104.8345	Normal	Verified
	Magnesium, mg/L	44.3	24.7158	Normal	Verified
	Specific conductance, µS	1118	943.2571	Normal	Verified

Prediction Limit Exceedances during the Second Semi-Annual Monitoring Event in 2023 (cont.)

Well	Parameter	Result	Prediction Limit	Prediction Limit Type	Verified/ Awaiting verification
MW-24	Ammonia, mg/L	0.77	0.1340	Nonparametric	Verified
	Magnesium, mg/L	31.2	24.7158	Normal	Verified
MW-3R1	Ammonia, mg/L	0.30	0.1340	Nonparametric	Verified
	Arsenic, µg/L	30.0	2.3779	Normal	Verified
	Cobalt, µg/L	11.4	0.7500	Nonparametric	Verified
	Iron, µg/L	8350	1104.8345	Normal	Verified
	Magnesium, mg/L	27.1	24.7158	Normal	Verified
MW-4	Ammonia, mg/L	1.6	0.1340	Nonparametric	Verified
	Arsenic, µg/L	17.4	2.3779	Normal	Verified
	Barium, µg/L	458	249.7144	Normal	Awaiting Verification
	Cobalt, µg/L	7.85	0.7500	Nonparametric	Verified
	Iron, µg/L	3930	1104.8345	Normal	Verified
	Magnesium, mg/L	36.9	24.7158	Normal	Verified

The detection frequencies of the parameters in the up and down gradient monitoring wells are summarized in Table 3. Arsenic, barium, chloride, iron, magnesium, pH, and specific conductance were detected at a frequency greater than or equal to 50% in the upgradient well so these parameters were tested for normality. The remainder of the parameters (ammonia and COD) are rarely detected (less than 50%) in the upgradient well so nonparametric prediction limits were be used in those cases.

Table 4 summarizes the results of the Shapiro-Wilk test. Table 5 is a summary of the statistics and prediction limits determined for the metals. Table 8 is a historical summary of the data at those wells that have indicated an exceedance. Time series graphs of each of the parameters at each well with the corresponding prediction limits are attached.

A statistical power curve indicates the expected false assessments for the site as a whole. The false positive rate for interwell analyses is the percentage of failures when the upgradient versus downgradient true mean difference equals zero. False negative rate indicates the chance of missing contamination at a single well for a single constituent. The statistical power is a function of the number of wells included, the number of constituents compared, the detection frequencies, and the data distributions involved. For interwell analysis, the site-wide false positive rate is 12% and the test becomes sensitive to 5 standard deviation unit increases over background.

Results of the Intrawell Statistics: Second Semi-Annual Monitoring event in 2023

The arsenic, barium, iron, magnesium, ammonia, COD, chloride, pH, and specific conductivity data from wells MW-1, MW-2, MW-3R1, MW-4, MW-21, MW-22, MW-23, MW-24, and MW-26 were evaluated using the combined Shewhart-CUSUM control chart method. The previous background at each well included the five rounds of data obtained from April 2018 through April 2020.

As ground water monitoring at a municipal solid waste facility proceeds, it is recommended to update background data sets periodically with valid detection monitoring results that are representative of background groundwater quality not affected by leakage from a monitored unit. Failure to update background will exclude factors such as natural temporal variation, changes in field or laboratory methodologies, and changes in the water table due to meteorological conditions or other influences. Since there have been no statistical failures attributed to the landfill, the background was updated to include data obtained from April 2018 through April 2022.

A summary of the intrawell statistics is included in Attachment E, Table 1 "Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts." The control charts or time series graphs follow the summary table. For the parameters evaluated, there were no statistical limit exceedances identified. No increasing trends were detected in the background data.

A control chart factor was selected to provide a balance of the site-wide false positive and false negative rates. A statistical power curve indicates the expected false assessments for the site as a whole. For intrawell analysis, the site-wide false positive rate is 21% and the test becomes sensitive to 4 standard deviation units over background. The false positive rate is much higher than desired but will come down once more data are available.

CONCLUSIONS

This document describes a comprehensive statistical plan designated for the Ash Monofill Facility. The ground water data was compared to background using both site prediction limits and intrawell control charts. Up-to down gradient comparisons were problematic due to having too few rounds of background data and the lack of special variability. It is recommended that a minimum of eight rounds of data are available prior to performing statistics. Also, having only one upgradient well, does not characterize the groundwater across the facility. Given the site data available, intrawell statistics are the most appropriate method for data comparisons at this time. For the most current data, there are no control limit exceedances detected.

Attachment A

Ground Water Data obtained in 2023

Table 1

Analytical Data Summary for 4/19/2023 to 4/20/2023

Constituents	Units	MW-1	MW-2	MW-21	MW-22	MW-23	MW-24	MW-26	MW-3R1	MW-4
Ammonia	mg/L	.610	<.104	<.104	2.600	1.200	.760	<.104	.400	.620
Arsenic, total	ug/L	3.32	1.19	1.54	17.80	18.10	<.90	<.90	61.20	11.70
Barium, total	ug/L	205	187	269	900	135	218	176	294	235
Chemical oxygen demand	mg/L	<5.7	<5.7	8.0	100.0	6.0	<5.7	<5.7	8.0	6.0
Chloride	mg/L	5.83	69.50	167.00	74.80	89.30	69.20	71.90	71.20	64.20
Cobalt, total	ug/L	<.75	1.25	<.75	31.40	2.00	2.09	<.75	13.00	8.29
Iron, total	ug/L	1270	1100	162	18300	2460	622	767	14900	3230
Magnesium, total	mg/L	28.3	27.9	47.0	46.0	39.4	28.8	19.7	33.2	25.2
pH	SU	7.33	6.47	6.92	6.71	6.99	6.91	6.57	6.59	6.69
Specific conductance	uS	711	859	1443	988	1151	862	709	836	782
Temperature	C	12.6	11.9	12.0	13.4	13.5	11.8	13.3	14.2	13.4

* - The displayed value is the arithmetic mean of multiple database matches.

Table 2

Analytical Data Summary for 5/24/2023

Constituents	Units	MW-22
Ammonia	mg/L	2.2
Arsenic, total	ug/L	23.7
Barium, total	ug/L	327
Chemical oxygen demand	mg/L	<5.7
Chloride	mg/L	76.8876
Cobalt, total	ug/L	14.2
Iron, total	ug/L	19400
Magnesium, total	mg/L	31.7
pH	SU	6.38
Specific conductance	uS	948
Temperature	C	18.7

* - The displayed value is the arithmetic mean of multiple database matches.

Table 3

Analytical Data Summary for 10/18/2023 to 10/24/2023

Constituents	Units	MW-1	MW-2	MW-21	MW-22	MW-23	MW-24	MW-26	MW-3R1	MW-4
Ammonia	mg/L	.630	<.104	<.104	2.000	1.200	.770	<.104	.300	1.600
Arsenic, total	ug/L	2.27	2.38	<1.45	22.30	10.90	<1.45	<1.45	30.00	17.40
Barium, total	ug/L	204	197	301	259	134	158	123	219	458
Chemical oxygen demand	mg/L	<5.7	<5.7	6.0	<5.7	<5.7	<5.7	<5.7	<5.7	<5.7
Chloride	mg/L	5.61	56.90	174.00	70.70	83.80	83.20	48.10	50.50	76.50
Cobalt, total	ug/L	<.65	<.65	<.65	10.10	1.34	<.65	<.65	11.40	7.85
Iron, total	ug/L	779	757	126	6540	1330	528	610	8350	3930
Magnesium, total	mg/L	31.9	31.4	52.7	33.2	44.3	31.2	12.5	27.1	36.9
pH	SU	7.2	6.7	6.9	6.8	6.8	7.0	6.4	6.7	6.8
Specific conductance	uS	707	701	1350	927	1118	885	461	760	869
Temperature	C	16.0	16.2	14.5	17.4	12.6	13.4	13.9	16.6	13.5

* - The displayed value is the arithmetic mean of multiple database matches.

Attachment B

Summary Tables and Graphs for the Interwell Comparisons
First Semi-Annual Monitoring Event in 2023

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Ammonia	mg/L	MW-26	04/26/2018	ND	0.5000	0.1340	**
Ammonia	mg/L	MW-26	10/15/2018	ND	0.5000	0.1340	**
Ammonia	mg/L	MW-26	04/23/2019	ND	0.5000	0.1340	**
Ammonia	mg/L	MW-26	10/22/2019	ND	0.2000	0.1340	**
Ammonia	mg/L	MW-26	04/21/2020	ND	0.1000	0.1340	**
Ammonia	mg/L	MW-26	10/12/2020	ND	0.2800	0.1340	**
Ammonia	mg/L	MW-26	04/14/2021	ND	0.1340		
Ammonia	mg/L	MW-26	10/19/2021	ND	0.1340		
Ammonia	mg/L	MW-26	04/14/2022	ND	0.1340		
Ammonia	mg/L	MW-26	10/13/2022	ND	0.1140	0.1340	**
Ammonia	mg/L	MW-26	04/19/2023	ND	0.1040	0.1340	**
Arsenic, total	ug/L	MW-26	04/26/2018		0.4500		
Arsenic, total	ug/L	MW-26	10/15/2018	ND	0.5700	0.9000	**
Arsenic, total	ug/L	MW-26	04/23/2019		0.3600		
Arsenic, total	ug/L	MW-26	10/22/2019	ND	0.7500	0.9000	**
Arsenic, total	ug/L	MW-26	04/21/2020		2.2700		
Arsenic, total	ug/L	MW-26	10/12/2020		0.5500		
Arsenic, total	ug/L	MW-26	04/14/2021		0.4700		
Arsenic, total	ug/L	MW-26	10/19/2021	ND	5.7500	0.9000	**
Arsenic, total	ug/L	MW-26	04/14/2022	ND	1.1500	0.9000	**
Arsenic, total	ug/L	MW-26	10/13/2022		1.0900		
Arsenic, total	ug/L	MW-26	04/19/2023	ND	0.9000		
Barium, total	ug/L	MW-26	04/26/2018		137.0000		
Barium, total	ug/L	MW-26	10/15/2018		185.0000		
Barium, total	ug/L	MW-26	04/23/2019		193.0000		
Barium, total	ug/L	MW-26	10/22/2019		104.0000		
Barium, total	ug/L	MW-26	04/21/2020		176.0000		
Barium, total	ug/L	MW-26	10/12/2020		102.0000		
Barium, total	ug/L	MW-26	04/14/2021		155.0000		
Barium, total	ug/L	MW-26	10/19/2021		73.0000		
Barium, total	ug/L	MW-26	04/14/2022		139.0000		
Barium, total	ug/L	MW-26	10/13/2022		162.0000		
Barium, total	ug/L	MW-26	04/19/2023		176.0000		
Chemical oxygen demand	mg/L	MW-26	04/26/2018		6.0000		
Chemical oxygen demand	mg/L	MW-26	10/15/2018	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/23/2019	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	10/22/2019	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/21/2020		8.0000		
Chemical oxygen demand	mg/L	MW-26	10/12/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/14/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	10/19/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/14/2022	ND	5.7000	7.0000	**
Chemical oxygen demand	mg/L	MW-26	10/13/2022	ND	5.7000	7.0000	**
Chemical oxygen demand	mg/L	MW-26	04/19/2023	ND	5.7000	7.0000	**
Chloride	mg/L	MW-26	04/26/2018		33.7000		
Chloride	mg/L	MW-26	10/15/2018		51.4100		
Chloride	mg/L	MW-26	04/23/2019		71.5000		
Chloride	mg/L	MW-26	10/22/2019		20.0000		
Chloride	mg/L	MW-26	04/21/2020		41.4000		
Chloride	mg/L	MW-26	10/12/2020		27.3000		
Chloride	mg/L	MW-26	04/14/2021		58.6000		
Chloride	mg/L	MW-26	10/19/2021		28.9180		
Chloride	mg/L	MW-26	04/14/2022		54.8900		
Chloride	mg/L	MW-26	10/13/2022		78.4000		
Chloride	mg/L	MW-26	04/19/2023		71.9000		
Cobalt, total	ug/L	MW-26	10/12/2020		0.5200		
Cobalt, total	ug/L	MW-26	04/14/2021	ND	0.5000	0.7500	**
Cobalt, total	ug/L	MW-26	10/19/2021	ND	6.2500	0.7500	**
Cobalt, total	ug/L	MW-26	04/14/2022	ND	1.2500	0.7500	**
Cobalt, total	ug/L	MW-26	10/13/2022	ND	0.7500		
Cobalt, total	ug/L	MW-26	04/19/2023	ND	0.7500		
Iron, total	ug/L	MW-26	04/26/2018		310.0000		
Iron, total	ug/L	MW-26	10/15/2018		380.0000		
Iron, total	ug/L	MW-26	04/23/2019		252.0000		
Iron, total	ug/L	MW-26	10/22/2019		516.0000		
Iron, total	ug/L	MW-26	04/21/2020		50.0000		*
Iron, total	ug/L	MW-26	10/12/2020		615.0000		
Iron, total	ug/L	MW-26	04/14/2021		510.0000		
Iron, total	ug/L	MW-26	10/19/2021	ND	272.6000		
Iron, total	ug/L	MW-26	04/14/2022	ND	681.5000	272.6000	**
Iron, total	ug/L	MW-26	10/13/2022		376.0000		
Iron, total	ug/L	MW-26	04/19/2023		767.0000		
Magnesium, total	mg/L	MW-26	04/26/2018		12.1000		
Magnesium, total	mg/L	MW-26	10/15/2018		17.6000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Magnesium, total	mg/L	MW-26	04/23/2019		17.8000		
Magnesium, total	mg/L	MW-26	10/22/2019		9.7900		
Magnesium, total	mg/L	MW-26	04/21/2020		9.8300		
Magnesium, total	mg/L	MW-26	10/12/2020		8.6100		
Magnesium, total	mg/L	MW-26	04/14/2021		11.9000		
Magnesium, total	mg/L	MW-26	10/19/2021		6.4900		
Magnesium, total	mg/L	MW-26	04/14/2022		14.5000		
Magnesium, total	mg/L	MW-26	10/13/2022		16.3000		
Magnesium, total	mg/L	MW-26	04/19/2023		19.7000		
pH	SU	MW-26	04/26/2018		6.0500		
pH	SU	MW-26	10/15/2018		6.3000		
pH	SU	MW-26	04/23/2019		6.2400		
pH	SU	MW-26	10/22/2019		6.3400		
pH	SU	MW-26	04/21/2020		6.0800		
pH	SU	MW-26	10/12/2020		6.2800		
pH	SU	MW-26	04/14/2021		6.1000		
pH	SU	MW-26	10/19/2021		6.3000		
pH	SU	MW-26	04/14/2022		6.8000		
pH	SU	MW-26	10/13/2022		6.3400		
pH	SU	MW-26	04/19/2023		6.5700		
Specific conductance	uS	MW-26	04/26/2018		143.0000		
Specific conductance	uS	MW-26	10/15/2018		545.0000		
Specific conductance	uS	MW-26	04/23/2019		649.0000		
Specific conductance	uS	MW-26	10/22/2019		305.0000		
Specific conductance	uS	MW-26	04/21/2020		389.0000		
Specific conductance	uS	MW-26	10/12/2020		319.0000		
Specific conductance	uS	MW-26	04/14/2021		546.0000		
Specific conductance	uS	MW-26	10/19/2021		355.0000		
Specific conductance	uS	MW-26	04/14/2022		538.0000		
Specific conductance	uS	MW-26	10/13/2022		646.0000		
Specific conductance	uS	MW-26	04/19/2023		709.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Ammonia	mg/L	MW-1	04/19/2023		0.6100	***	0.1340
Arsenic, total	ug/L	MW-1	04/19/2023		3.3200	***	2.5115
Barium, total	ug/L	MW-1	04/19/2023		205.0000		257.5150
Chemical oxygen demand	mg/L	MW-1	04/19/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-1	04/19/2023		5.8300		106.8866
Cobalt, total	ug/L	MW-1	04/19/2023	ND	0.7500		0.7500
Iron, total	ug/L	MW-1	04/19/2023		1270.0000	***	1107.8926
Magnesium, total	mg/L	MW-1	04/19/2023		28.3000	***	25.5959
pH	SU	MW-1	04/19/2023		7.3300	***	5.58 - 7.03
Specific conductance	uS	MW-1	04/19/2023		711.0000		978.1522
Ammonia	mg/L	MW-2	04/19/2023	ND	0.1040		0.1340
Arsenic, total	ug/L	MW-2	04/19/2023		1.1900		2.5115
Barium, total	ug/L	MW-2	04/19/2023		187.0000	**	257.5150
Chemical oxygen demand	mg/L	MW-2	04/19/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-2	04/19/2023		69.5000		106.8866
Cobalt, total	ug/L	MW-2	04/19/2023		1.2500	***	0.7500
Iron, total	ug/L	MW-2	04/19/2023		1100.0000		1107.8926
Magnesium, total	mg/L	MW-2	04/19/2023		27.9000	*	25.5959
pH	SU	MW-2	04/19/2023		6.4700		5.58 - 7.03
Specific conductance	uS	MW-2	04/19/2023		859.0000		978.1522
Ammonia	mg/L	MW-21	04/19/2023	ND	0.1040		0.1340
Arsenic, total	ug/L	MW-21	04/19/2023		1.5400		2.5115
Barium, total	ug/L	MW-21	04/19/2023		269.0000	***	257.5150
Chemical oxygen demand	mg/L	MW-21	04/19/2023		8.0000		8.0000
Chloride	mg/L	MW-21	04/19/2023		167.0000	***	106.8866
Cobalt, total	ug/L	MW-21	04/19/2023	ND	0.7500		0.7500
Iron, total	ug/L	MW-21	04/19/2023		162.0000		1107.8926
Magnesium, total	mg/L	MW-21	04/19/2023		47.0000	***	25.5959
pH	SU	MW-21	04/19/2023		6.9200		5.58 - 7.03
Specific conductance	uS	MW-21	04/19/2023		1443.0000	***	978.1522
Ammonia	mg/L	MW-22	04/20/2023		2.6000	***	0.1340
Arsenic, total	ug/L	MW-22	04/20/2023		17.8000	***	2.5115
Barium, total	ug/L	MW-22	04/20/2023		900.0000	***	257.5150
Chemical oxygen demand	mg/L	MW-22	04/20/2023		100.0000	*	8.0000
Chloride	mg/L	MW-22	04/20/2023		74.8000		106.8866
Cobalt, total	ug/L	MW-22	04/20/2023		31.4000	***	0.7500
Iron, total	ug/L	MW-22	04/20/2023		18300.0000	***	1107.8926
Magnesium, total	mg/L	MW-22	04/20/2023		46.0000	***	25.5959
pH	SU	MW-22	04/20/2023		6.7100		5.58 - 7.03
Specific conductance	uS	MW-22	04/20/2023		988.0000	***	978.1522
Ammonia	mg/L	MW-23	04/19/2023		1.2000	***	0.1340
Arsenic, total	ug/L	MW-23	04/19/2023		18.1000	***	2.5115
Barium, total	ug/L	MW-23	04/19/2023		135.0000		257.5150
Chemical oxygen demand	mg/L	MW-23	04/19/2023		6.0000		8.0000
Chloride	mg/L	MW-23	04/19/2023		89.3000		106.8866
Cobalt, total	ug/L	MW-23	04/19/2023		2.0000	***	0.7500
Iron, total	ug/L	MW-23	04/19/2023		2460.0000	***	1107.8926
Magnesium, total	mg/L	MW-23	04/19/2023		39.4000	***	25.5959
pH	SU	MW-23	04/19/2023		6.9900	**	5.58 - 7.03
Specific conductance	uS	MW-23	04/19/2023		1151.0000	***	978.1522
Ammonia	mg/L	MW-24	04/19/2023		0.7600	***	0.1340
Arsenic, total	ug/L	MW-24	04/19/2023	ND	0.9000		2.5115
Barium, total	ug/L	MW-24	04/19/2023		218.0000	**	257.5150
Chemical oxygen demand	mg/L	MW-24	04/19/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-24	04/19/2023		69.2000		106.8866
Cobalt, total	ug/L	MW-24	04/19/2023		2.0900	***	0.7500
Iron, total	ug/L	MW-24	04/19/2023		622.0000		1107.8926
Magnesium, total	mg/L	MW-24	04/19/2023		28.8000	***	25.5959
pH	SU	MW-24	04/19/2023		6.9100	**	5.58 - 7.03
Specific conductance	uS	MW-24	04/19/2023		862.0000	**	978.1522
Ammonia	mg/L	MW-3R1	04/19/2023		0.4000	***	0.1340
Arsenic, total	ug/L	MW-3R1	04/19/2023		61.2000	***	2.5115
Barium, total	ug/L	MW-3R1	04/19/2023		294.0000	***	257.5150
Chemical oxygen demand	mg/L	MW-3R1	04/19/2023		8.0000		8.0000
Chloride	mg/L	MW-3R1	04/19/2023		71.2000		106.8866
Cobalt, total	ug/L	MW-3R1	04/19/2023		13.0000	***	0.7500
Iron, total	ug/L	MW-3R1	04/19/2023		14900.0000	***	1107.8926
Magnesium, total	mg/L	MW-3R1	04/19/2023		33.2000	***	25.5959
pH	SU	MW-3R1	04/19/2023		6.5900		5.58 - 7.03
Specific conductance	uS	MW-3R1	04/19/2023		836.0000		978.1522
Ammonia	mg/L	MW-4	04/19/2023		0.6200	***	0.1340
Arsenic, total	ug/L	MW-4	04/19/2023		11.7000	***	2.5115

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Barium, total	ug/L	MW-4	04/19/2023		235.0000	**	257.5150
Chemical oxygen demand	mg/L	MW-4	04/19/2023		6.0000		8.0000
Chloride	mg/L	MW-4	04/19/2023		64.2000		106.8866
Cobalt, total	ug/L	MW-4	04/19/2023		8.2900	***	0.7500
Iron, total	ug/L	MW-4	04/19/2023		3230.0000	***	1107.8926
Magnesium, total	mg/L	MW-4	04/19/2023		25.2000	**	25.5959
pH	SU	MW-4	04/19/2023		6.6900		5.58 - 7.03
Specific conductance	uS	MW-4	04/19/2023		782.0000		978.1522

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 3

Detection Frequencies in Upgradient and Downgradient Wells

Constituent	Detect	Upgradient N	Proportion	Detect	Downgradient N	Proportion
Ammonia	0	11	0.000	66	88	0.750
Arsenic, total	6	11	0.545	79	88	0.898
Barium, total	11	11	1.000	88	88	1.000
Chemical oxygen demand	2	11	0.182	43	87	0.494
Chloride	11	11	1.000	88	88	1.000
Cobalt, total	1	6	0.167	36	48	0.750
Iron, total	8	10	0.800	77	88	0.875
Magnesium, total	11	11	1.000	88	88	1.000
pH	11	11	1.000	88	88	1.000
Specific conductance	11	11	1.000	88	88	1.000

N = Total number of measurements in all wells.
Detect = Total number of detections in all wells.
Proportion = Detect/N.

Table 4

Shapiro-Wilk Multiple Group Test of Normality

Constituent	Detect	N	Detect Freq	G raw	G log	G cbrt	G sqrt	G sqr	G cub	Crit Value	Dist Form	Model Type
Ammonia	0	11	0.000									nonpar
Arsenic, total	6	11	0.545	2.132	0.900					2.326	normal	normal
Barium, total	11	11	1.000	0.283	1.146					2.326	normal	normal
Chemical oxygen demand	2	11	0.182									nonpar
Chloride	11	11	1.000	0.016	0.118					2.326	normal	normal
Cobalt, total	1	6	0.167									nonpar
Iron, total	8	10	0.800	0.569	1.540					2.326	normal	normal
Magnesium, total	11	11	1.000	0.400	0.284					2.326	normal	normal
pH	11	11	1.000	1.116	0.980					2.326	normal	normal
Specific conductance	11	11	1.000	0.070	1.307					2.326	normal	normal

* - Distribution override for that constituent.
Fit to distribution is confirmed if G <= critical value.
Model type may not match distributional form when detection frequency < 50%.

Table 5

Summary Statistics and Prediction Limits

Constituent	Units	Detect	N	Mean	SD	alpha	Factor	Pred Limit	Type		Conf
Ammonia	mg/L	0	11					0.1340	nonpar	***	0.91
Arsenic, total	ug/L	6	11	0.4718	0.7067	0.0100	2.8863	2.5115	normal		
Barium, total	ug/L	11	11	145.6364	38.7615	0.0100	2.8863	257.5150	normal		
Chemical oxygen demand	mg/L	2	11					8.0000	nonpar		0.91
Chloride	mg/L	11	11	48.9107	20.0864	0.0100	2.8863	106.8866	normal		
Cobalt, total	ug/L	1	6					0.7500	nonpar	***	0.80
Iron, total	ug/L	8	10	372.6000	248.4929	0.0100	2.9590	1107.8926	normal		
Magnesium, total	mg/L	11	11	13.1473	4.3130	0.0100	2.8863	25.5959	normal		
pH	SU	11	11	6.3091	0.2191	0.0100	3.3097	5.58 - 7.03	normal		
Specific conductance	uS	11	11	467.6364	176.8736	0.0100	2.8863	978.1522	normal		

Conf = confidence level for passing initial test or one verification resample at all downgradient wells for a single constituent (nonparametric test only).
* - Insufficient Data.
** - Calculated limit raised to Manual Reporting Limit.
*** - Nonparametric limit based on ND value.
For transformed data, mean and SD in transformed units and prediction limit in original units.
All sample sizes and statistics are based on outlier free data.
For nonparametric limits, median reporting limits are substituted for extreme reporting limit values.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Ammonia	mg/L	MW-1	04/26/2018		1.0000	*	0.1340
Ammonia	mg/L	MW-1	10/15/2018		0.5300	*	0.1340
Ammonia	mg/L	MW-1	04/23/2019		1.1000	*	0.1340
Ammonia	mg/L	MW-1	10/22/2019		0.9100	*	0.1340
Ammonia	mg/L	MW-1	04/21/2020		0.5800	*	0.1340
Ammonia	mg/L	MW-1	10/13/2020		0.7100	*	0.1340
Ammonia	mg/L	MW-1	04/14/2021		0.6300	*	0.1340
Ammonia	mg/L	MW-1	10/19/2021		0.6500	*	0.1340
Ammonia	mg/L	MW-1	04/14/2022		0.7400	*	0.1340
Ammonia	mg/L	MW-1	10/13/2022		0.6300	*	0.1340
Ammonia	mg/L	MW-1	04/19/2023		0.6100	*	0.1340
Arsenic, total	ug/L	MW-1	04/26/2018		2.4000		2.5115
Arsenic, total	ug/L	MW-1	10/15/2018		1.3700		2.5115
Arsenic, total	ug/L	MW-1	04/23/2019		4.0200	*	2.5115
Arsenic, total	ug/L	MW-1	10/22/2019		3.9600	*	2.5115
Arsenic, total	ug/L	MW-1	04/21/2020		3.6500	*	2.5115
Arsenic, total	ug/L	MW-1	10/13/2020		3.7500	*	2.5115
Arsenic, total	ug/L	MW-1	04/14/2021		5.6100	*	2.5115
Arsenic, total	ug/L	MW-1	10/19/2021	ND	0.2300		2.5115
Arsenic, total	ug/L	MW-1	04/14/2022		3.4700	*	2.5115
Arsenic, total	ug/L	MW-1	10/13/2022		3.7100	*	2.5115
Arsenic, total	ug/L	MW-1	04/19/2023		3.3200	*	2.5115
Iron, total	ug/L	MW-1	04/26/2018		2840.0000	*	1107.8926
Iron, total	ug/L	MW-1	10/15/2018		1900.0000	*	1107.8926
Iron, total	ug/L	MW-1	04/23/2019		6880.0000	*	1107.8926
Iron, total	ug/L	MW-1	10/22/2019		5820.0000	*	1107.8926
Iron, total	ug/L	MW-1	04/21/2020		45.8000		1107.8926
Iron, total	ug/L	MW-1	10/13/2020		5900.0000	*	1107.8926
Iron, total	ug/L	MW-1	04/14/2021		9720.0000	*	1107.8926
Iron, total	ug/L	MW-1	10/19/2021		4090.0000	*	1107.8926
Iron, total	ug/L	MW-1	04/14/2022		4100.0000	*	1107.8926
Iron, total	ug/L	MW-1	10/13/2022		4910.0000	*	1107.8926
Iron, total	ug/L	MW-1	04/19/2023		1270.0000	*	1107.8926
Magnesium, total	mg/L	MW-1	04/26/2018		29.0000	*	25.5959
Magnesium, total	mg/L	MW-1	10/15/2018		32.0000	*	25.5959
Magnesium, total	mg/L	MW-1	04/23/2019		20.7000		25.5959
Magnesium, total	mg/L	MW-1	10/22/2019		25.8000	*	25.5959
Magnesium, total	mg/L	MW-1	04/21/2020		23.5000		25.5959
Magnesium, total	mg/L	MW-1	10/13/2020		24.2000		25.5959
Magnesium, total	mg/L	MW-1	04/14/2021		29.3000	*	25.5959
Magnesium, total	mg/L	MW-1	10/19/2021		20.9000		25.5959
Magnesium, total	mg/L	MW-1	04/14/2022		28.7000	*	25.5959
Magnesium, total	mg/L	MW-1	10/13/2022		29.2000	*	25.5959
Magnesium, total	mg/L	MW-1	04/19/2023		28.3000	*	25.5959
pH	SU	MW-1	04/26/2018		6.5000		5.58 - 7.03
pH	SU	MW-1	10/15/2018		7.2200	*	5.58 - 7.03
pH	SU	MW-1	04/23/2019		7.0300		5.58 - 7.03
pH	SU	MW-1	10/22/2019		7.2100	*	5.58 - 7.03
pH	SU	MW-1	04/21/2020		7.2300	*	5.58 - 7.03
pH	SU	MW-1	10/13/2020		7.0300		5.58 - 7.03
pH	SU	MW-1	04/14/2021		7.4000	*	5.58 - 7.03
pH	SU	MW-1	10/19/2021		7.4000	*	5.58 - 7.03
pH	SU	MW-1	04/14/2022		7.5000	*	5.58 - 7.03
pH	SU	MW-1	10/13/2022		7.1700	*	5.58 - 7.03
pH	SU	MW-1	04/19/2023		7.3300	*	5.58 - 7.03
Barium, total	ug/L	MW-2	04/27/2018		173.0000		257.5150
Barium, total	ug/L	MW-2	10/16/2018		153.0000		257.5150
Barium, total	ug/L	MW-2	04/24/2019		144.0000		257.5150
Barium, total	ug/L	MW-2	10/23/2019		182.0000		257.5150
Barium, total	ug/L	MW-2	04/21/2020		210.0000		257.5150
Barium, total	ug/L	MW-2	10/13/2020		220.0000		257.5150
Barium, total	ug/L	MW-2	04/15/2021		132.0000		257.5150
Barium, total	ug/L	MW-2	10/20/2021		229.0000		257.5150
Barium, total	ug/L	MW-2	04/15/2022		226.0000		257.5150
Barium, total	ug/L	MW-2	10/14/2022		262.0000	*	257.5150
Barium, total	ug/L	MW-2	04/19/2023		187.0000		257.5150
Cobalt, total	ug/L	MW-2	10/13/2020		8.6300	*	0.7500
Cobalt, total	ug/L	MW-2	04/15/2021		2.1800	*	0.7500
Cobalt, total	ug/L	MW-2	10/20/2021		8.8000	*	0.7500
Cobalt, total	ug/L	MW-2	04/15/2022		6.1800	*	0.7500
Cobalt, total	ug/L	MW-2	10/14/2022		8.0600	*	0.7500

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Cobalt, total	ug/L	MW-2	04/19/2023		1.2500	*	0.7500
Magnesium, total	mg/L	MW-2	04/27/2018		23.9000		25.5959
Magnesium, total	mg/L	MW-2	10/16/2018		23.3000		25.5959
Magnesium, total	mg/L	MW-2	04/24/2019		20.1000		25.5959
Magnesium, total	mg/L	MW-2	10/23/2019		22.3000		25.5959
Magnesium, total	mg/L	MW-2	04/21/2020		23.0000		25.5959
Magnesium, total	mg/L	MW-2	10/13/2020		21.5000		25.5959
Magnesium, total	mg/L	MW-2	04/15/2021		21.9000		25.5959
Magnesium, total	mg/L	MW-2	10/20/2021		17.1000		25.5959
Magnesium, total	mg/L	MW-2	04/15/2022		28.4000	*	25.5959
Magnesium, total	mg/L	MW-2	10/14/2022		21.2000		25.5959
Magnesium, total	mg/L	MW-2	04/19/2023		27.9000	*	25.5959
Barium, total	ug/L	MW-21	04/26/2018		406.0000	*	257.5150
Barium, total	ug/L	MW-21	10/15/2018		372.0000	*	257.5150
Barium, total	ug/L	MW-21	04/24/2019		413.0000	*	257.5150
Barium, total	ug/L	MW-21	10/22/2019		438.0000	*	257.5150
Barium, total	ug/L	MW-21	04/21/2020		401.0000	*	257.5150
Barium, total	ug/L	MW-21	10/13/2020		338.0000	*	257.5150
Barium, total	ug/L	MW-21	04/14/2021		347.0000	*	257.5150
Barium, total	ug/L	MW-21	10/20/2021		229.0000		257.5150
Barium, total	ug/L	MW-21	04/14/2022		325.0000	*	257.5150
Barium, total	ug/L	MW-21	10/13/2022		307.0000	*	257.5150
Barium, total	ug/L	MW-21	04/19/2023		269.0000	*	257.5150
Chloride	mg/L	MW-21	04/26/2018		224.0000	*	106.8866
Chloride	mg/L	MW-21	10/15/2018		194.9500	*	106.8866
Chloride	mg/L	MW-21	04/24/2019		224.0000	*	106.8866
Chloride	mg/L	MW-21	10/22/2019		217.0000	*	106.8866
Chloride	mg/L	MW-21	04/21/2020		227.0000	*	106.8866
Chloride	mg/L	MW-21	10/13/2020		245.0000	*	106.8866
Chloride	mg/L	MW-21	04/14/2021		238.0000	*	106.8866
Chloride	mg/L	MW-21	10/20/2021		195.9450	*	106.8866
Chloride	mg/L	MW-21	04/14/2022		178.0400	*	106.8866
Chloride	mg/L	MW-21	10/13/2022		162.0000	*	106.8866
Chloride	mg/L	MW-21	04/19/2023		167.0000	*	106.8866
Magnesium, total	mg/L	MW-21	04/26/2018		60.1000	*	25.5959
Magnesium, total	mg/L	MW-21	10/15/2018		55.3000	*	25.5959
Magnesium, total	mg/L	MW-21	04/24/2019		58.7000	*	25.5959
Magnesium, total	mg/L	MW-21	10/22/2019		58.0000	*	25.5959
Magnesium, total	mg/L	MW-21	04/21/2020		59.6000	*	25.5959
Magnesium, total	mg/L	MW-21	10/13/2020		56.8000	*	25.5959
Magnesium, total	mg/L	MW-21	04/14/2021		55.4000	*	25.5959
Magnesium, total	mg/L	MW-21	10/20/2021		36.9000	*	25.5959
Magnesium, total	mg/L	MW-21	04/14/2022		51.5000	*	25.5959
Magnesium, total	mg/L	MW-21	10/13/2022		43.9000	*	25.5959
Magnesium, total	mg/L	MW-21	04/19/2023		47.0000	*	25.5959
Specific conductance	uS	MW-21	04/26/2018		1554.0000	*	978.1522
Specific conductance	uS	MW-21	10/15/2018		1391.0000	*	978.1522
Specific conductance	uS	MW-21	04/24/2019		1590.0000	*	978.1522
Specific conductance	uS	MW-21	10/22/2019		1532.0000	*	978.1522
Specific conductance	uS	MW-21	04/21/2020		1661.0000	*	978.1522
Specific conductance	uS	MW-21	10/13/2020		1542.0000	*	978.1522
Specific conductance	uS	MW-21	04/14/2021		1649.0000	*	978.1522
Specific conductance	uS	MW-21	10/20/2021		1480.0000	*	978.1522
Specific conductance	uS	MW-21	04/14/2022		1484.0000	*	978.1522
Specific conductance	uS	MW-21	10/13/2022		1520.0000	*	978.1522
Specific conductance	uS	MW-21	04/19/2023		1443.0000	*	978.1522
Ammonia	mg/L	MW-22	04/27/2018		6.4000	*	0.1340
Ammonia	mg/L	MW-22	10/16/2018		4.0000	*	0.1340
Ammonia	mg/L	MW-22	04/24/2019		3.7000	*	0.1340
Ammonia	mg/L	MW-22	10/23/2019		3.9000	*	0.1340
Ammonia	mg/L	MW-22	04/21/2020		5.9000	*	0.1340
Ammonia	mg/L	MW-22	10/13/2020		4.9000	*	0.1340
Ammonia	mg/L	MW-22	04/15/2021		3.6000	*	0.1340
Ammonia	mg/L	MW-22	10/20/2021		2.8000	*	0.1340
Ammonia	mg/L	MW-22	04/15/2022		3.8000	*	0.1340
Ammonia	mg/L	MW-22	10/14/2022		2.8000	*	0.1340
Ammonia	mg/L	MW-22	04/20/2023		2.6000	*	0.1340
Arsenic, total	ug/L	MW-22	04/27/2018		19.0000	*	2.5115
Arsenic, total	ug/L	MW-22	10/16/2018		14.6000	*	2.5115
Arsenic, total	ug/L	MW-22	04/24/2019		19.8000	*	2.5115
Arsenic, total	ug/L	MW-22	10/23/2019		16.0000	*	2.5115

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Arsenic, total	ug/L	MW-22	04/21/2020		11.6000	*	2.5115
Arsenic, total	ug/L	MW-22	10/13/2020		7.4200	*	2.5115
Arsenic, total	ug/L	MW-22	04/15/2021		15.0000	*	2.5115
Arsenic, total	ug/L	MW-22	10/20/2021		15.2000	*	2.5115
Arsenic, total	ug/L	MW-22	04/15/2022		16.0000	*	2.5115
Arsenic, total	ug/L	MW-22	10/14/2022		25.0000	*	2.5115
Arsenic, total	ug/L	MW-22	04/20/2023		17.8000	*	2.5115
Barium, total	ug/L	MW-22	04/27/2018		315.0000	*	257.5150
Barium, total	ug/L	MW-22	10/16/2018		225.0000		257.5150
Barium, total	ug/L	MW-22	04/24/2019		281.0000	*	257.5150
Barium, total	ug/L	MW-22	10/23/2019		269.0000	*	257.5150
Barium, total	ug/L	MW-22	04/21/2020		440.0000	*	257.5150
Barium, total	ug/L	MW-22	10/13/2020		318.0000	*	257.5150
Barium, total	ug/L	MW-22	04/15/2021		326.0000	*	257.5150
Barium, total	ug/L	MW-22	10/20/2021		241.0000		257.5150
Barium, total	ug/L	MW-22	04/15/2022		361.0000	*	257.5150
Barium, total	ug/L	MW-22	10/14/2022		567.0000	*	257.5150
Barium, total	ug/L	MW-22	04/20/2023		900.0000	*	257.5150
Chemical oxygen demand	mg/L	MW-22	04/27/2018		8.0000		8.0000
Chemical oxygen demand	mg/L	MW-22	10/16/2018	ND	7.0000		8.0000
Chemical oxygen demand	mg/L	MW-22	04/24/2019		10.0000	*	8.0000
Chemical oxygen demand	mg/L	MW-22	10/23/2019	ND	7.0000		8.0000
Chemical oxygen demand	mg/L	MW-22	04/21/2020		8.0000		8.0000
Chemical oxygen demand	mg/L	MW-22	10/13/2020	ND	7.0000		8.0000
Chemical oxygen demand	mg/L	MW-22	04/15/2021	ND	7.0000		8.0000
Chemical oxygen demand	mg/L	MW-22	10/20/2021	ND	7.0000		8.0000
Chemical oxygen demand	mg/L	MW-22	04/15/2022	ND	5.7000		8.0000
Chemical oxygen demand	mg/L	MW-22	10/14/2022	ND	5.7000		8.0000
Chemical oxygen demand	mg/L	MW-22	04/20/2023		100.0000	*	8.0000
Cobalt, total	ug/L	MW-22	10/13/2020		8.0000	*	0.7500
Cobalt, total	ug/L	MW-22	04/15/2021		8.2400	*	0.7500
Cobalt, total	ug/L	MW-22	10/20/2021		7.4400	*	0.7500
Cobalt, total	ug/L	MW-22	04/15/2022		9.6300	*	0.7500
Cobalt, total	ug/L	MW-22	10/14/2022		10.7000	*	0.7500
Cobalt, total	ug/L	MW-22	04/20/2023		31.4000	*	0.7500
Iron, total	ug/L	MW-22	04/27/2018		12800.0000	*	1107.8926
Iron, total	ug/L	MW-22	10/16/2018		8130.0000	*	1107.8926
Iron, total	ug/L	MW-22	04/24/2019		18200.0000	*	1107.8926
Iron, total	ug/L	MW-22	10/23/2019		13600.0000	*	1107.8926
Iron, total	ug/L	MW-22	04/21/2020		93.3000		1107.8926
Iron, total	ug/L	MW-22	10/13/2020		3990.0000	*	1107.8926
Iron, total	ug/L	MW-22	04/15/2021		11700.0000	*	1107.8926
Iron, total	ug/L	MW-22	10/20/2021		9990.0000	*	1107.8926
Iron, total	ug/L	MW-22	04/15/2022		12000.0000	*	1107.8926
Iron, total	ug/L	MW-22	10/14/2022		19600.0000	*	1107.8926
Iron, total	ug/L	MW-22	04/20/2023		18300.0000	*	1107.8926
Magnesium, total	mg/L	MW-22	04/27/2018		33.6000	*	25.5959
Magnesium, total	mg/L	MW-22	10/16/2018		27.9000	*	25.5959
Magnesium, total	mg/L	MW-22	04/24/2019		31.6000	*	25.5959
Magnesium, total	mg/L	MW-22	10/23/2019		28.5000	*	25.5959
Magnesium, total	mg/L	MW-22	04/21/2020		33.1000	*	25.5959
Magnesium, total	mg/L	MW-22	10/13/2020		32.6000	*	25.5959
Magnesium, total	mg/L	MW-22	04/15/2021		32.9000	*	25.5959
Magnesium, total	mg/L	MW-22	10/20/2021		24.6000		25.5959
Magnesium, total	mg/L	MW-22	04/15/2022		35.1000	*	25.5959
Magnesium, total	mg/L	MW-22	10/14/2022		33.2000	*	25.5959
Magnesium, total	mg/L	MW-22	04/20/2023		46.0000	*	25.5959
Specific conductance	uS	MW-22	04/27/2018		1340.0000	*	978.1522
Specific conductance	uS	MW-22	10/16/2018		1033.0000	*	978.1522
Specific conductance	uS	MW-22	04/24/2019		1142.0000	*	978.1522
Specific conductance	uS	MW-22	10/23/2019		972.0000		978.1522
Specific conductance	uS	MW-22	04/21/2020		1149.0000	*	978.1522
Specific conductance	uS	MW-22	10/13/2020		1041.0000	*	978.1522
Specific conductance	uS	MW-22	04/15/2021		1090.0000	*	978.1522
Specific conductance	uS	MW-22	10/20/2021		1028.0000	*	978.1522
Specific conductance	uS	MW-22	04/15/2022		1004.0000	*	978.1522
Specific conductance	uS	MW-22	10/14/2022		1035.0000	*	978.1522
Specific conductance	uS	MW-22	04/20/2023		988.0000	*	978.1522
Ammonia	mg/L	MW-23	04/26/2018		1.7000	*	0.1340
Ammonia	mg/L	MW-23	10/16/2018		1.6000	*	0.1340
Ammonia	mg/L	MW-23	04/24/2019		1.7000	*	0.1340

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Ammonia	mg/L	MW-23	10/23/2019		1.8000	*	0.1340
Ammonia	mg/L	MW-23	04/21/2020		1.1000	*	0.1340
Ammonia	mg/L	MW-23	10/12/2020		1.5000	*	0.1340
Ammonia	mg/L	MW-23	04/14/2021		1.1000	*	0.1340
Ammonia	mg/L	MW-23	10/19/2021		1.3000	*	0.1340
Ammonia	mg/L	MW-23	04/15/2022		1.4000	*	0.1340
Ammonia	mg/L	MW-23	10/13/2022		1.3000	*	0.1340
Ammonia	mg/L	MW-23	04/19/2023		1.2000	*	0.1340
Arsenic, total	ug/L	MW-23	04/26/2018		32.2000	*	2.5115
Arsenic, total	ug/L	MW-23	10/16/2018		15.2000	*	2.5115
Arsenic, total	ug/L	MW-23	04/24/2019		18.8000	*	2.5115
Arsenic, total	ug/L	MW-23	10/23/2019		14.6000	*	2.5115
Arsenic, total	ug/L	MW-23	04/21/2020		30.4000	*	2.5115
Arsenic, total	ug/L	MW-23	10/12/2020		31.8000	*	2.5115
Arsenic, total	ug/L	MW-23	04/14/2021		21.9000	*	2.5115
Arsenic, total	ug/L	MW-23	10/19/2021		9.4000	*	2.5115
Arsenic, total	ug/L	MW-23	04/15/2022		16.5000	*	2.5115
Arsenic, total	ug/L	MW-23	10/13/2022		11.5000	*	2.5115
Arsenic, total	ug/L	MW-23	04/19/2023		18.1000	*	2.5115
Cobalt, total	ug/L	MW-23	10/12/2020		2.3900	*	0.7500
Cobalt, total	ug/L	MW-23	04/14/2021		1.8400	*	0.7500
Cobalt, total	ug/L	MW-23	10/19/2021	ND	6.2500		0.7500
Cobalt, total	ug/L	MW-23	04/15/2022		2.2400	*	0.7500
Cobalt, total	ug/L	MW-23	10/13/2022		2.3700	*	0.7500
Cobalt, total	ug/L	MW-23	04/19/2023		2.0000	*	0.7500
Iron, total	ug/L	MW-23	04/26/2018		14400.0000	*	1107.8926
Iron, total	ug/L	MW-23	10/16/2018		7000.0000	*	1107.8926
Iron, total	ug/L	MW-23	04/24/2019		8360.0000	*	1107.8926
Iron, total	ug/L	MW-23	10/23/2019		7430.0000	*	1107.8926
Iron, total	ug/L	MW-23	04/21/2020		118.0000		1107.8926
Iron, total	ug/L	MW-23	10/12/2020		12400.0000	*	1107.8926
Iron, total	ug/L	MW-23	04/14/2021		10300.0000	*	1107.8926
Iron, total	ug/L	MW-23	10/19/2021		4970.0000	*	1107.8926
Iron, total	ug/L	MW-23	04/15/2022		7520.0000	*	1107.8926
Iron, total	ug/L	MW-23	10/13/2022		5370.0000	*	1107.8926
Iron, total	ug/L	MW-23	04/19/2023		2460.0000	*	1107.8926
Magnesium, total	mg/L	MW-23	04/26/2018		37.4000	*	25.5959
Magnesium, total	mg/L	MW-23	10/16/2018		35.4000	*	25.5959
Magnesium, total	mg/L	MW-23	04/24/2019		39.5000	*	25.5959
Magnesium, total	mg/L	MW-23	10/23/2019		37.9000	*	25.5959
Magnesium, total	mg/L	MW-23	04/21/2020		36.9000	*	25.5959
Magnesium, total	mg/L	MW-23	10/12/2020		38.8000	*	25.5959
Magnesium, total	mg/L	MW-23	04/14/2021		38.1000	*	25.5959
Magnesium, total	mg/L	MW-23	10/19/2021		29.7000	*	25.5959
Magnesium, total	mg/L	MW-23	04/15/2022		40.6000	*	25.5959
Magnesium, total	mg/L	MW-23	10/13/2022		40.4000	*	25.5959
Magnesium, total	mg/L	MW-23	04/19/2023		39.4000	*	25.5959
pH	SU	MW-23	04/26/2018		7.0700	*	5.58 - 7.03
pH	SU	MW-23	10/16/2018		6.9900		5.58 - 7.03
pH	SU	MW-23	04/24/2019		6.6500		5.58 - 7.03
pH	SU	MW-23	10/23/2019		6.7200		5.58 - 7.03
pH	SU	MW-23	04/21/2020		7.2200	*	5.58 - 7.03
pH	SU	MW-23	10/12/2020		7.1000	*	5.58 - 7.03
pH	SU	MW-23	04/14/2021		6.9000		5.58 - 7.03
pH	SU	MW-23	10/19/2021		7.0000		5.58 - 7.03
pH	SU	MW-23	04/15/2022		7.3000	*	5.58 - 7.03
pH	SU	MW-23	10/13/2022		7.0500	*	5.58 - 7.03
pH	SU	MW-23	04/19/2023		6.9900		5.58 - 7.03
Specific conductance	uS	MW-23	04/26/2018		1201.0000	*	978.1522
Specific conductance	uS	MW-23	10/16/2018		1117.0000	*	978.1522
Specific conductance	uS	MW-23	04/24/2019		1149.0000	*	978.1522
Specific conductance	uS	MW-23	10/23/2019		1112.0000	*	978.1522
Specific conductance	uS	MW-23	04/21/2020		1093.0000	*	978.1522
Specific conductance	uS	MW-23	10/12/2020		1067.0000	*	978.1522
Specific conductance	uS	MW-23	04/14/2021		1124.0000	*	978.1522
Specific conductance	uS	MW-23	10/19/2021		1158.0000	*	978.1522
Specific conductance	uS	MW-23	04/15/2022		1177.0000	*	978.1522
Specific conductance	uS	MW-23	10/13/2022		1215.0000	*	978.1522
Specific conductance	uS	MW-23	04/19/2023		1151.0000	*	978.1522
Ammonia	mg/L	MW-24	04/26/2018		2.8000	*	0.1340
Ammonia	mg/L	MW-24	10/16/2018		2.0000	*	0.1340

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Ammonia	mg/L	MW-24	04/24/2019		1.5000	*	0.1340
Ammonia	mg/L	MW-24	10/23/2019		1.5000	*	0.1340
Ammonia	mg/L	MW-24	04/21/2020		1.0000	*	0.1340
Ammonia	mg/L	MW-24	10/12/2020		1.2000	*	0.1340
Ammonia	mg/L	MW-24	04/14/2021		1.0000	*	0.1340
Ammonia	mg/L	MW-24	10/19/2021		1.1000	*	0.1340
Ammonia	mg/L	MW-24	04/14/2022		1.1000	*	0.1340
Ammonia	mg/L	MW-24	10/13/2022		0.8200	*	0.1340
Ammonia	mg/L	MW-24	04/19/2023		0.7600	*	0.1340
Barium, total	ug/L	MW-24	04/26/2018		634.0000	*	257.5150
Barium, total	ug/L	MW-24	10/16/2018		307.0000	*	257.5150
Barium, total	ug/L	MW-24	04/24/2019		407.0000	*	257.5150
Barium, total	ug/L	MW-24	10/23/2019		271.0000	*	257.5150
Barium, total	ug/L	MW-24	04/21/2020		344.0000	*	257.5150
Barium, total	ug/L	MW-24	10/12/2020		305.0000	*	257.5150
Barium, total	ug/L	MW-24	04/14/2021		292.0000	*	257.5150
Barium, total	ug/L	MW-24	10/19/2021		129.0000		257.5150
Barium, total	ug/L	MW-24	04/14/2022		179.0000		257.5150
Barium, total	ug/L	MW-24	10/13/2022		466.0000	*	257.5150
Barium, total	ug/L	MW-24	04/19/2023		218.0000		257.5150
Cobalt, total	ug/L	MW-24	10/12/2020		3.2400	*	0.7500
Cobalt, total	ug/L	MW-24	04/14/2021		1.7200	*	0.7500
Cobalt, total	ug/L	MW-24	10/19/2021	ND	6.2500		0.7500
Cobalt, total	ug/L	MW-24	04/14/2022		2.4500	*	0.7500
Cobalt, total	ug/L	MW-24	10/13/2022		4.3100	*	0.7500
Cobalt, total	ug/L	MW-24	04/19/2023		2.0900	*	0.7500
Magnesium, total	mg/L	MW-24	04/26/2018		44.9000	*	25.5959
Magnesium, total	mg/L	MW-24	10/16/2018		40.8000	*	25.5959
Magnesium, total	mg/L	MW-24	04/24/2019		36.8000	*	25.5959
Magnesium, total	mg/L	MW-24	10/23/2019		36.7000	*	25.5959
Magnesium, total	mg/L	MW-24	04/21/2020		39.5000	*	25.5959
Magnesium, total	mg/L	MW-24	10/12/2020		43.3000	*	25.5959
Magnesium, total	mg/L	MW-24	04/14/2021		38.8000	*	25.5959
Magnesium, total	mg/L	MW-24	10/19/2021		28.0000	*	25.5959
Magnesium, total	mg/L	MW-24	04/14/2022		36.8000	*	25.5959
Magnesium, total	mg/L	MW-24	10/13/2022		35.9000	*	25.5959
Magnesium, total	mg/L	MW-24	04/19/2023		28.8000	*	25.5959
pH	SU	MW-24	04/26/2018		6.8900		5.58 - 7.03
pH	SU	MW-24	10/16/2018		7.0300		5.58 - 7.03
pH	SU	MW-24	04/24/2019		6.7500		5.58 - 7.03
pH	SU	MW-24	10/23/2019		6.8200		5.58 - 7.03
pH	SU	MW-24	04/21/2020		6.9600		5.58 - 7.03
pH	SU	MW-24	10/12/2020		7.0300		5.58 - 7.03
pH	SU	MW-24	04/14/2021		6.9000		5.58 - 7.03
pH	SU	MW-24	10/19/2021		6.9000		5.58 - 7.03
pH	SU	MW-24	04/14/2022		7.0000		5.58 - 7.03
pH	SU	MW-24	10/13/2022		7.0400	*	5.58 - 7.03
pH	SU	MW-24	04/19/2023		6.9100		5.58 - 7.03
Specific conductance	uS	MW-24	04/26/2018		1107.0000	*	978.1522
Specific conductance	uS	MW-24	10/16/2018		1011.0000	*	978.1522
Specific conductance	uS	MW-24	04/24/2019		963.0000		978.1522
Specific conductance	uS	MW-24	10/23/2019		968.0000		978.1522
Specific conductance	uS	MW-24	04/21/2020		1105.0000	*	978.1522
Specific conductance	uS	MW-24	10/12/2020		1073.0000	*	978.1522
Specific conductance	uS	MW-24	04/14/2021		1074.0000	*	978.1522
Specific conductance	uS	MW-24	10/19/2021		1090.0000	*	978.1522
Specific conductance	uS	MW-24	04/14/2022		1077.0000	*	978.1522
Specific conductance	uS	MW-24	10/13/2022		1009.0000	*	978.1522
Specific conductance	uS	MW-24	04/19/2023		862.0000		978.1522
Ammonia	mg/L	MW-3R1	06/05/2018		0.8200	*	0.1340
Ammonia	mg/L	MW-3R1	10/16/2018		0.9800	*	0.1340
Ammonia	mg/L	MW-3R1	04/24/2019		1.5000	*	0.1340
Ammonia	mg/L	MW-3R1	10/23/2019		1.3000	*	0.1340
Ammonia	mg/L	MW-3R1	04/21/2020		0.5700	*	0.1340
Ammonia	mg/L	MW-3R1	10/13/2020		0.7500	*	0.1340
Ammonia	mg/L	MW-3R1	04/15/2021	ND	0.1340		0.1340
Ammonia	mg/L	MW-3R1	10/20/2021		0.5600	*	0.1340
Ammonia	mg/L	MW-3R1	04/15/2022	ND	0.1340		0.1340
Ammonia	mg/L	MW-3R1	10/14/2022		0.6100	*	0.1340
Ammonia	mg/L	MW-3R1	04/19/2023		0.4000	*	0.1340
Arsenic, total	ug/L	MW-3R1	06/05/2018		372.0000	*	2.5115

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Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Arsenic, total	ug/L	MW-3R1	10/16/2018		59.6000	*	2.5115
Arsenic, total	ug/L	MW-3R1	04/24/2019		62.3000	*	2.5115
Arsenic, total	ug/L	MW-3R1	10/23/2019		62.9000	*	2.5115
Arsenic, total	ug/L	MW-3R1	04/21/2020		82.5000	*	2.5115
Arsenic, total	ug/L	MW-3R1	10/13/2020		50.3000	*	2.5115
Arsenic, total	ug/L	MW-3R1	04/15/2021		77.6000	*	2.5115
Arsenic, total	ug/L	MW-3R1	10/20/2021		30.7000	*	2.5115
Arsenic, total	ug/L	MW-3R1	04/15/2022		64.7000	*	2.5115
Arsenic, total	ug/L	MW-3R1	10/14/2022		57.0000	*	2.5115
Arsenic, total	ug/L	MW-3R1	04/19/2023		61.2000	*	2.5115
Barium, total	ug/L	MW-3R1	06/05/2018		1920.0000	*	257.5150
Barium, total	ug/L	MW-3R1	10/16/2018		484.0000	*	257.5150
Barium, total	ug/L	MW-3R1	04/24/2019		405.0000	*	257.5150
Barium, total	ug/L	MW-3R1	10/23/2019		388.0000	*	257.5150
Barium, total	ug/L	MW-3R1	04/21/2020		496.0000	*	257.5150
Barium, total	ug/L	MW-3R1	10/13/2020		375.0000	*	257.5150
Barium, total	ug/L	MW-3R1	04/15/2021		616.0000	*	257.5150
Barium, total	ug/L	MW-3R1	10/20/2021		248.0000		257.5150
Barium, total	ug/L	MW-3R1	04/15/2022		369.0000	*	257.5150
Barium, total	ug/L	MW-3R1	10/14/2022		377.0000	*	257.5150
Barium, total	ug/L	MW-3R1	04/19/2023		294.0000	*	257.5150
Cobalt, total	ug/L	MW-3R1	10/13/2020		10.2000	*	0.7500
Cobalt, total	ug/L	MW-3R1	04/15/2021		11.9000	*	0.7500
Cobalt, total	ug/L	MW-3R1	10/20/2021		9.7300	*	0.7500
Cobalt, total	ug/L	MW-3R1	04/15/2022		12.0000	*	0.7500
Cobalt, total	ug/L	MW-3R1	10/14/2022		13.1000	*	0.7500
Cobalt, total	ug/L	MW-3R1	04/19/2023		13.0000	*	0.7500
Iron, total	ug/L	MW-3R1	06/05/2018		357000.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	10/16/2018		66400.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	04/24/2019		54900.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	10/23/2019		44700.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	04/21/2020		535.0000		1107.8926
Iron, total	ug/L	MW-3R1	10/13/2020		43100.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	04/15/2021		61000.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	10/20/2021		30000.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	04/15/2022		52400.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	10/14/2022		46000.0000	*	1107.8926
Iron, total	ug/L	MW-3R1	04/19/2023		14900.0000	*	1107.8926
Magnesium, total	mg/L	MW-3R1	06/05/2018		525.0000	*	25.5959
Magnesium, total	mg/L	MW-3R1	10/16/2018		127.0000	*	25.5959
Magnesium, total	mg/L	MW-3R1	04/24/2019		62.4000	*	25.5959
Magnesium, total	mg/L	MW-3R1	10/23/2019		39.9000	*	25.5959
Magnesium, total	mg/L	MW-3R1	04/21/2020		45.8000	*	25.5959
Magnesium, total	mg/L	MW-3R1	10/13/2020		33.7000	*	25.5959
Magnesium, total	mg/L	MW-3R1	04/15/2021		53.0000	*	25.5959
Magnesium, total	mg/L	MW-3R1	10/20/2021		33.9000	*	25.5959
Magnesium, total	mg/L	MW-3R1	04/15/2022		35.3000	*	25.5959
Magnesium, total	mg/L	MW-3R1	10/14/2022		46.5000	*	25.5959
Magnesium, total	mg/L	MW-3R1	04/19/2023		33.2000	*	25.5959
Ammonia	mg/L	MW-4	04/26/2018		2.9000	*	0.1340
Ammonia	mg/L	MW-4	10/15/2018		1.3000	*	0.1340
Ammonia	mg/L	MW-4	04/23/2019		0.9000	*	0.1340
Ammonia	mg/L	MW-4	10/22/2019		1.2000	*	0.1340
Ammonia	mg/L	MW-4	04/21/2020		0.8400	*	0.1340
Ammonia	mg/L	MW-4	10/12/2020		1.4000	*	0.1340
Ammonia	mg/L	MW-4	04/14/2021		1.0000	*	0.1340
Ammonia	mg/L	MW-4	10/19/2021		2.0000	*	0.1340
Ammonia	mg/L	MW-4	04/14/2022		1.6000	*	0.1340
Ammonia	mg/L	MW-4	10/13/2022		1.5000	*	0.1340
Ammonia	mg/L	MW-4	04/19/2023		0.6200	*	0.1340
Arsenic, total	ug/L	MW-4	04/26/2018		25.7000	*	2.5115
Arsenic, total	ug/L	MW-4	10/15/2018		26.5000	*	2.5115
Arsenic, total	ug/L	MW-4	04/23/2019		13.4000	*	2.5115
Arsenic, total	ug/L	MW-4	10/22/2019		26.3000	*	2.5115
Arsenic, total	ug/L	MW-4	04/21/2020		14.7000	*	2.5115
Arsenic, total	ug/L	MW-4	10/12/2020		15.1000	*	2.5115
Arsenic, total	ug/L	MW-4	04/14/2021		14.2000	*	2.5115
Arsenic, total	ug/L	MW-4	10/19/2021		18.8000	*	2.5115
Arsenic, total	ug/L	MW-4	04/14/2022		31.5000	*	2.5115
Arsenic, total	ug/L	MW-4	10/13/2022		22.3000	*	2.5115
Arsenic, total	ug/L	MW-4	04/19/2023		11.7000	*	2.5115

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

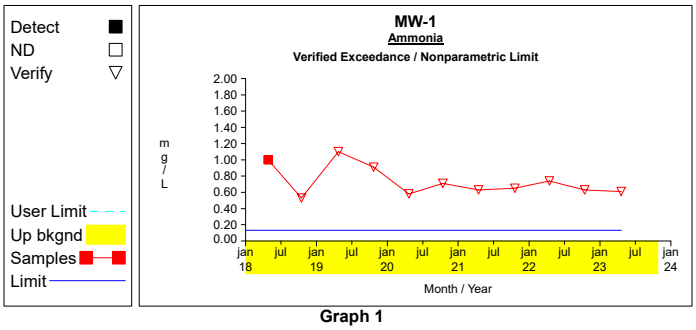
Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

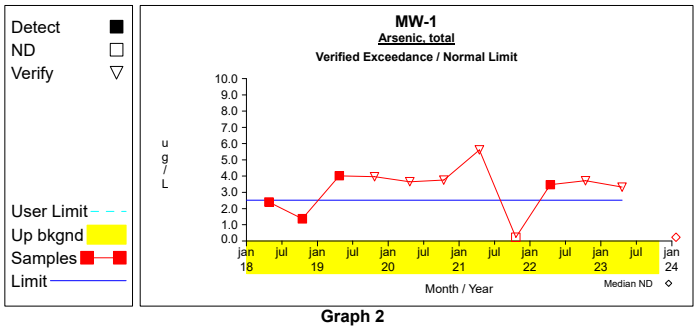
Constituent	Units	Well	Date		Result		Pred. Limit
Barium, total	ug/L	MW-4	04/26/2018		372.0000	*	257.5150
Barium, total	ug/L	MW-4	10/15/2018		270.0000	*	257.5150
Barium, total	ug/L	MW-4	04/23/2019		282.0000	*	257.5150
Barium, total	ug/L	MW-4	10/22/2019		350.0000	*	257.5150
Barium, total	ug/L	MW-4	04/21/2020		301.0000	*	257.5150
Barium, total	ug/L	MW-4	10/12/2020		279.0000	*	257.5150
Barium, total	ug/L	MW-4	04/14/2021		343.0000	*	257.5150
Barium, total	ug/L	MW-4	10/19/2021		378.0000	*	257.5150
Barium, total	ug/L	MW-4	04/14/2022		500.0000	*	257.5150
Barium, total	ug/L	MW-4	10/13/2022		404.0000	*	257.5150
Barium, total	ug/L	MW-4	04/19/2023		235.0000		257.5150
Cobalt, total	ug/L	MW-4	10/12/2020		4.1500	*	0.7500
Cobalt, total	ug/L	MW-4	04/14/2021		2.4200	*	0.7500
Cobalt, total	ug/L	MW-4	10/19/2021	ND	6.2500		0.7500
Cobalt, total	ug/L	MW-4	04/14/2022		7.1400	*	0.7500
Cobalt, total	ug/L	MW-4	10/13/2022		15.1000	*	0.7500
Cobalt, total	ug/L	MW-4	04/19/2023		8.2900	*	0.7500
Iron, total	ug/L	MW-4	04/26/2018		6740.0000	*	1107.8926
Iron, total	ug/L	MW-4	10/15/2018		6260.0000	*	1107.8926
Iron, total	ug/L	MW-4	04/23/2019		3690.0000	*	1107.8926
Iron, total	ug/L	MW-4	10/22/2019		7270.0000	*	1107.8926
Iron, total	ug/L	MW-4	04/21/2020		36.2000		1107.8926
Iron, total	ug/L	MW-4	10/12/2020		4910.0000	*	1107.8926
Iron, total	ug/L	MW-4	04/14/2021		4320.0000	*	1107.8926
Iron, total	ug/L	MW-4	10/19/2021		5800.0000	*	1107.8926
Iron, total	ug/L	MW-4	04/14/2022		8470.0000	*	1107.8926
Iron, total	ug/L	MW-4	10/13/2022		11600.0000	*	1107.8926
Iron, total	ug/L	MW-4	04/19/2023		3230.0000	*	1107.8926
Magnesium, total	mg/L	MW-4	04/26/2018		35.8000	*	25.5959
Magnesium, total	mg/L	MW-4	10/15/2018		27.7000	*	25.5959
Magnesium, total	mg/L	MW-4	04/23/2019		30.3000	*	25.5959
Magnesium, total	mg/L	MW-4	10/22/2019		22.7000		25.5959
Magnesium, total	mg/L	MW-4	04/21/2020		23.6000		25.5959
Magnesium, total	mg/L	MW-4	10/12/2020		23.0000		25.5959
Magnesium, total	mg/L	MW-4	04/14/2021		28.9000	*	25.5959
Magnesium, total	mg/L	MW-4	10/19/2021		25.1000		25.5959
Magnesium, total	mg/L	MW-4	04/14/2022		32.1000	*	25.5959
Magnesium, total	mg/L	MW-4	10/13/2022		32.5000	*	25.5959
Magnesium, total	mg/L	MW-4	04/19/2023		25.2000		25.5959

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

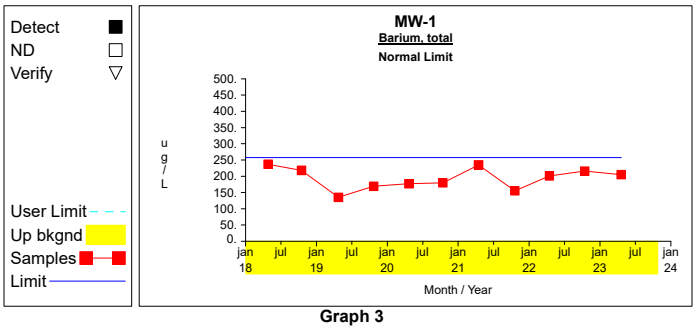
Up vs. Down Prediction Limits



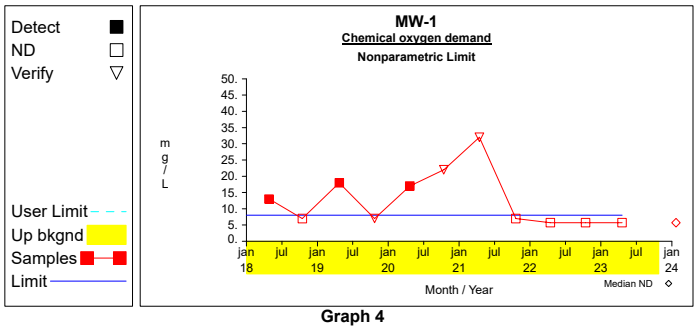
Graph 1



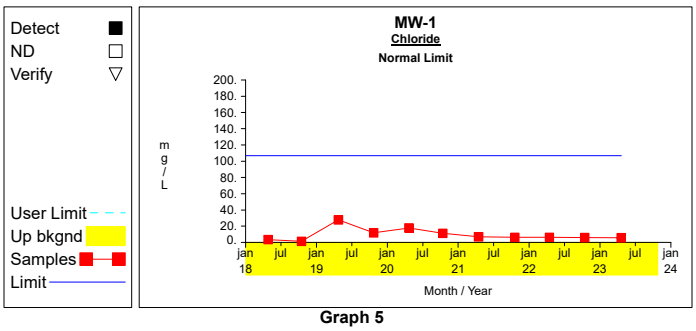
Graph 2



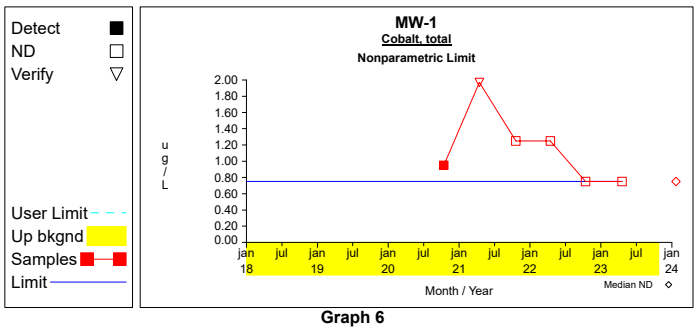
Graph 3



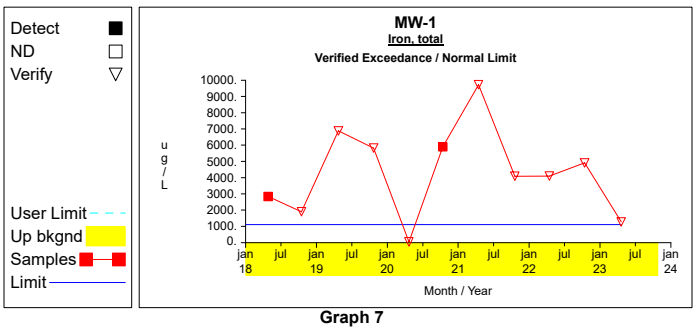
Graph 4



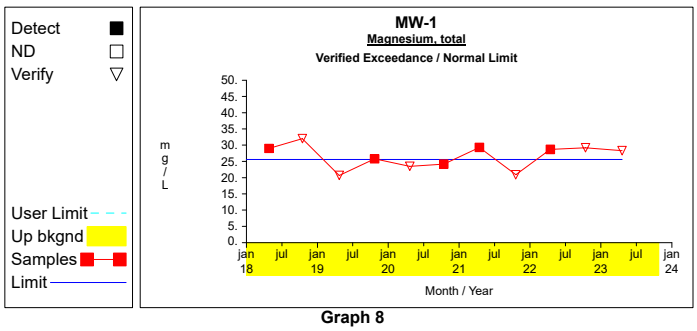
Graph 5



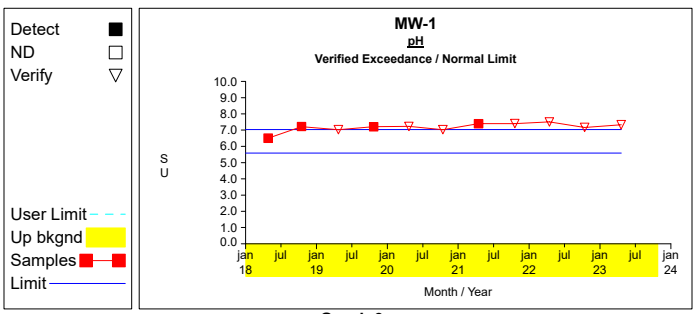
Graph 6



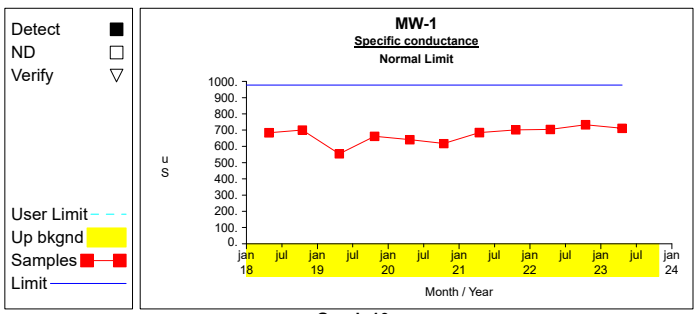
Graph 7



Graph 8



Graph 9



Graph 10

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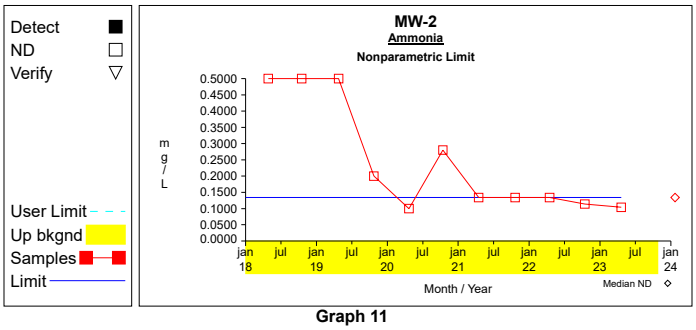
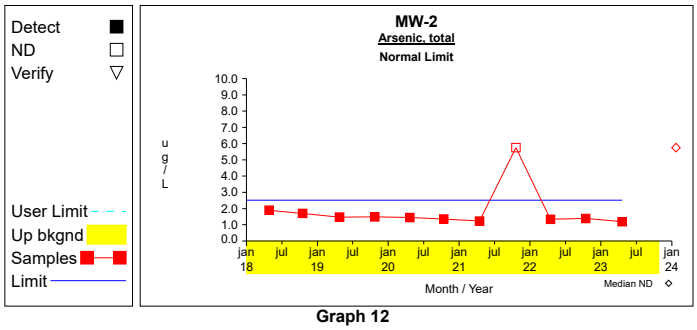
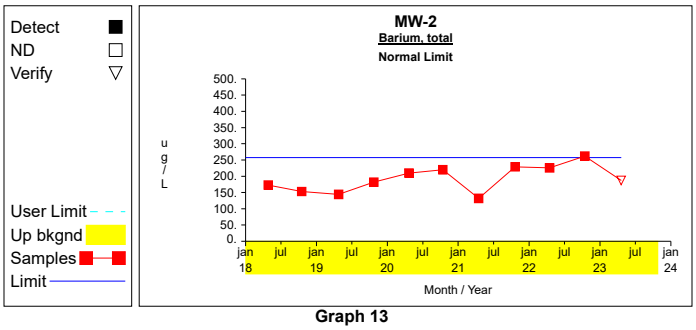
Up vs. Down Prediction Limits



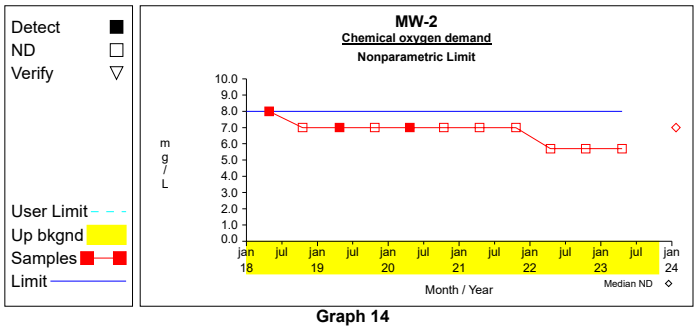
Graph 11



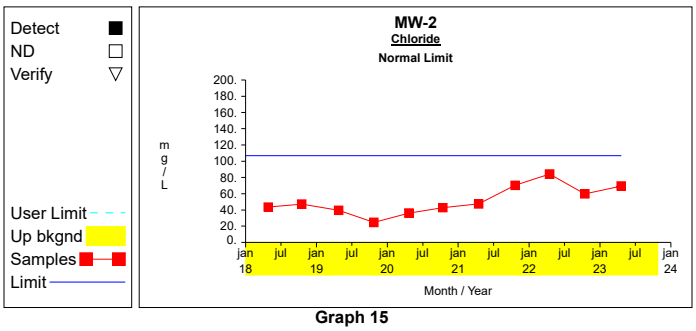
Graph 12



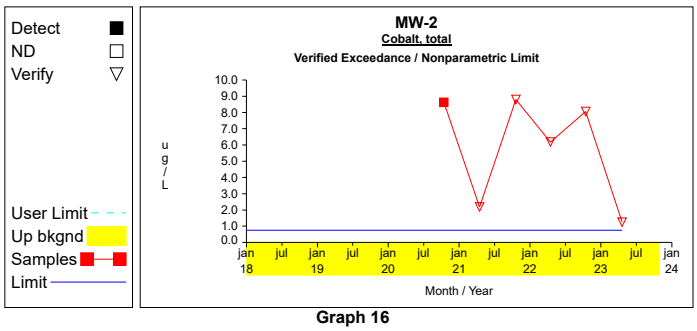
Graph 13



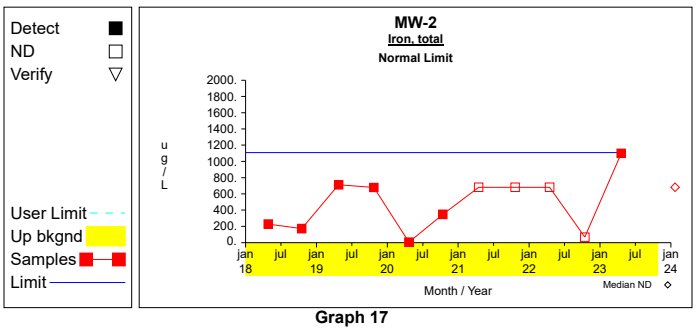
Graph 14



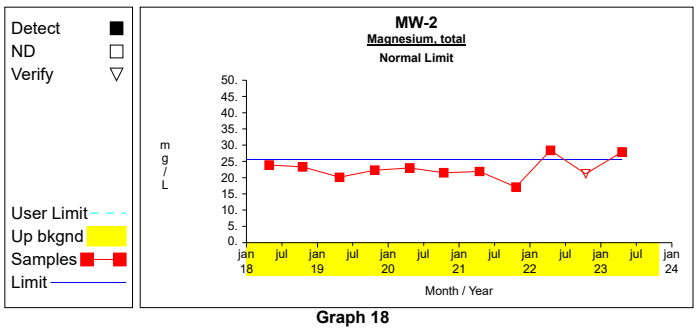
Graph 15



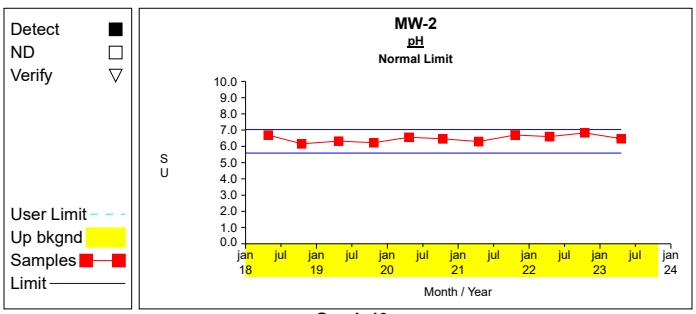
Graph 16



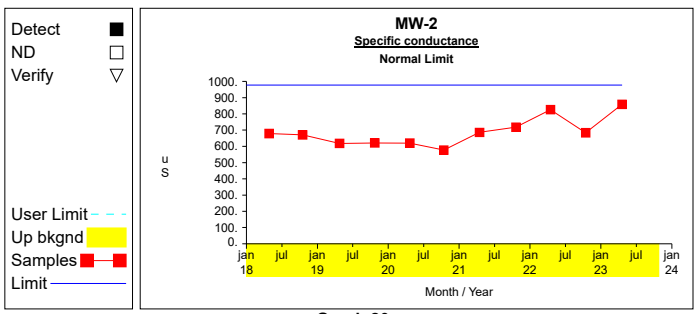
Graph 17



Graph 18



Graph 19



Graph 20

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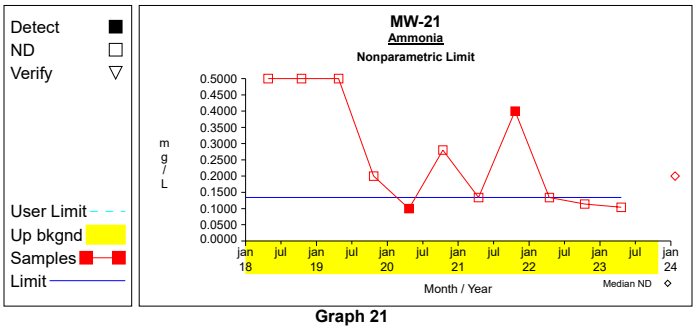
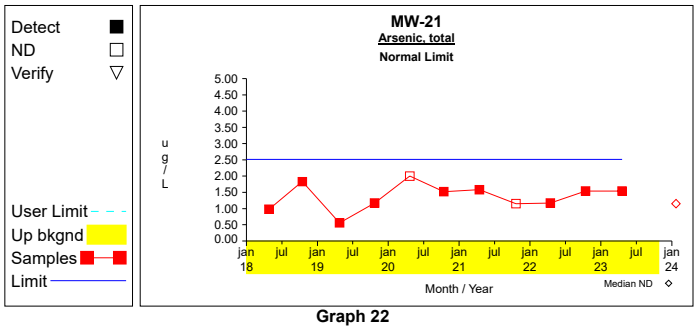
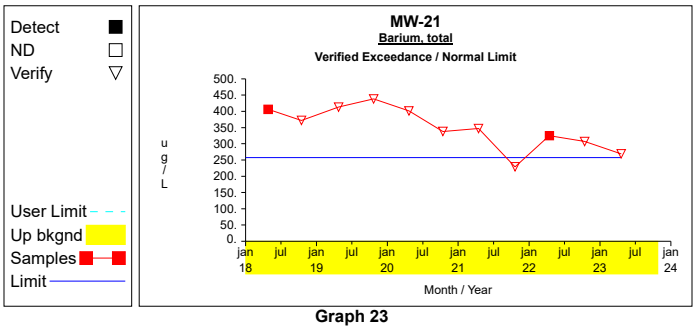
Up vs. Down Prediction Limits



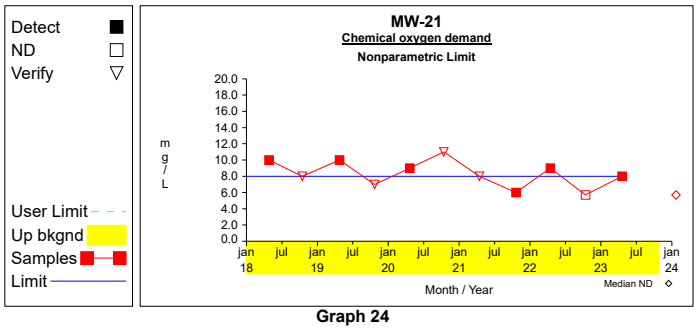
Graph 21



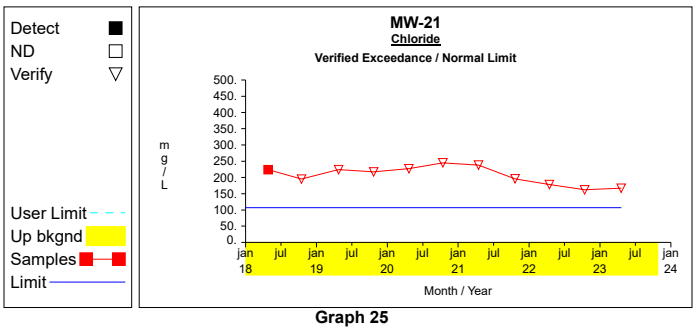
Graph 22



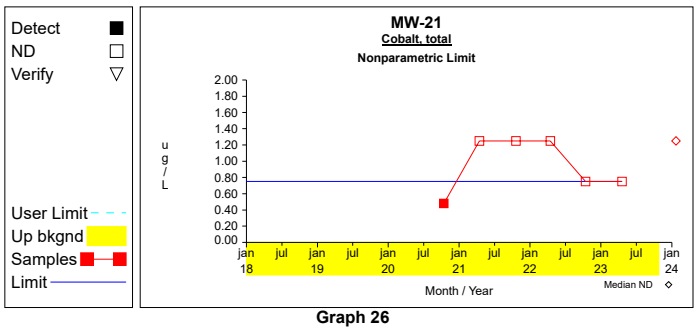
Graph 23



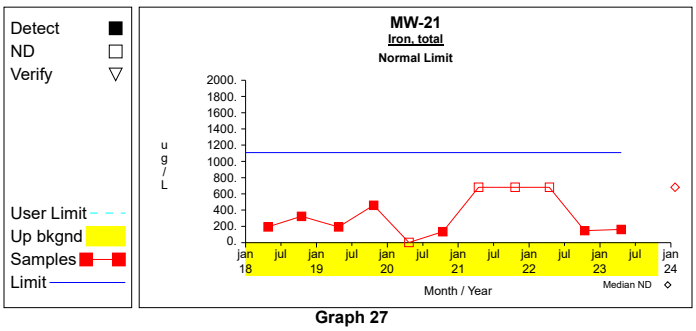
Graph 24



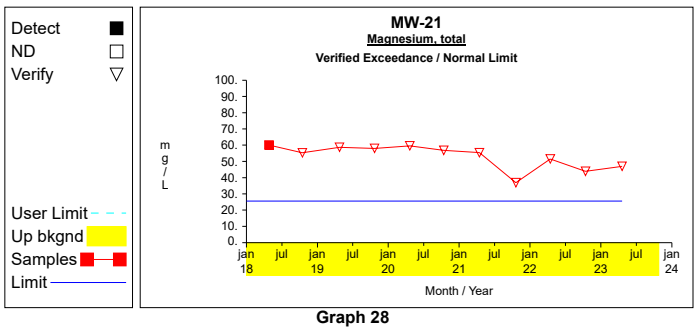
Graph 25



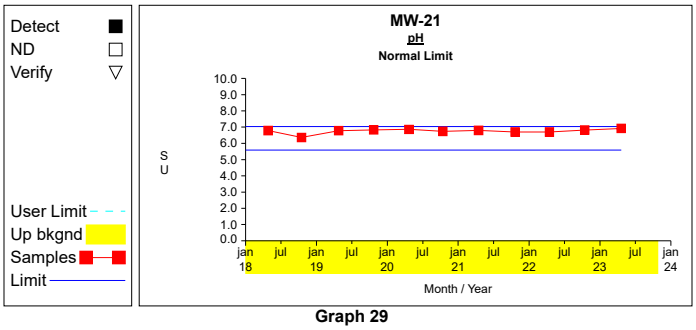
Graph 26



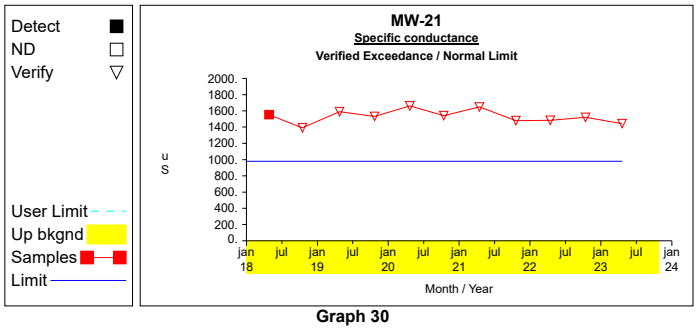
Graph 27



Graph 28



Graph 29



Graph 30

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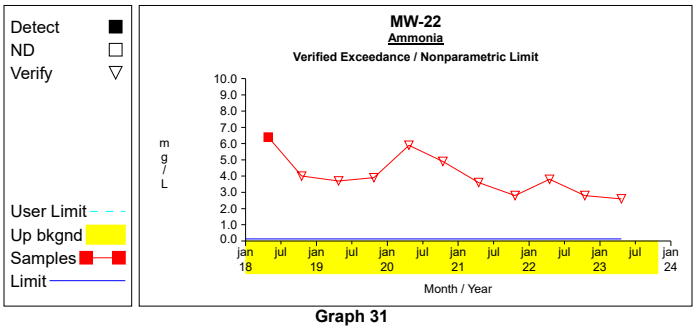
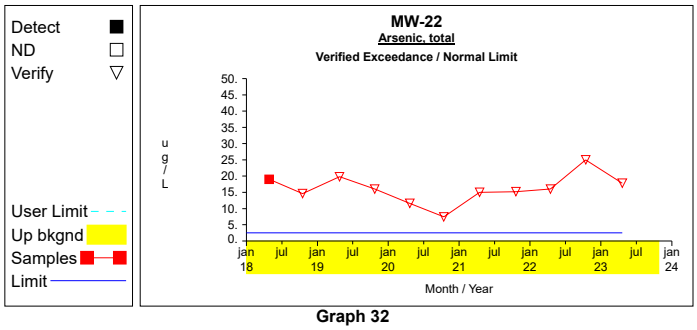
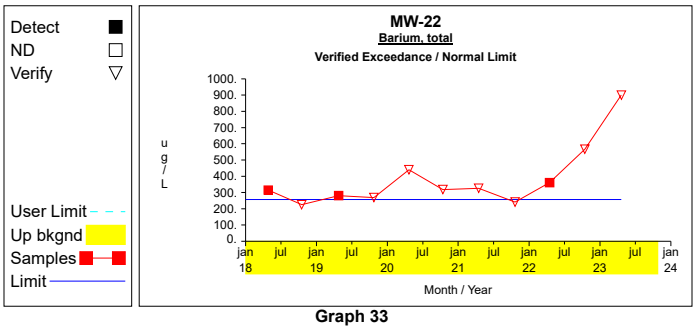
Up vs. Down Prediction Limits



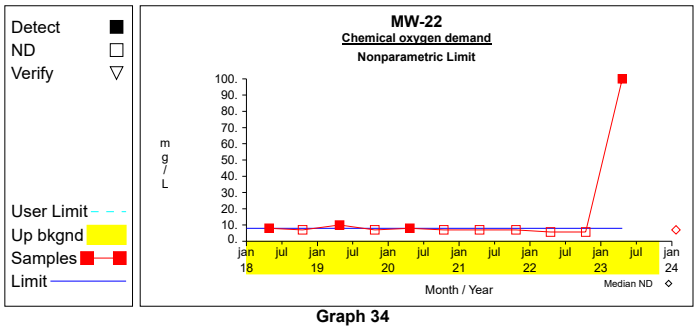
Graph 31



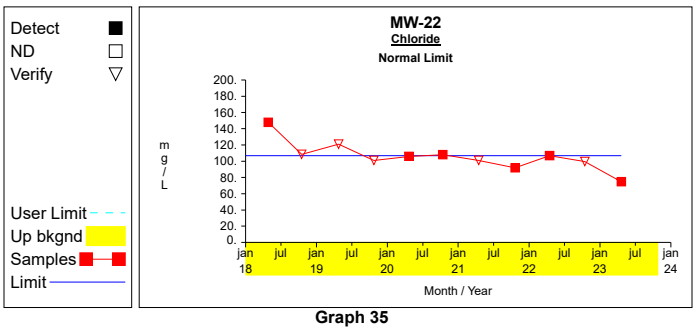
Graph 32



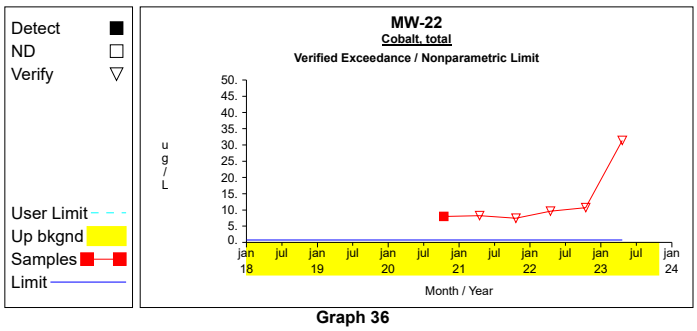
Graph 33



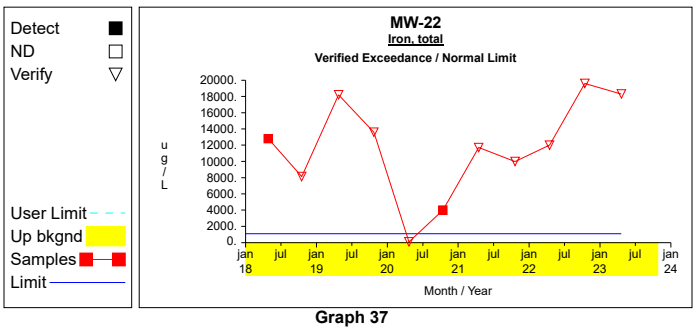
Graph 34



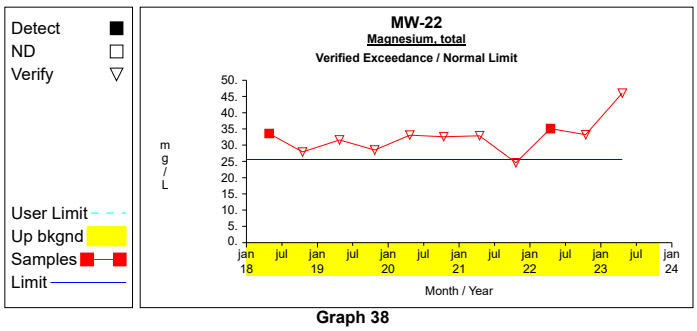
Graph 35



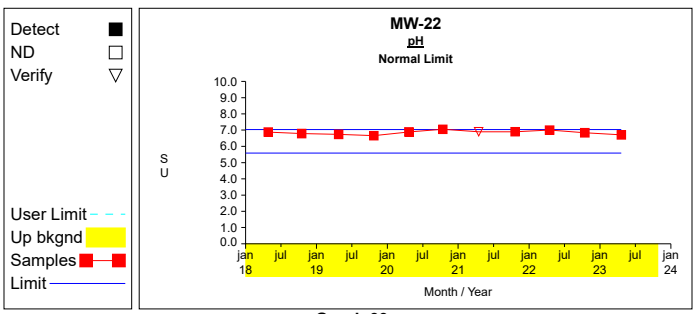
Graph 36



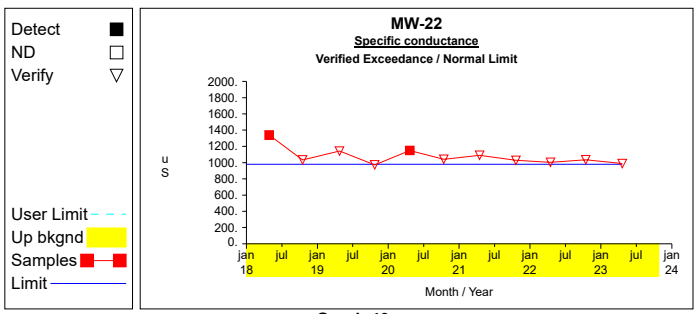
Graph 37



Graph 38



Graph 39



Graph 40

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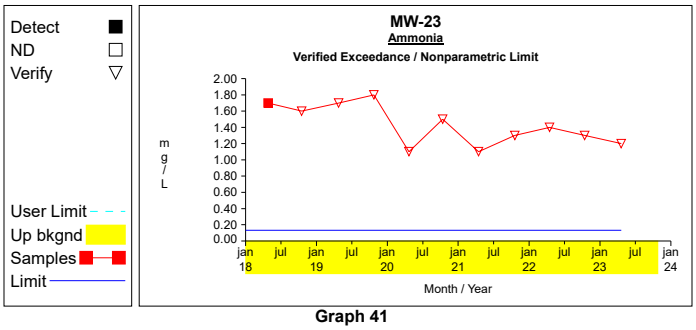
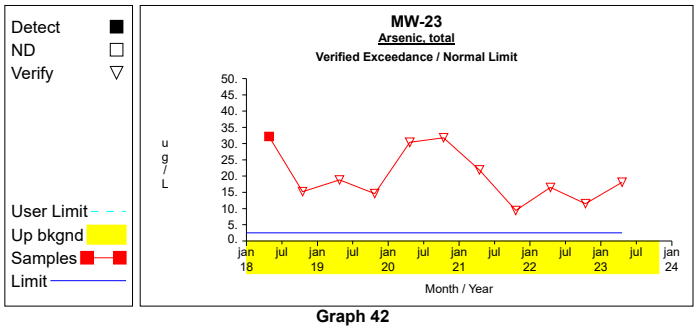
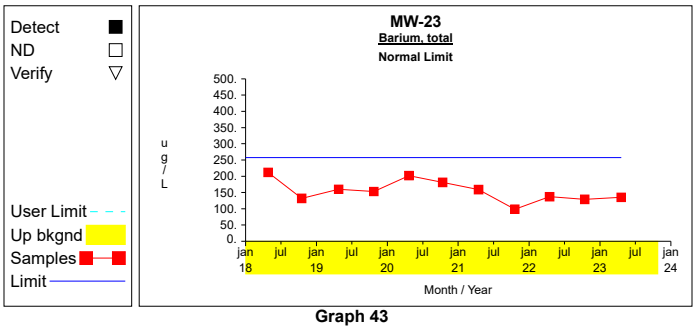
Up vs. Down Prediction Limits



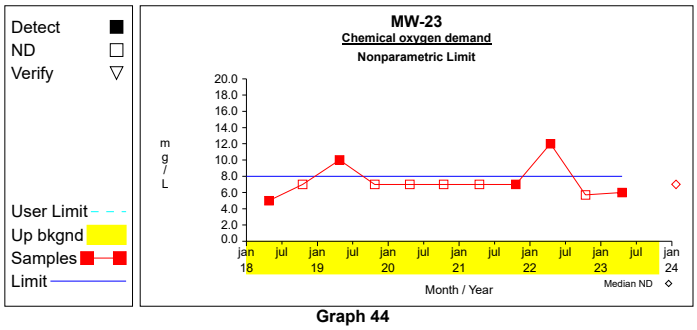
Graph 41



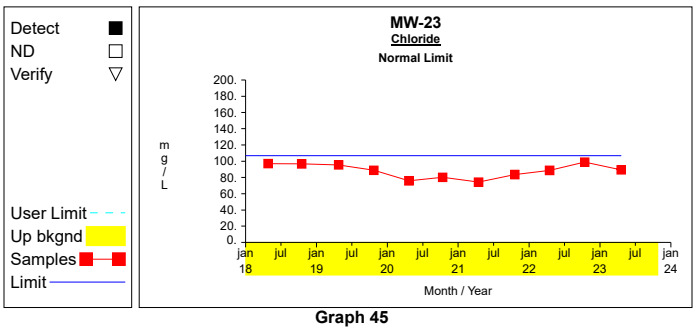
Graph 42



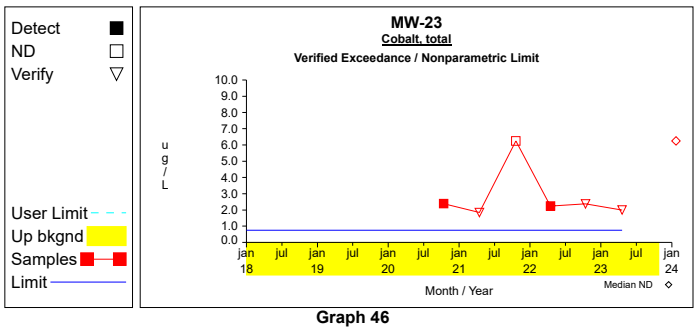
Graph 43



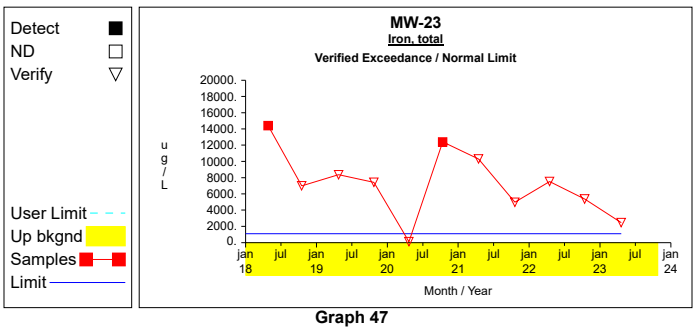
Graph 44



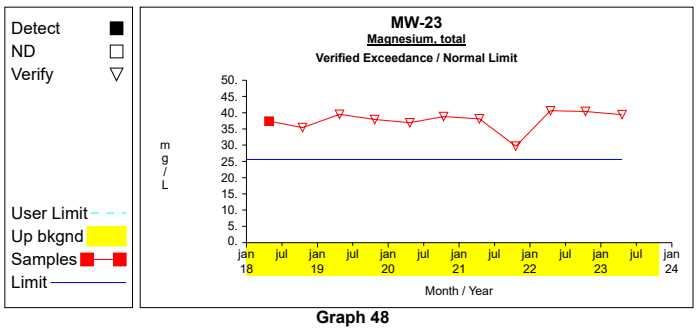
Graph 45



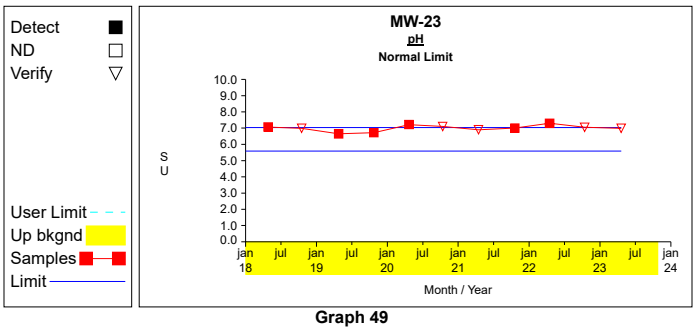
Graph 46



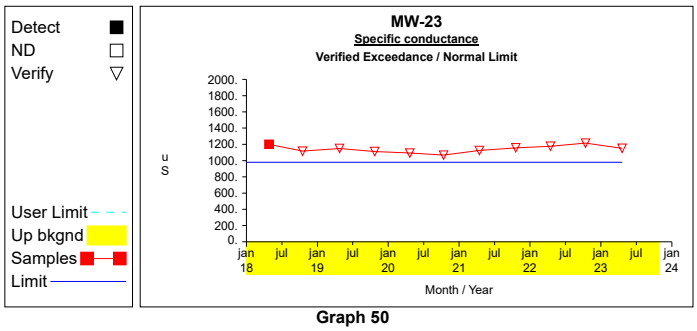
Graph 47



Graph 48



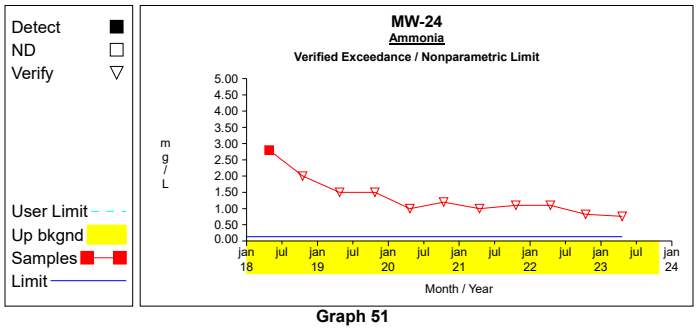
Graph 49



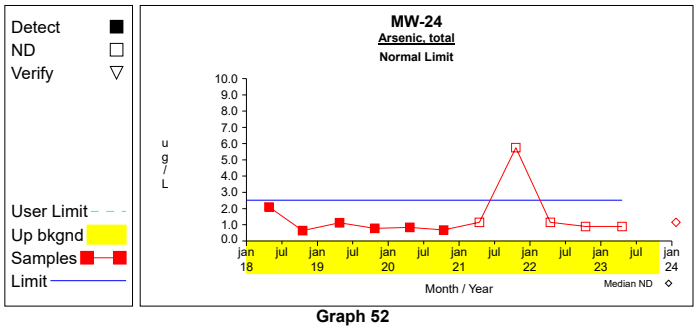
Graph 50

Prepared by: Otter Creek Environmental

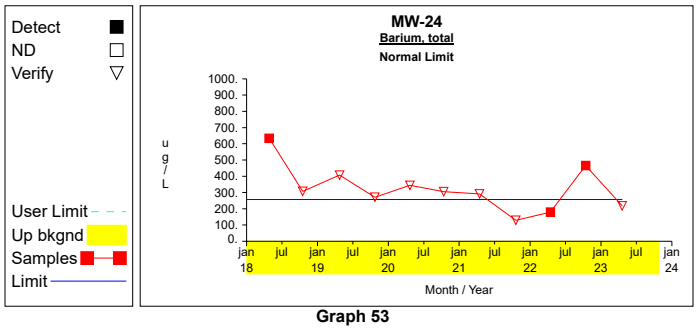
Up vs. Down Prediction Limits



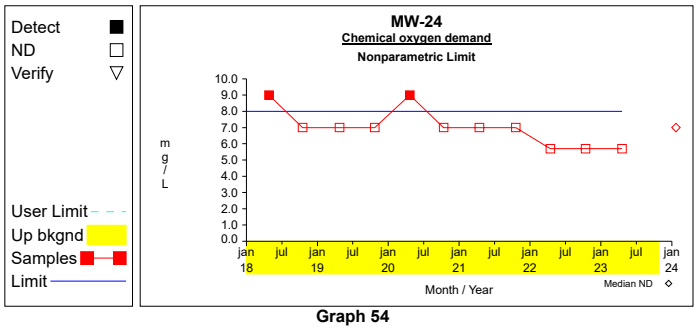
Graph 51



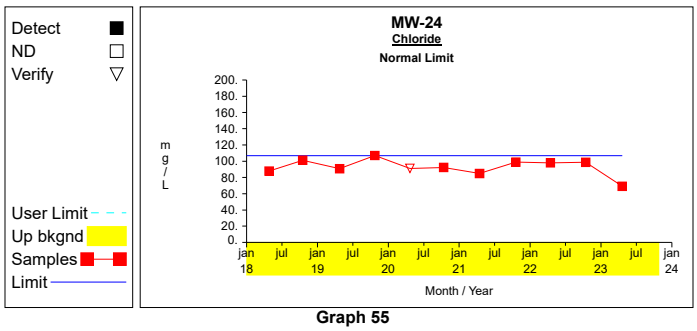
Graph 52



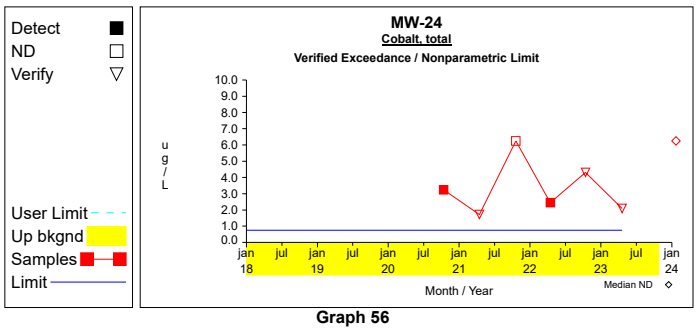
Graph 53



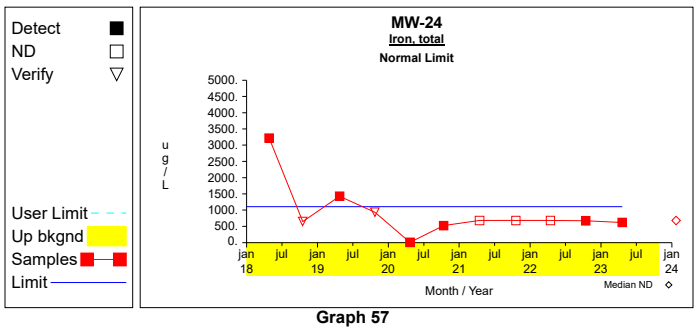
Graph 54



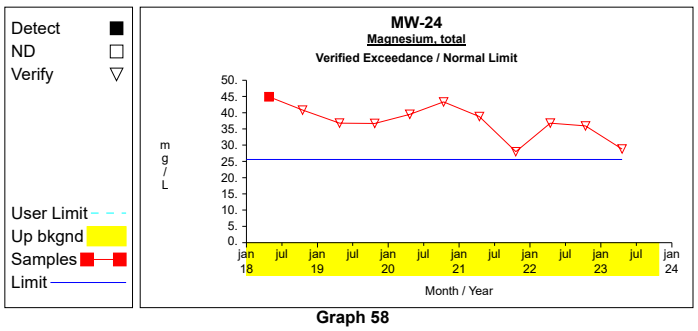
Graph 55



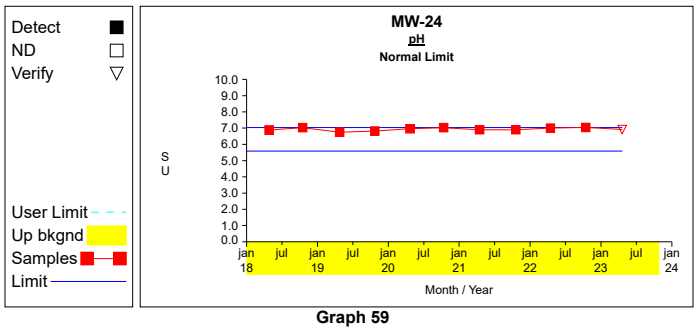
Graph 56



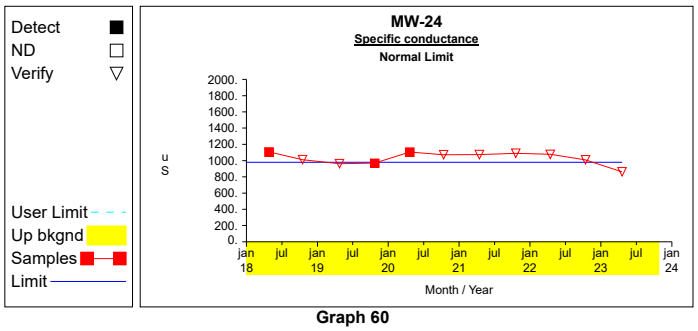
Graph 57



Graph 58



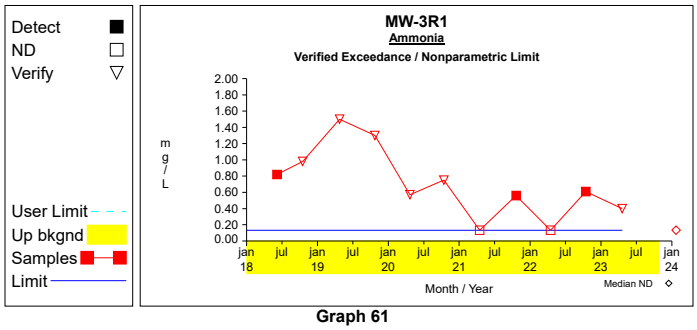
Graph 59



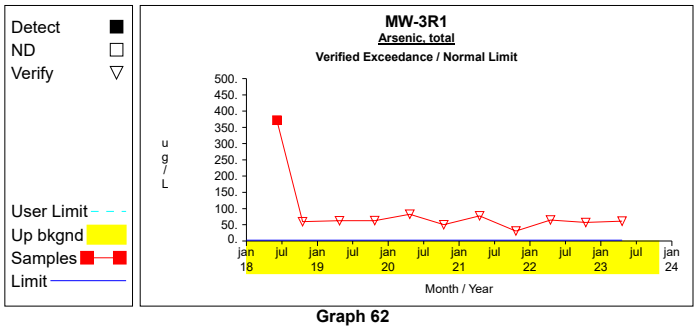
Graph 60

Prepared by: Otter Creek Environmental

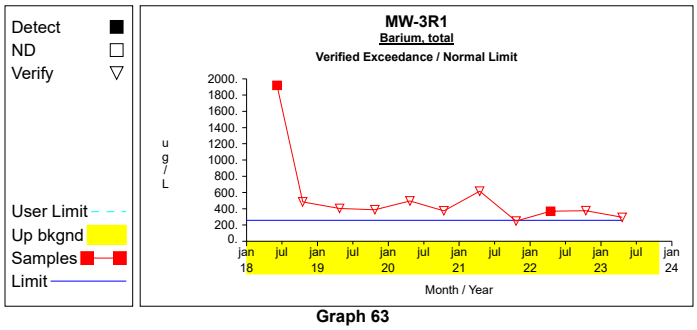
Up vs. Down Prediction Limits



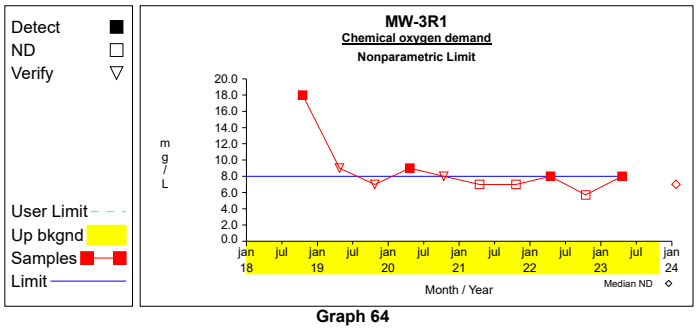
Graph 61



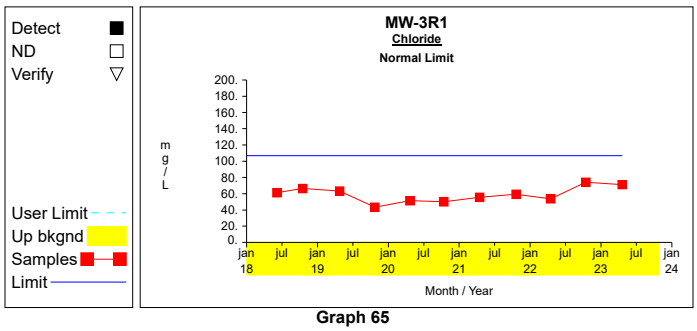
Graph 62



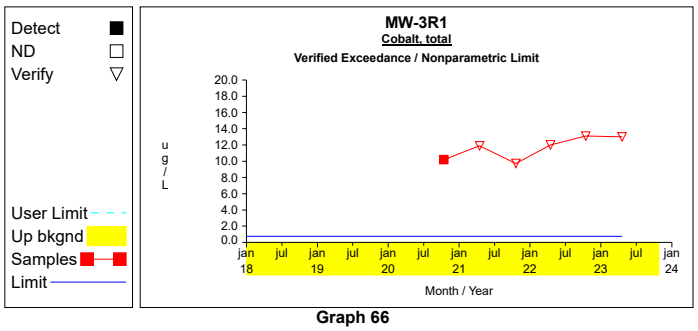
Graph 63



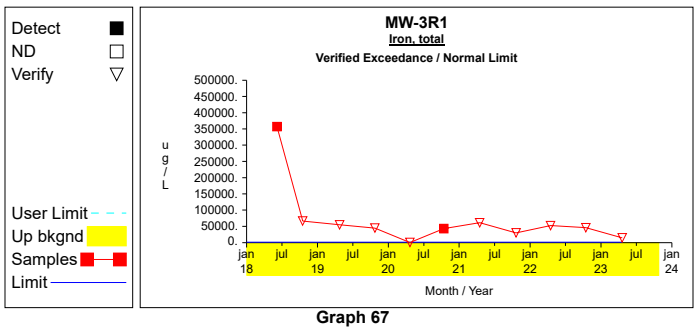
Graph 64



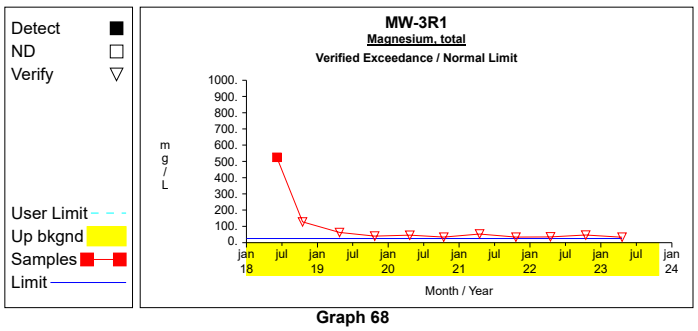
Graph 65



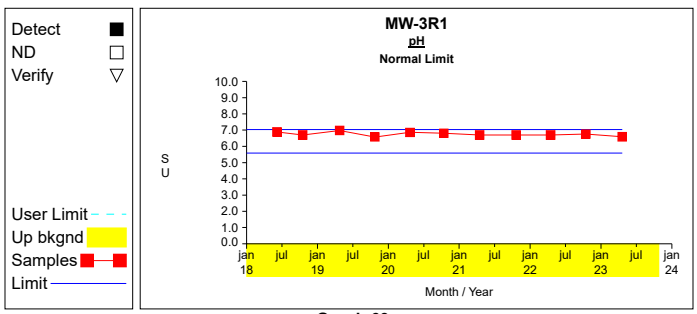
Graph 66



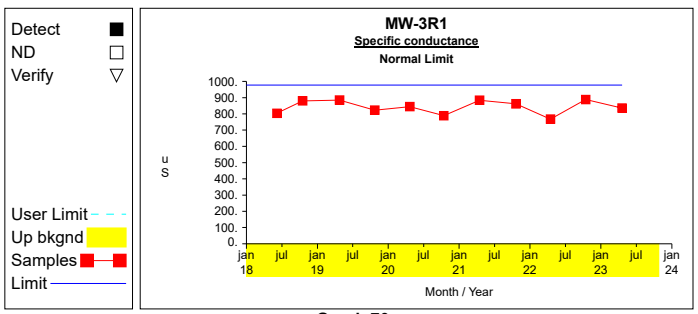
Graph 67



Graph 68



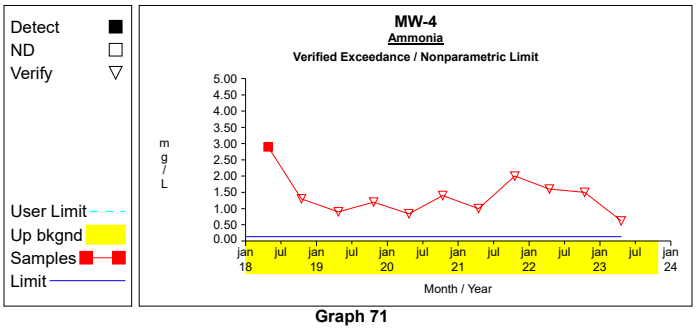
Graph 69



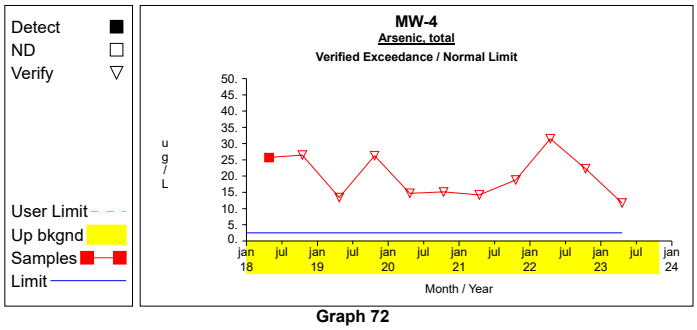
Graph 70

Prepared by: Otter Creek Environmental

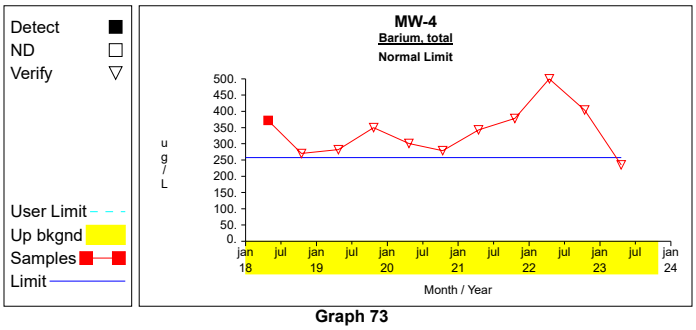
Up vs. Down Prediction Limits



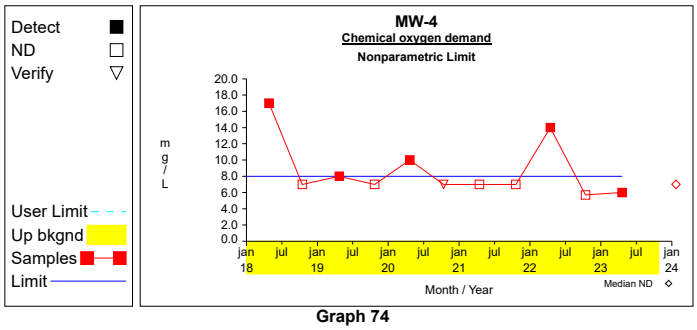
Graph 71



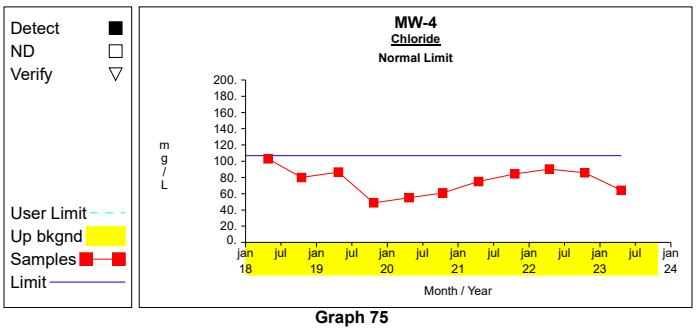
Graph 72



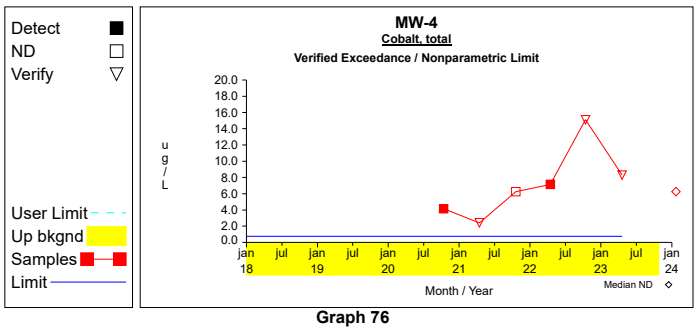
Graph 73



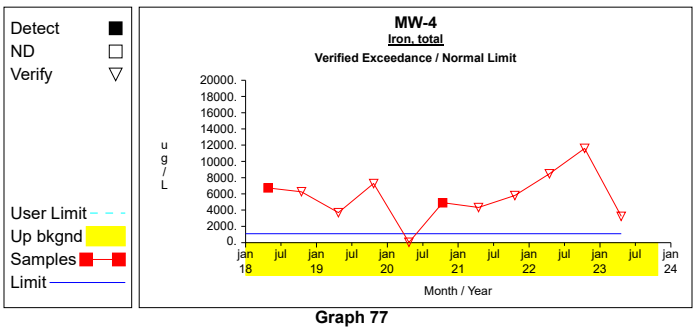
Graph 74



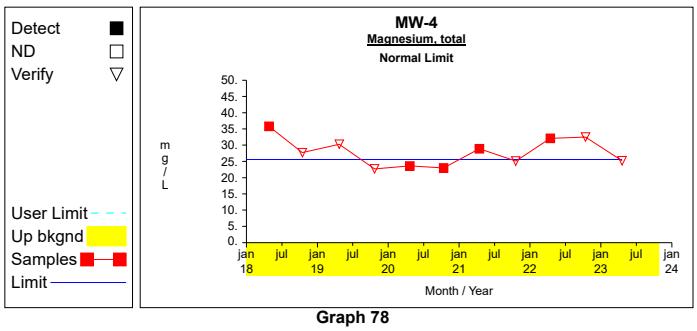
Graph 75



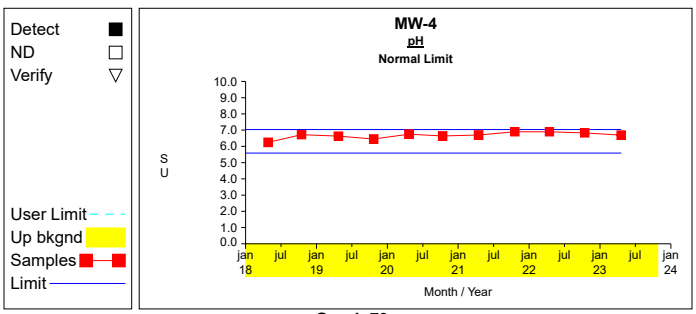
Graph 76



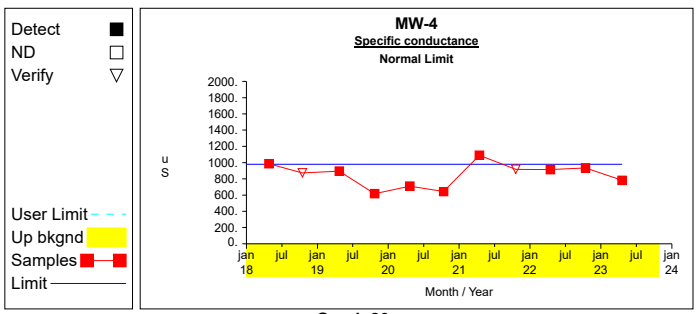
Graph 77



Graph 78



Graph 79

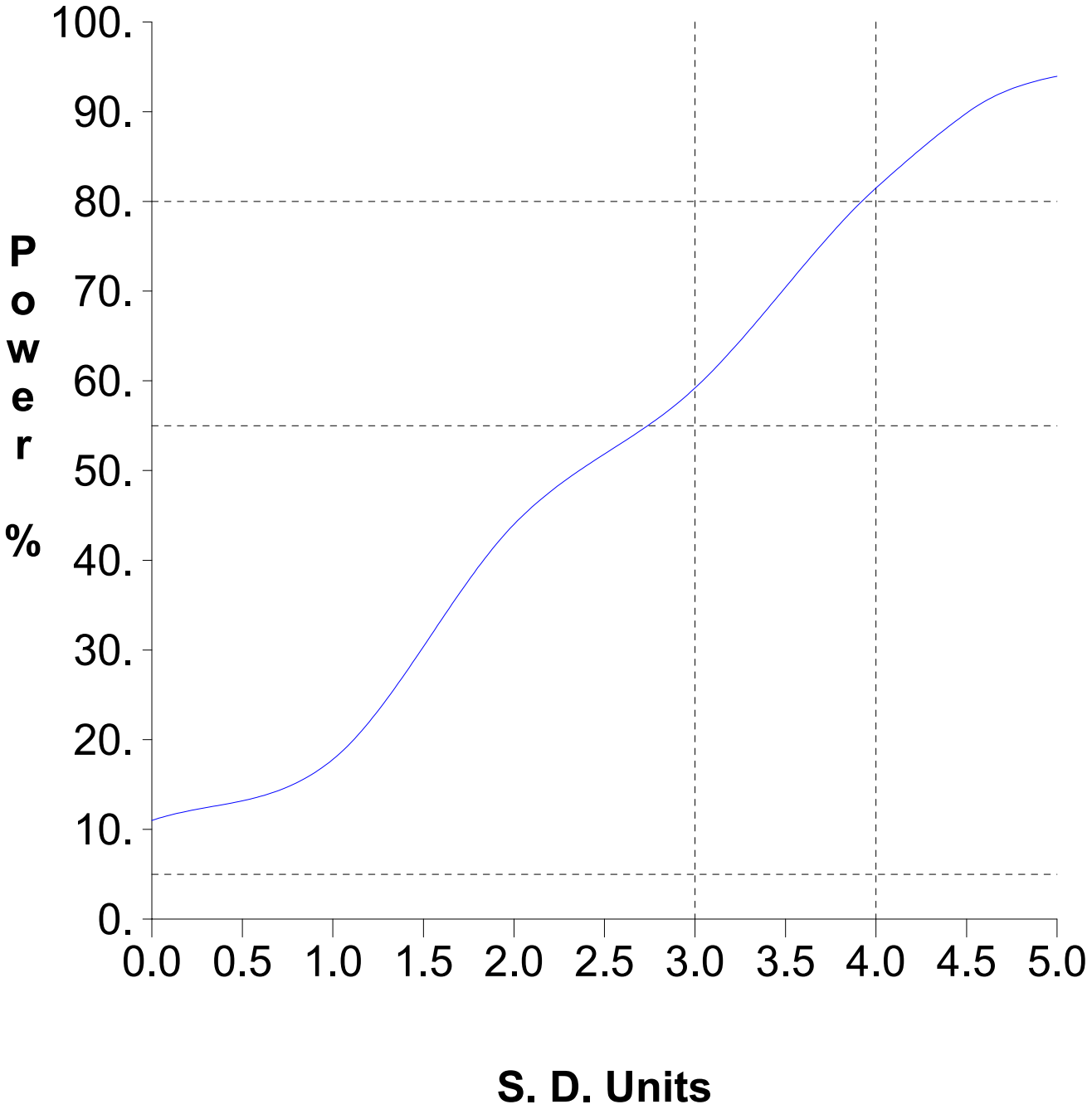


Graph 80

Prepared by: Otter Creek Environmental

False Positive and False Negative Rates for Current

Upgradient vs. Downgradient Monitoring Program



Attachment C

Summary Tables and Graphs for the Intrawell Comparisons
First Semi-Annual Monitoring Event in 2023

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Ammonia	mg/L	MW-1	9	2	11	0.7611	0.1978	0.6300	0.6100	0.7611	0.7611	2.0466	normal		
Arsenic, total	ug/L	MW-1	9	2	11	3.1622	1.5982	3.7100	3.3200	3.1622	3.1622	13.5503	normal		
Barium, total	ug/L	MW-1	9	2	11	189.6667	35.5282	216.0000	205.0000	189.6667	189.6667	420.5997	normal		
Chemical oxygen demand	mg/L	MW-1	9	2	11	14.4444	8.7194	5.7000	5.7000	14.4444	14.4444	71.1205	normal		
Chloride	mg/L	MW-1	9	2	11	10.3244	8.1872	5.8900	5.8300	10.3244	10.3244	63.5412	normal		
Cobalt, total	ug/L	MW-1	4	2	6	1.3550	0.4337	0.7500	0.7500	1.3550	1.3550	4.1741	normal		
Iron, total	ug/L	MW-1	8	2	11	5156.2500	2478.8704	4910.0000	1270.0000	5156.2500	5156.2500	21268.9073	normal		
Magnesium, total	mg/L	MW-1	9	2	11	26.0111	3.9813	29.2000	28.3000	26.0111	26.0111	51.8899	normal		
pH	SU	MW-1	9	2	11	7.1689	0.2980	7.1700	7.3300	7.1689	7.1689	5.23 - 9.11	normal		
Specific conductance	uS	MW-1	9	2	11	661.0000	49.9274	733.0000	711.0000	683.0726	683.1451	985.5284	normal		
Ammonia	mg/L	MW-2	9	2	11								nonpar *		**
Arsenic, total	ug/L	MW-2	8	2	11	1.4925	0.2142	1.3900	1.1900	1.4925	1.4925	2.8848	normal		
Barium, total	ug/L	MW-2	9	2	11	185.4444	37.3032	262.0000	187.0000	224.6968	188.9492	427.9152	normal		
Chemical oxygen demand	mg/L	MW-2	9	2	11	7.1111	0.3333	5.7000	5.7000	7.1111	7.1111	9.2778	normal		
Chloride	mg/L	MW-2	9	2	11	48.4391	18.0710	59.8000	69.5000	48.4391	51.4290	165.9005	normal		
Cobalt, total	ug/L	MW-2	4	2	6	6.4475	3.0866	8.0600	1.2500	6.4475	6.4475	26.5102	normal		
Iron, total	ug/L	MW-2	8	2	11	523.0625	231.6665	67.9000	1100.0000	523.0625	868.3335	2028.8950	normal		
Magnesium, total	mg/L	MW-2	9	2	11	22.3889	3.0387	21.2000	27.9000	22.3889	24.8613	42.1403	normal		
pH	SU	MW-2	9	2	11	6.4456	0.2034	6.8300	6.4700	6.6266	6.4476	5.12 - 7.77	normal		
Specific conductance	uS	MW-2	9	2	11	668.4444	73.4934	684.0000	859.0000	668.4444	785.5066	1146.1515	normal		
Ammonia	mg/L	MW-21	9	2	11								nonpar *		**
Arsenic, total	ug/L	MW-21	9	2	11	1.2344	0.3704	1.5400	1.5400	1.2344	1.2344	3.6423	normal		
Barium, total	ug/L	MW-21	9	2	11	363.2222	63.0273	307.0000	269.0000	363.2222	363.2222	772.8999	normal		
Chemical oxygen demand	mg/L	MW-21	9	2	11	8.6667	1.5811	5.7000	8.0000	8.6667	8.6667	18.9441	normal		
Chloride	mg/L	MW-21	9	2	11	215.9928	21.9695	162.0000	167.0000	215.9928	215.9928	358.7944	normal		
Cobalt, total	ug/L	MW-21	4	2	6	1.0575	0.3850	0.7500	0.7500	1.0575	1.0575	3.5600	normal		
Iron, total	ug/L	MW-21	8	2	11	418.5625	239.2071	147.0000	162.0000	418.5625	418.5625	1973.4086	normal		
Magnesium, total	mg/L	MW-21	9	2	11	54.7000	7.1798	43.9000	47.0000	54.7000	54.7000	101.3689	normal		
pH	SU	MW-21	9	2	11	6.7289	0.1486	6.8200	6.9200	6.7289	6.7714	5.76 - 7.69	normal		
Specific conductance	uS	MW-21	9	2	11	1542.5556	85.2674	1520.0000	1443.0000	1542.5556	1542.5556	2096.7936	normal		
Ammonia	mg/L	MW-22	9	2	11	4.3333	1.1683	2.8000	2.6000	4.3333	4.3333	11.9275	normal		
Arsenic, total	ug/L	MW-22	9	2	11	14.9578	3.7121	25.0000	17.8000	21.2879	20.4179	39.0867	normal		
Barium, total	ug/L	MW-22	9	2	11	308.4444	65.5098	567.0000	900.0000	501.4902	1027.5360	734.2578	normal		
Chemical oxygen demand	mg/L	MW-22	9	2	11	7.5556	1.0138	5.7000	100.0000	7.5556	98.9862	14.1452	normal		
Chloride	mg/L	MW-22	9	2	11	110.2439	16.1508	99.6000	74.8000	110.2439	110.2439	215.2241	normal		
Cobalt, total	ug/L	MW-22	4	2	6	8.3275	0.9308	10.7000	31.4000	9.7692	31.9109	14.3776	normal		
Iron, total	ug/L	MW-22	8	2	11	11301.2500	4157.6279	19600.0000	18300.0000	15442.3721	18283.4942	38325.8313	normal		
Magnesium, total	mg/L	MW-22	9	2	11	31.1000	3.3771	33.2000	46.0000	31.1000	42.6229	53.0513	normal		
pH	SU	MW-22	9	2	11	6.8678	0.1219	6.8400	6.7100	6.8678	6.8678	6.08 - 7.66	normal		
Specific conductance	uS	MW-22	9	2	11	1088.7778	111.5154	1035.0000	988.0000	1088.7778	1088.7778	1813.6282	normal		
Ammonia	mg/L	MW-23	9	2	11	1.4667	0.2598	1.3000	1.2000	1.4667	1.4667	3.1554	normal		
Arsenic, total	ug/L	MW-23	9	2	11	21.2000	8.4049	11.5000	18.1000	21.2000	21.2000	75.8319	normal		
Barium, total	ug/L	MW-23	9	2	11	159.4000	35.4237	129.0000	135.0000	159.4000	159.4000	389.6542	normal		
Chemical oxygen demand	mg/L	MW-23	9	2	11	7.6667	2.0616	5.7000	6.0000	7.6667	7.6667	21.0668	normal		
Chloride	mg/L	MW-23	9	2	11	86.7652	8.7783	98.9000	89.3000	90.1217	86.7652	143.8243	normal		
Cobalt, total	ug/L	MW-23	4	2	6	3.1800	2.0598	2.3700	2.0000	3.1800	3.1800	16.5686	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one verification resample (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Iron, total	ug/L	MW-23	8	2	11	9047.5000	3109.8404	5370.0000	2460.0000	9047.5000	9047.5000	29261.4624	normal		
Magnesium, total	mg/L	MW-23	9	2	11	37.1444	3.1682	40.4000	39.4000	37.2318	37.1444	57.7380	normal		
pH	SU	MW-23	9	2	11	6.9944	0.2133	7.0500	6.9900	6.9944	6.9944	5.61 - 8.38	normal		
Specific conductance	uS	MW-23	9	2	11	1133.1111	42.0935	1215.0000	1151.0000	1172.9065	1148.7019	1406.7187	normal		
Ammonia	mg/L	MW-24	9	2	11	1.4667	0.5958	0.8200	0.7600	1.4667	1.4667	5.3395	normal		
Arsenic, total	ug/L	MW-24	9	2	11	1.0689	0.4413	0.9000	0.9000	1.0689	1.0689	3.9371	normal		
Barium, total	ug/L	MW-24	9	2	11	318.6667	144.3373	466.0000	218.0000	321.6627	318.6667	1256.8590	normal		
Chemical oxygen demand	mg/L	MW-24	9	2	11								nonpar *		**
Chloride	mg/L	MW-24	9	2	11	94.6720	7.0513	98.7000	69.2000	94.6720	94.6720	140.5052	normal		
Cobalt, total	ug/L	MW-24	4	2	6	3.4150	1.9893	4.3100	2.0900	3.4150	3.4150	16.3455	normal		
Iron, total	ug/L	MW-24	8	2	11	1100.5625	901.5777	673.0000	622.0000	1100.5625	1100.5625	6960.8174	normal		
Magnesium, total	mg/L	MW-24	9	2	11	38.4000	4.8678	35.9000	28.8000	38.4000	38.4000	70.0404	normal		
pH	SU	MW-24	9	2	11	6.9200	0.0954	7.0400	6.9100	6.9446	6.9200	6.30 - 7.54	normal		
Specific conductance	uS	MW-24	9	2	11	1052.0000	56.4424	1009.0000	862.0000	1052.0000	1052.0000	1418.8759	normal		
Ammonia	mg/L	MW-26	9	2	11								nonpar *		**
Arsenic, total	ug/L	MW-26	9	2	11	0.7889	0.5763	1.0900	0.9000	0.7889	0.7889	4.5351	normal		
Barium, total	ug/L	MW-26	9	2	11	140.4444	41.2193	162.0000	176.0000	140.4444	140.4444	408.3697	normal		
Chemical oxygen demand	mg/L	MW-26	9	2	11								nonpar *		**
Chloride	mg/L	MW-26	9	2	11	43.0798	17.0679	78.4000	71.9000	61.3321	73.0845	154.0209	normal		
Cobalt, total	ug/L	MW-26	4	2	6	1.0675	0.3650	0.7500	0.7500	1.0675	1.0675	3.4400	normal		
Iron, total	ug/L	MW-26	8	2	11	391.0250	138.3588	376.0000	767.0000	391.0250	628.6412	1290.3572	normal		
Magnesium, total	mg/L	MW-26	9	2	11	12.0689	3.9159	16.3000	19.7000	12.3841	16.0994	37.5221	normal		
pH	SU	MW-26	9	2	11	6.2767	0.2241	6.3400	6.5700	6.2767	6.3459	4.82 - 7.73	normal		
Specific conductance	uS	MW-26	9	2	11	421.0000	159.3730	646.0000	709.0000	486.6270	615.2540	1456.9244	normal		
Ammonia	mg/L	MW-3R1	9	2	11	0.7498	0.4677	0.6100	0.4000	0.7498	0.7498	3.7901	normal		
Arsenic, total	ug/L	MW-3R1	8	2	11	61.3250	15.9933	57.0000	61.2000	61.3250	61.3250	165.2813	normal		
Barium, total	ug/L	MW-3R1	8	2	11	422.6250	109.3434	377.0000	294.0000	422.6250	422.6250	1133.3572	normal		
Chemical oxygen demand	mg/L	MW-3R1	8	2	10	9.1250	3.6815	5.7000	8.0000	9.1250	9.1250	33.0549	normal		
Chloride	mg/L	MW-3R1	9	2	11	56.0031	7.2377	74.1000	71.2000	66.8623	74.8215	103.0481	normal		
Cobalt, total	ug/L	MW-3R1	4	2	6	10.9575	1.1627	13.1000	13.0000	11.9373	12.8171	18.5151	normal		
Iron, total	ug/L	MW-3R1	7	2	11	50357.1429	12210.2221	46000.0000	14900.0000	50357.1429	50357.1429	129723.5865	normal		
Magnesium, total	mg/L	MW-3R1	9	2	11	106.2222	159.7377	46.5000	33.2000	106.2222	106.2222	1144.5170	normal		
pH	SU	MW-3R1	9	2	11	6.7689	0.1244	6.7600	6.5900	6.7689	6.7689	5.96 - 7.58	normal		
Specific conductance	uS	MW-3R1	9	2	11	837.7778	43.8685	888.0000	836.0000	844.1315	837.7778	1122.9230	normal		
Ammonia	mg/L	MW-4	9	2	11	1.4600	0.6511	1.5000	0.6200	1.4600	1.4600	5.6920	normal		
Arsenic, total	ug/L	MW-4	9	2	11	20.6889	6.8296	22.3000	11.7000	20.6889	20.6889	65.0814	normal		
Barium, total	ug/L	MW-4	9	2	11	341.6667	72.1613	404.0000	235.0000	341.6667	341.6667	810.7150	normal		
Chemical oxygen demand	mg/L	MW-4	9	2	11	9.3333	3.7081	5.7000	6.0000	9.3333	9.3333	33.4360	normal		
Chloride	mg/L	MW-4	9	2	11	76.0033	17.8265	85.8000	64.2000	76.0033	76.0033	191.8759	normal		
Cobalt, total	ug/L	MW-4	4	2	6	4.9900	2.1229	15.1000	8.2900	12.9771	14.1541	18.7891	normal		
Iron, total	ug/L	MW-4	8	2	11	5932.5000	1589.2114	11600.0000	3230.0000	10010.7886	5932.5000	16262.3741	normal		
Magnesium, total	mg/L	MW-4	9	2	11	27.6889	4.5253	32.5000	25.2000	27.9747	27.6889	57.1035	normal		
pH	SU	MW-4	9	2	11	6.6600	0.2068	6.8300	6.6900	6.6600	6.6600	5.32 - 8.00	normal		
Specific conductance	uS	MW-4	9	2	11	849.6667	159.6731	934.0000	782.0000	849.6667	849.6667	1887.5418	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one verification resample (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

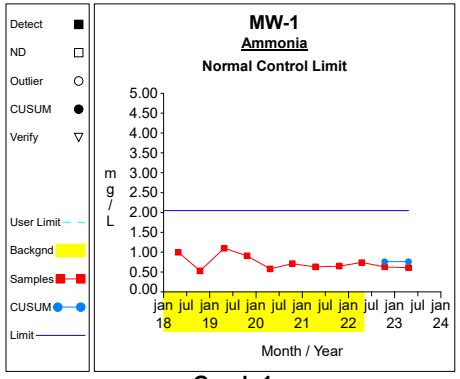
Table 4

Dixon's Test Outliers
1% Significance Level

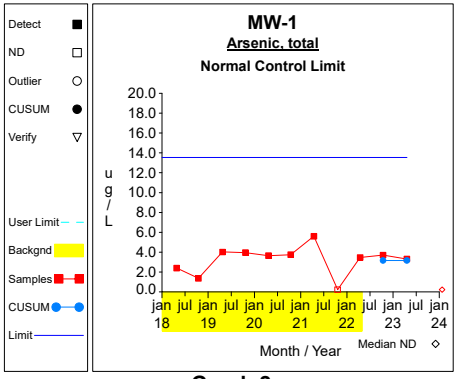
Constituent	Units	Well	Date	Result	ND Qualifier	Date Range	N	Critical Value
Iron, total	ug/L	MW-1	04/21/2020	45.8000		04/26/2018-04/14/2022	9	0.6346
Arsenic, total	ug/L	MW-2	10/20/2021	5.7500	< 5.7500	04/27/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-2	04/21/2020	5.7200		04/27/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-21	04/21/2020	2.0000	< 2.0000	04/26/2018-04/14/2022	9	0.6346
Iron, total	ug/L	MW-22	04/21/2020	93.3000		04/27/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-23	04/21/2020	118.0000		04/26/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-24	04/21/2020	9.3400		04/26/2018-04/14/2022	9	0.6346
Arsenic, total	ug/L	MW-3R1	06/05/2018	372.0000		06/05/2018-04/15/2022	9	0.6346
Barium, total	ug/L	MW-3R1	06/05/2018	1920.0000		06/05/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-3R1	06/05/2018	357000.0000		06/05/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-3R1	04/21/2020	535.0000		06/05/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-4	04/21/2020	36.2000		04/26/2018-04/14/2022	9	0.6346

N = Total number of independent measurements in background at each well.
Date Range = Dates of the first and last measurements included in background at each well.
Critical Value depends on the significance level and on N-1 when the two most extreme values are tested or N for the most extreme value.

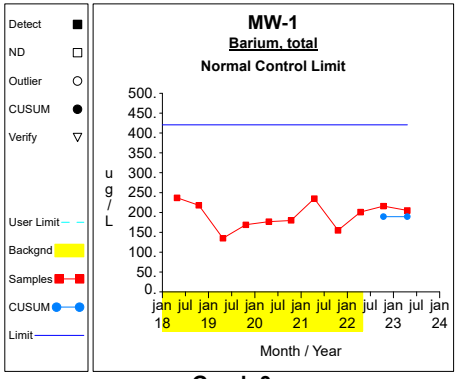
Intra-Well Control Charts / Prediction Limits



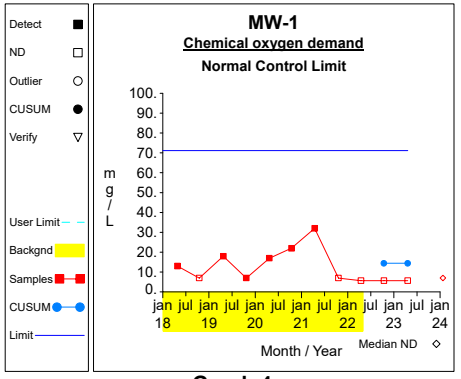
Graph 1



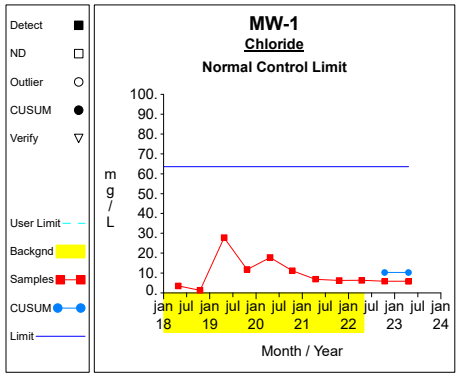
Graph 2



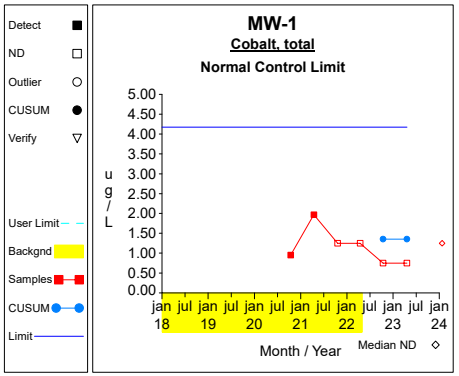
Graph 3



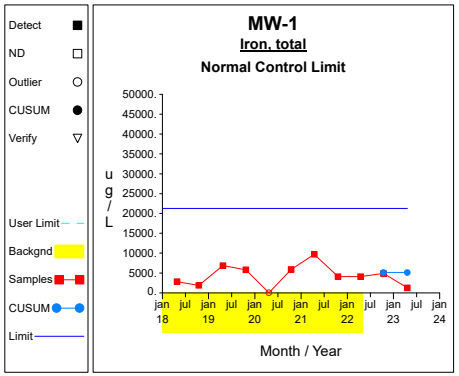
Graph 4



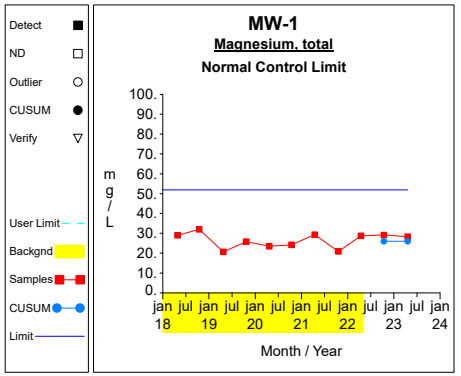
Graph 5



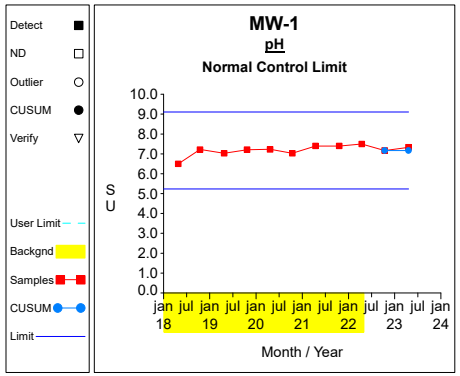
Graph 6



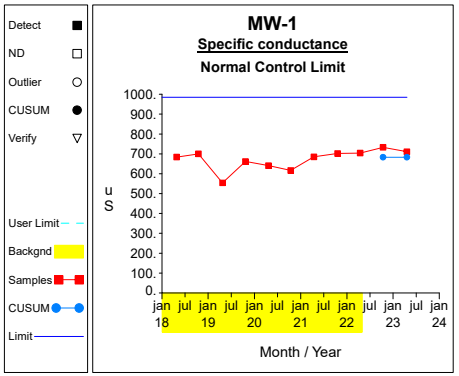
Graph 7



Graph 8

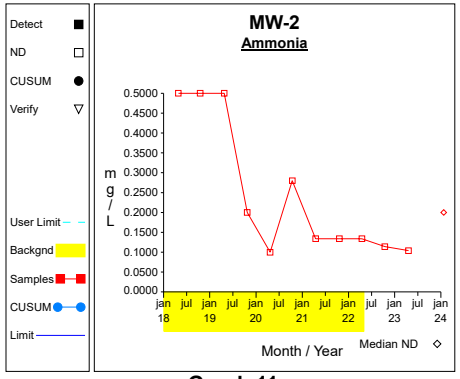


Graph 9

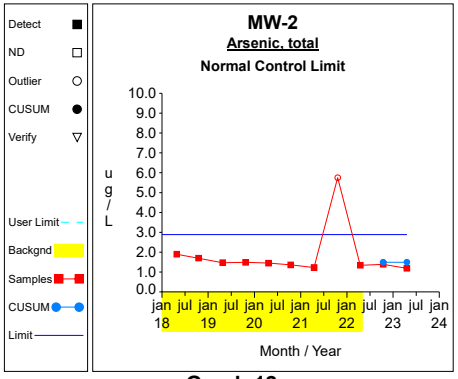


Graph 10

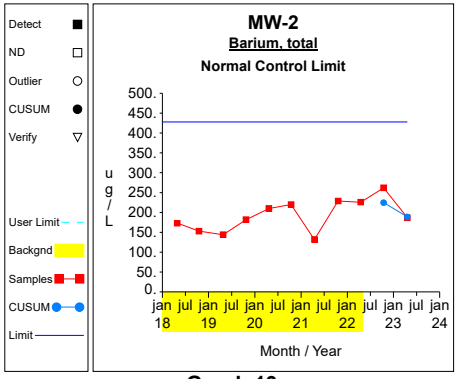
Intra-Well Control Charts / Prediction Limits



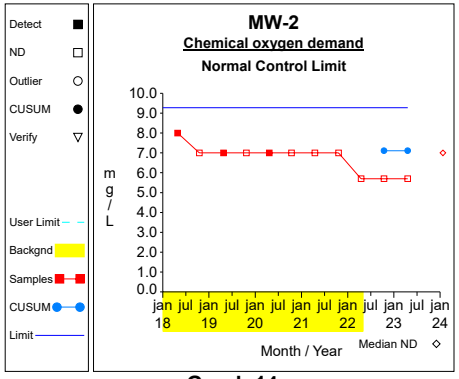
Graph 11



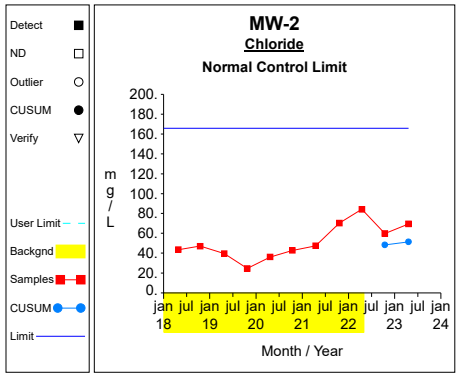
Graph 12



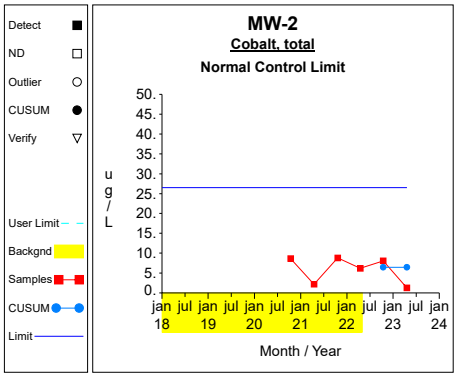
Graph 13



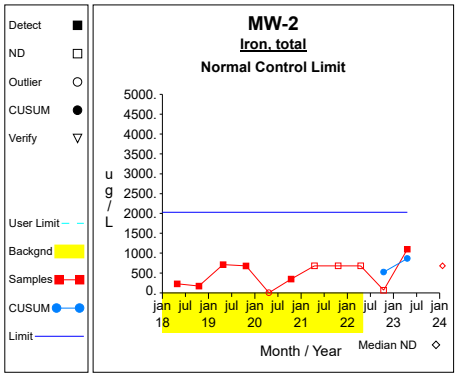
Graph 14



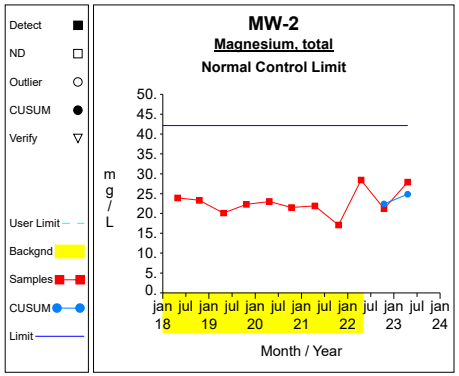
Graph 15



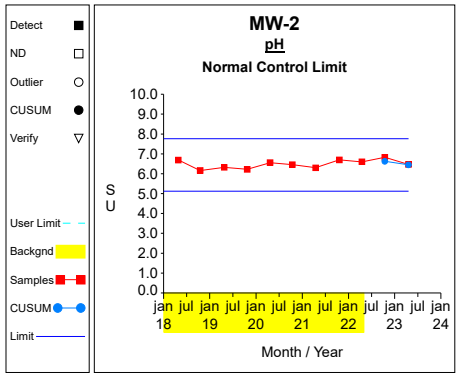
Graph 16



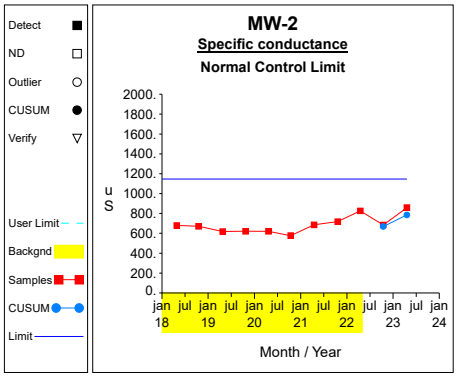
Graph 17



Graph 18

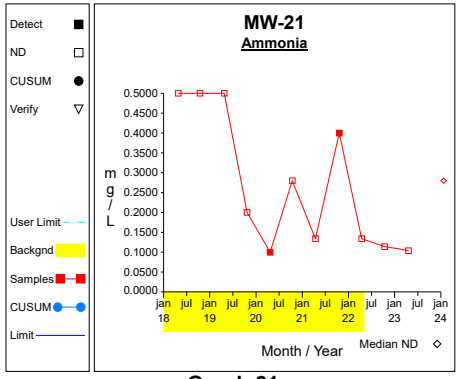


Graph 19

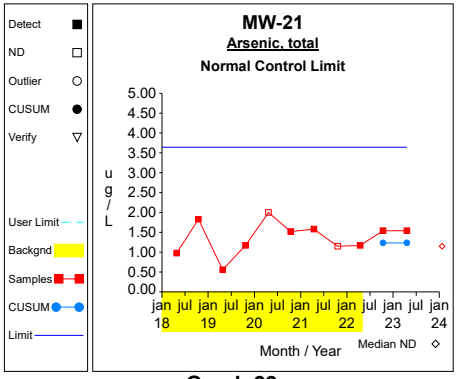


Graph 20

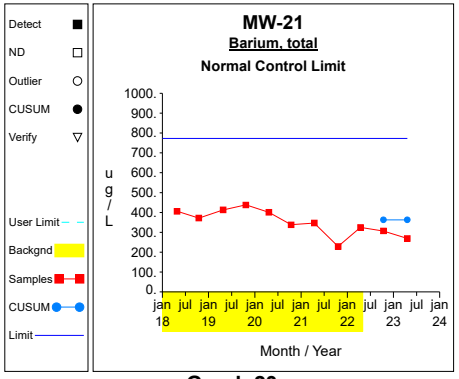
Intra-Well Control Charts / Prediction Limits



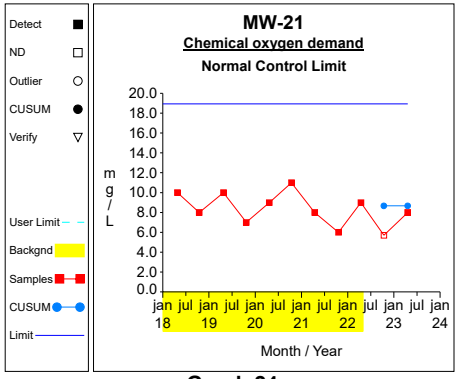
Graph 21



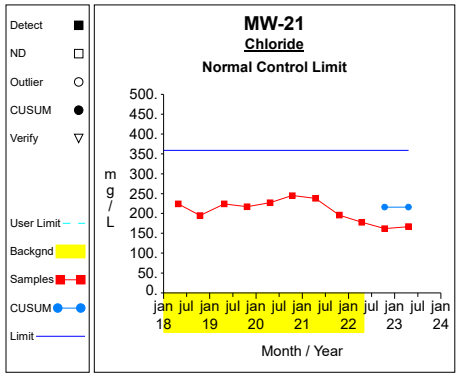
Graph 22



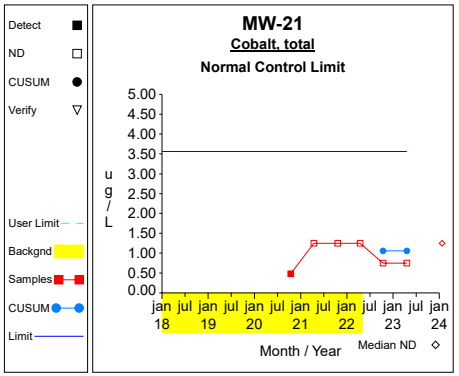
Graph 23



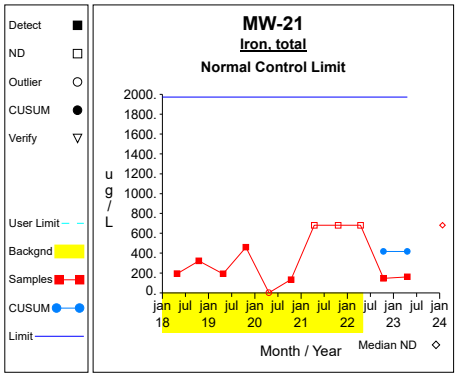
Graph 24



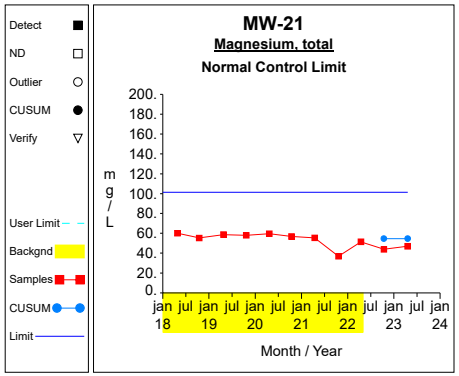
Graph 25



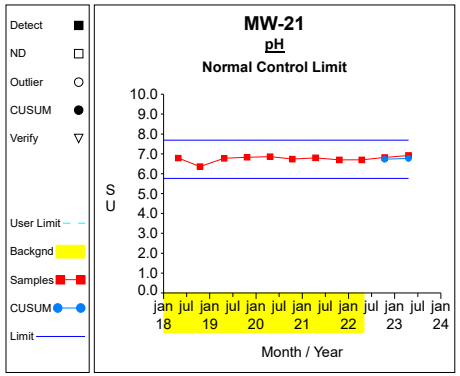
Graph 26



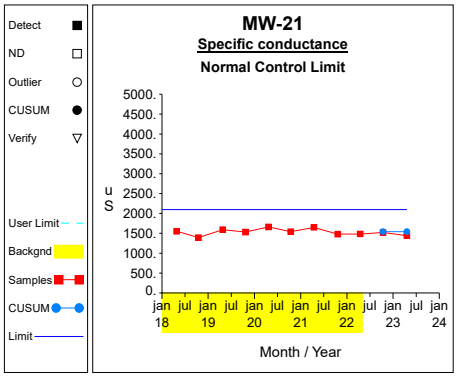
Graph 27



Graph 28

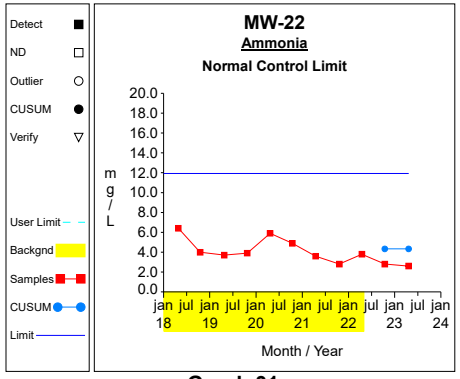


Graph 29

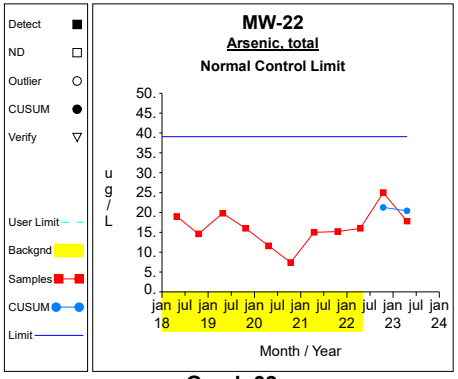


Graph 30

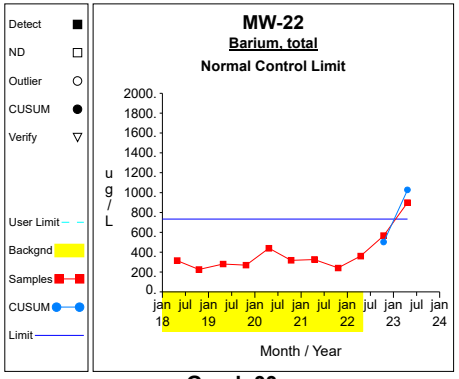
Intra-Well Control Charts / Prediction Limits



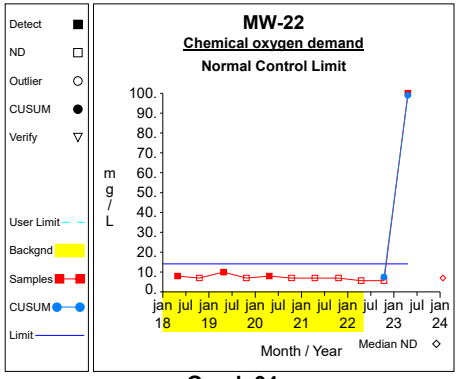
Graph 31



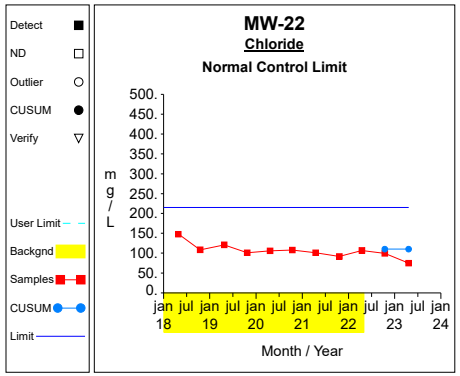
Graph 32



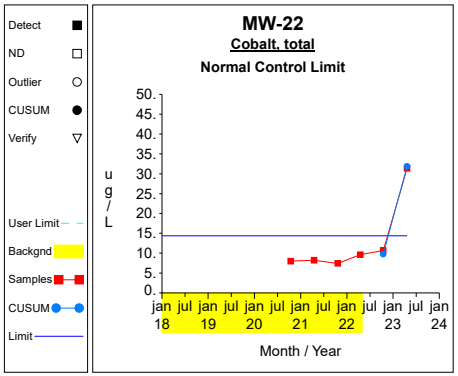
Graph 33



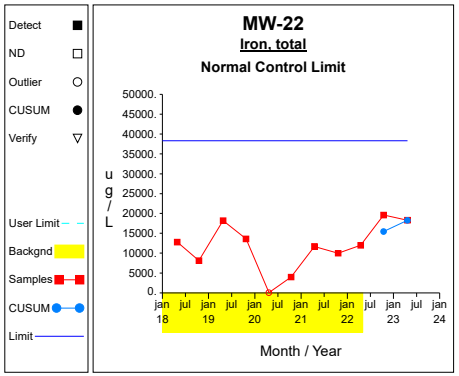
Graph 34



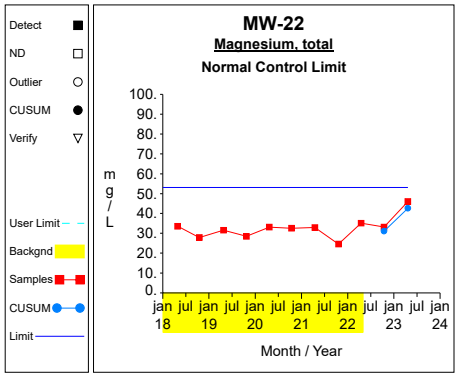
Graph 35



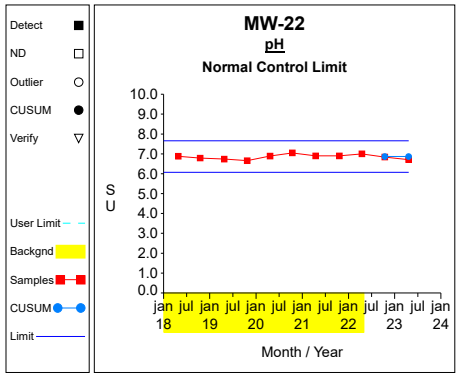
Graph 36



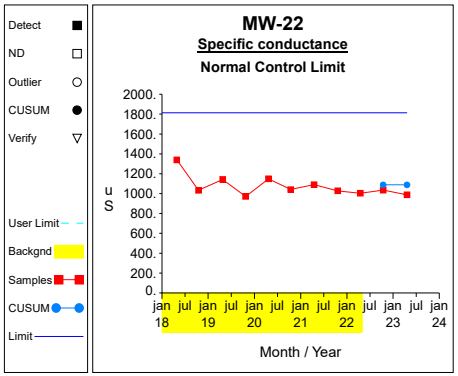
Graph 37



Graph 38



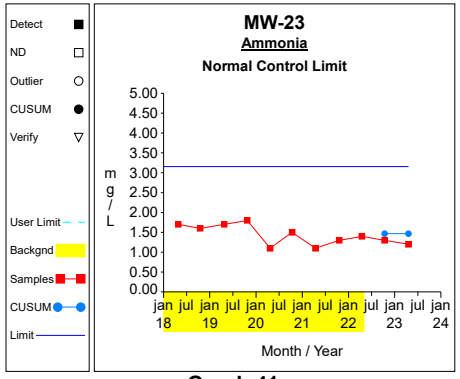
Graph 39



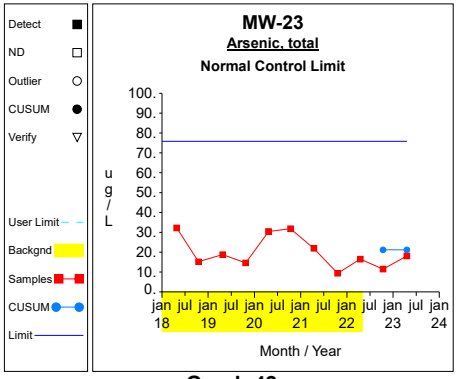
Graph 40

Prepared by: Otter Creek Environmental

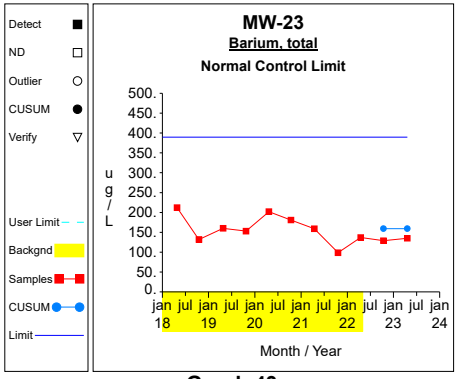
Intra-Well Control Charts / Prediction Limits



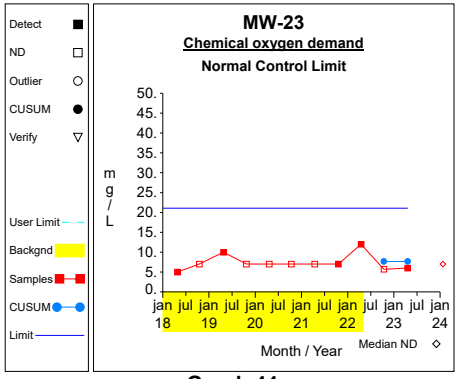
Graph 41



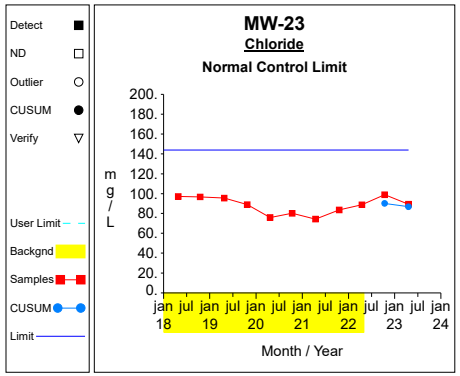
Graph 42



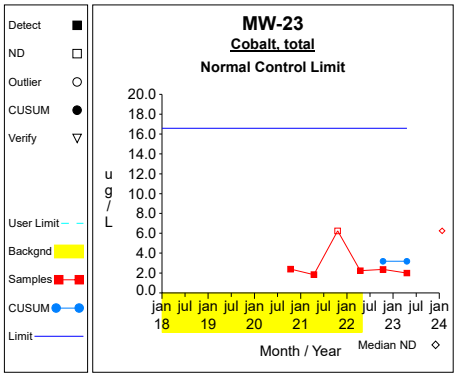
Graph 43



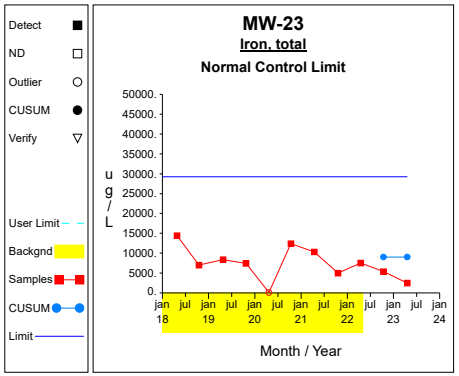
Graph 44



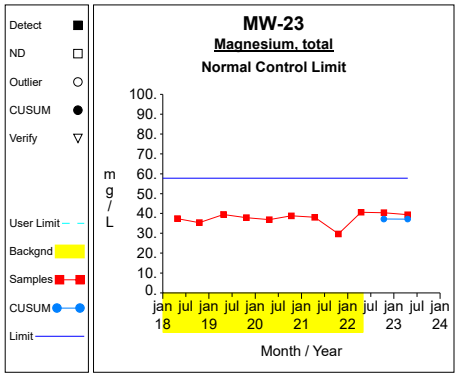
Graph 45



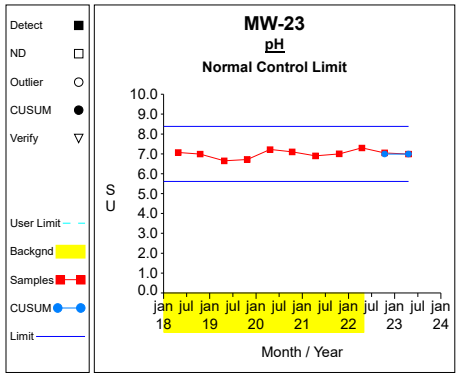
Graph 46



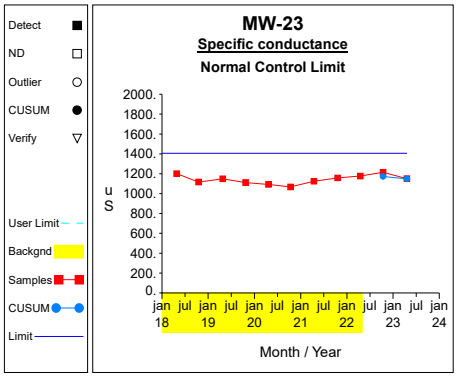
Graph 47



Graph 48

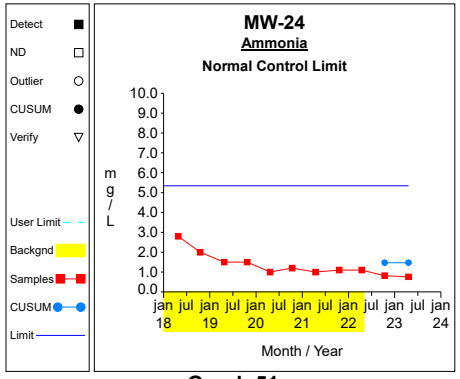


Graph 49

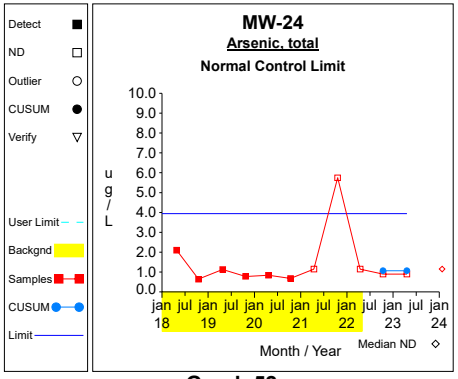


Graph 50

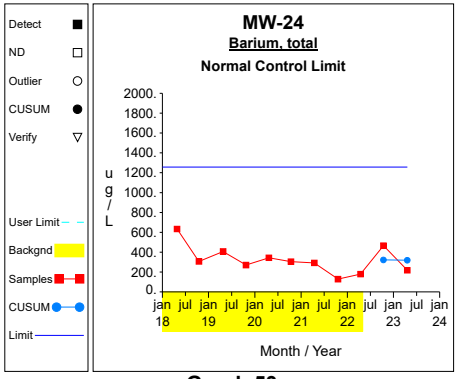
Intra-Well Control Charts / Prediction Limits



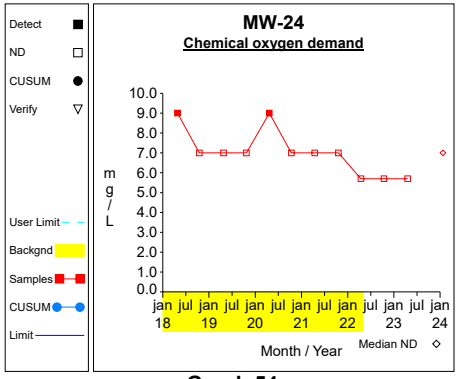
Graph 51



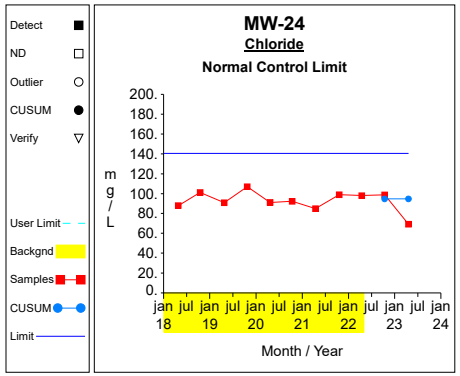
Graph 52



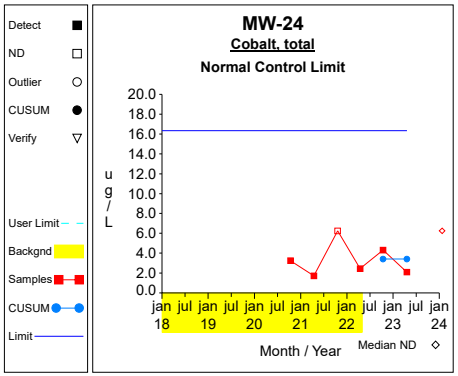
Graph 53



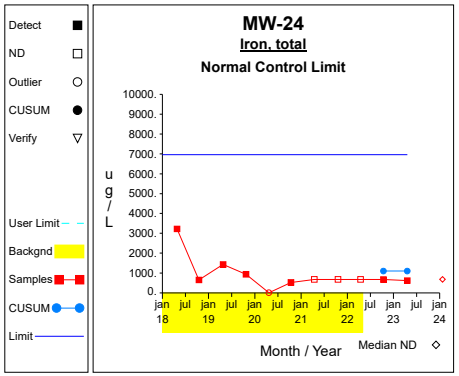
Graph 54



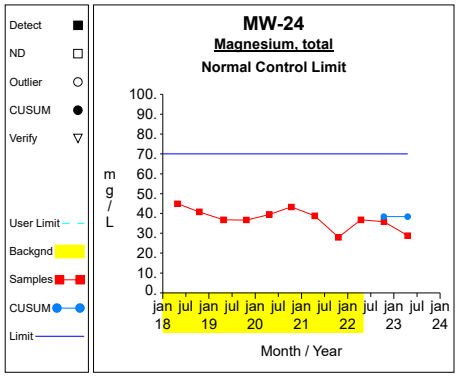
Graph 55



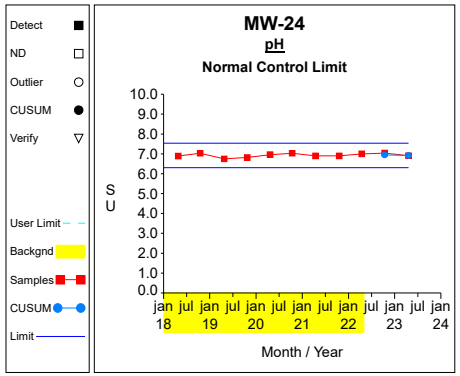
Graph 56



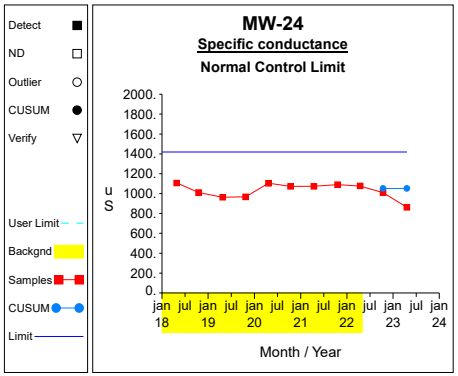
Graph 57



Graph 58

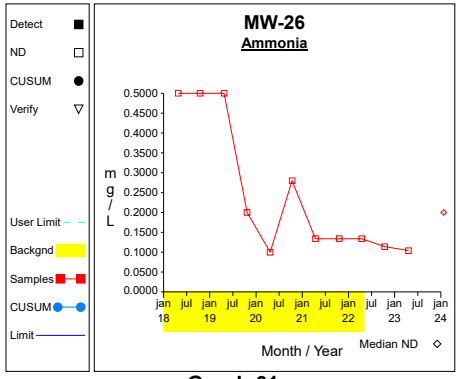


Graph 59

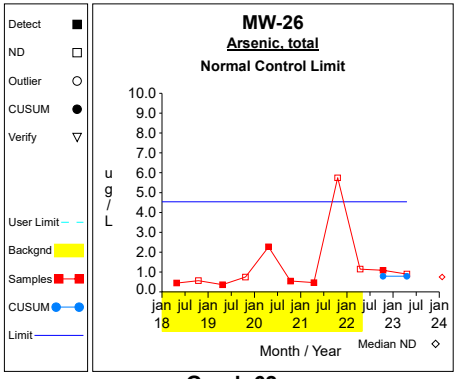


Graph 60

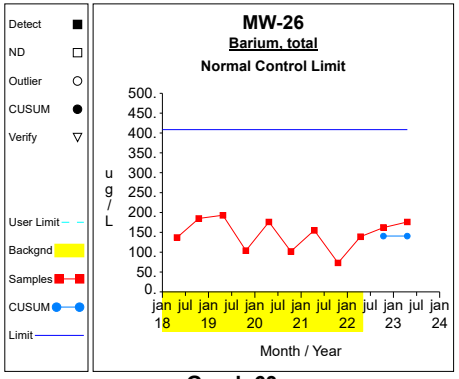
Intra-Well Control Charts / Prediction Limits



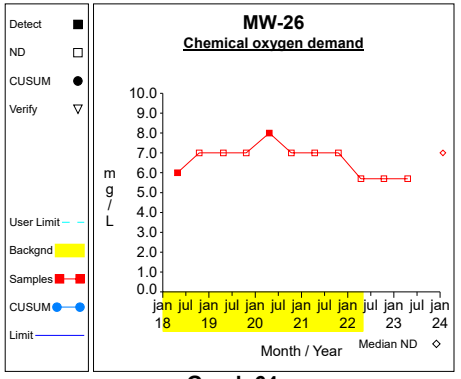
Graph 61



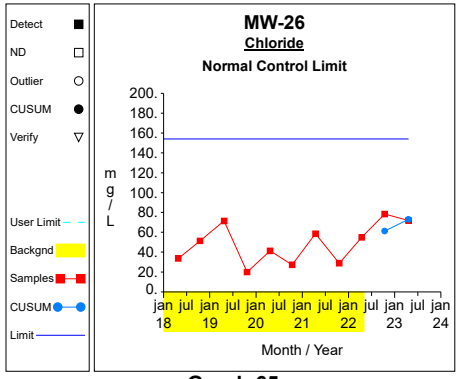
Graph 62



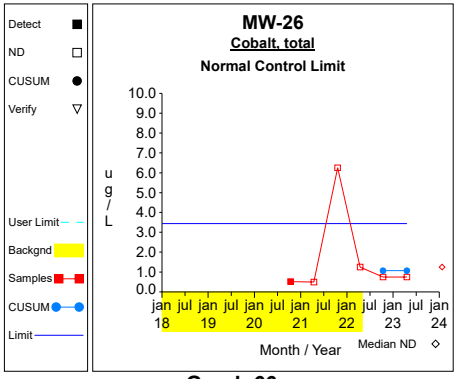
Graph 63



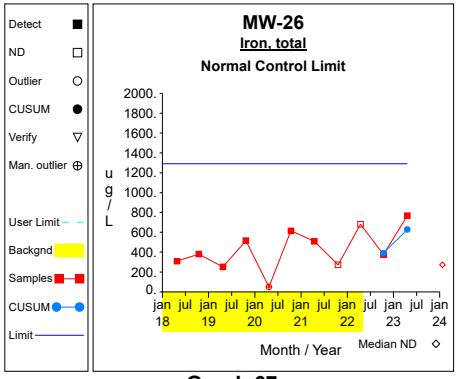
Graph 64



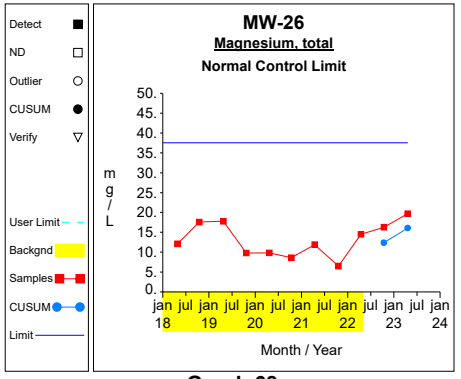
Graph 65



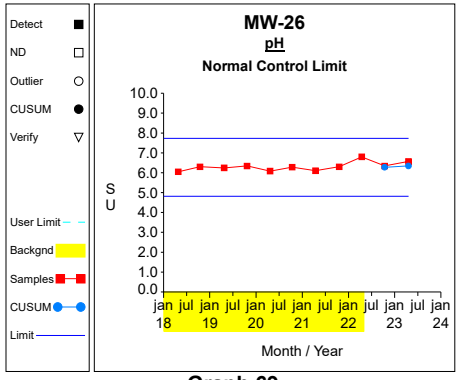
Graph 66



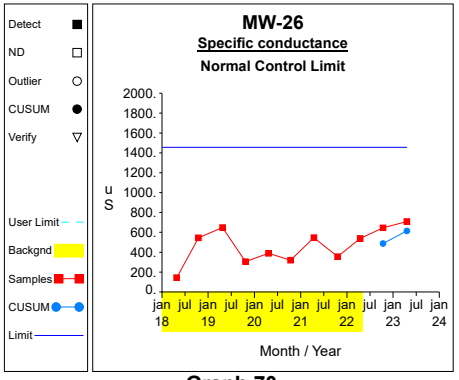
Graph 67



Graph 68

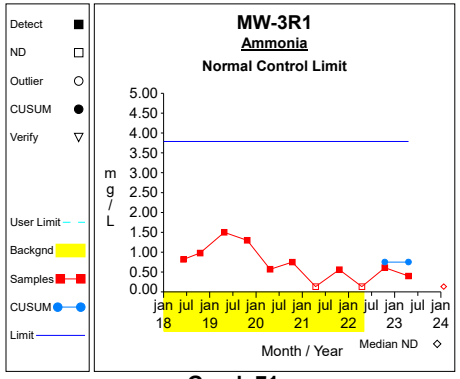


Graph 69

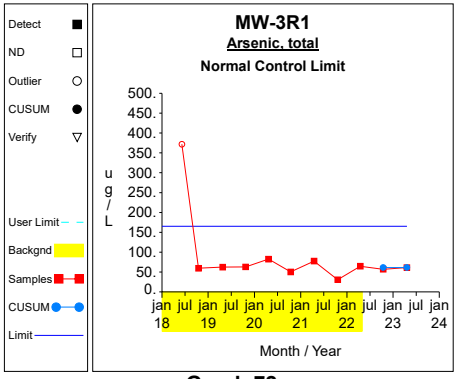


Graph 70

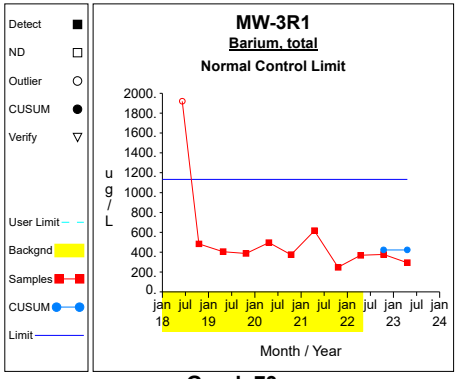
Intra-Well Control Charts / Prediction Limits



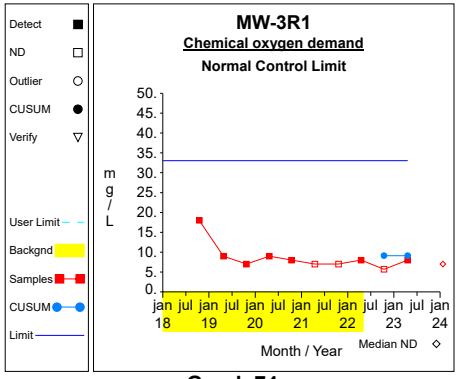
Graph 71



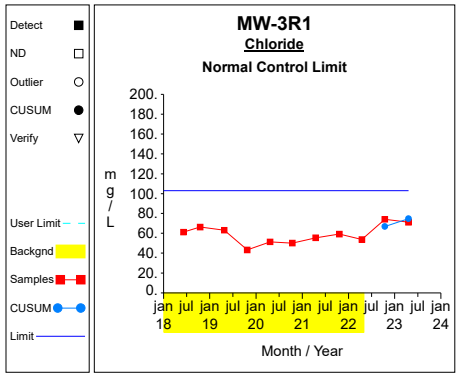
Graph 72



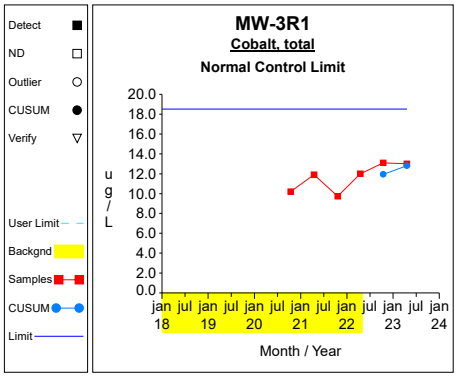
Graph 73



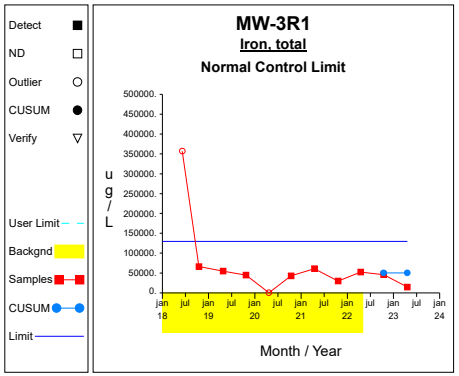
Graph 74



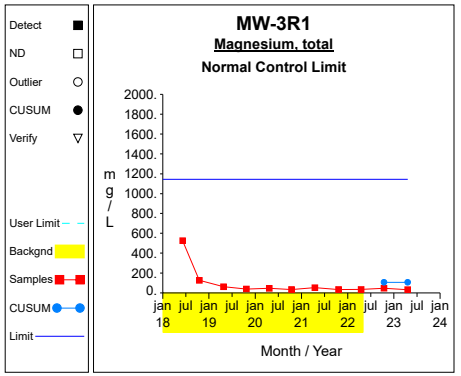
Graph 75



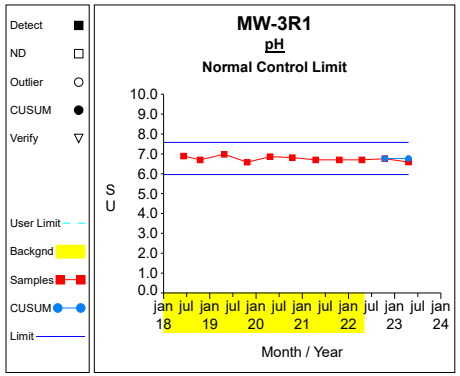
Graph 76



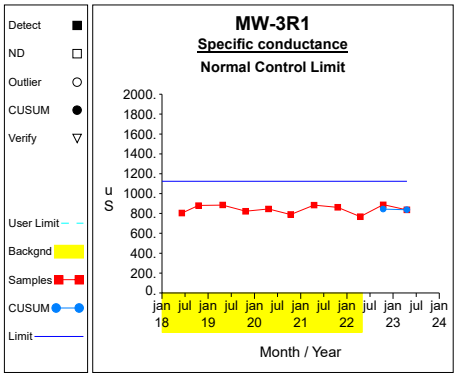
Graph 77



Graph 78

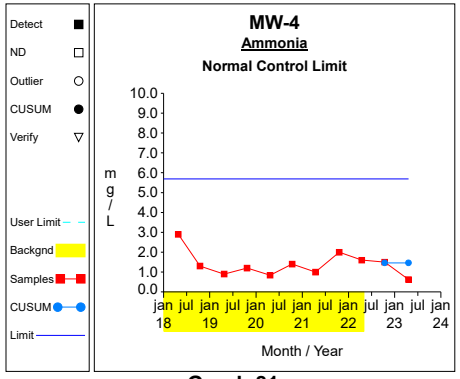


Graph 79

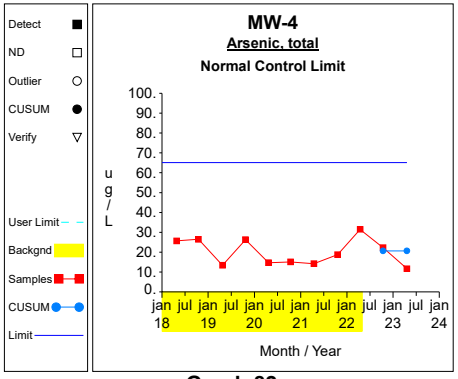


Graph 80

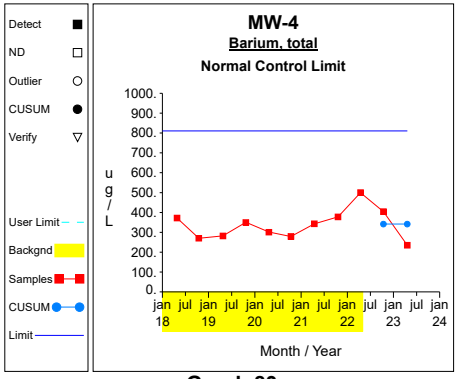
Intra-Well Control Charts / Prediction Limits



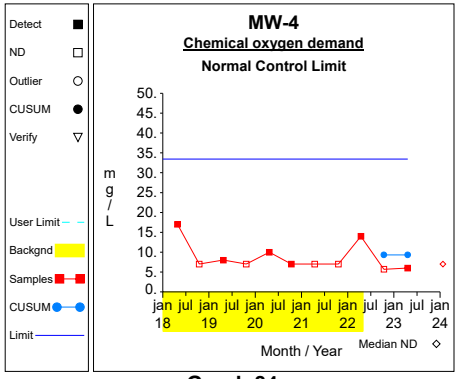
Graph 81



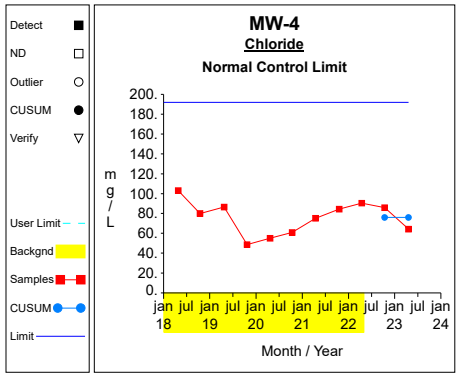
Graph 82



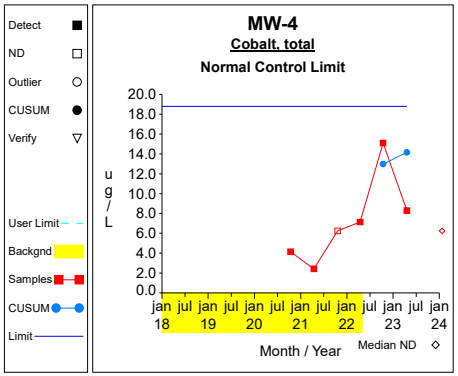
Graph 83



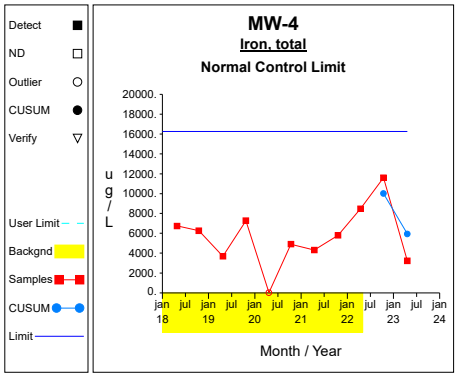
Graph 84



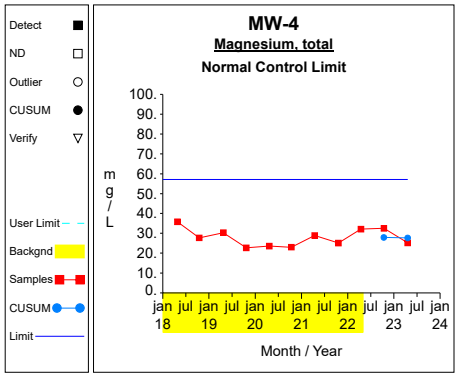
Graph 85



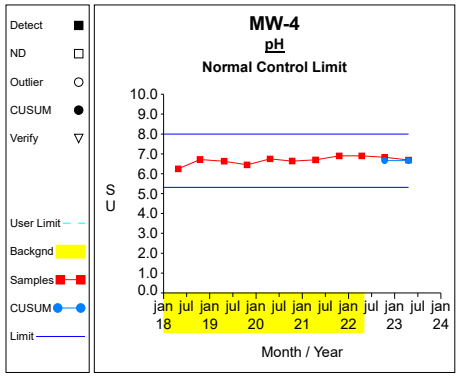
Graph 86



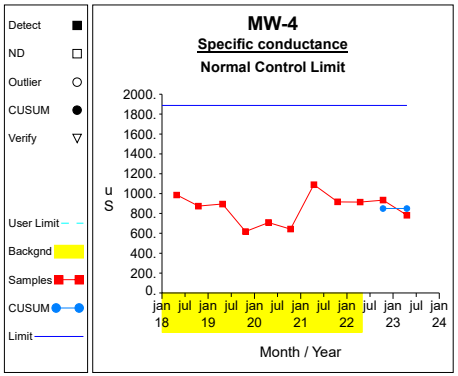
Graph 87



Graph 88



Graph 89



Graph 90

False Positive and False Negative Rates for Current Intra-Well Control Charts Monitoring Program

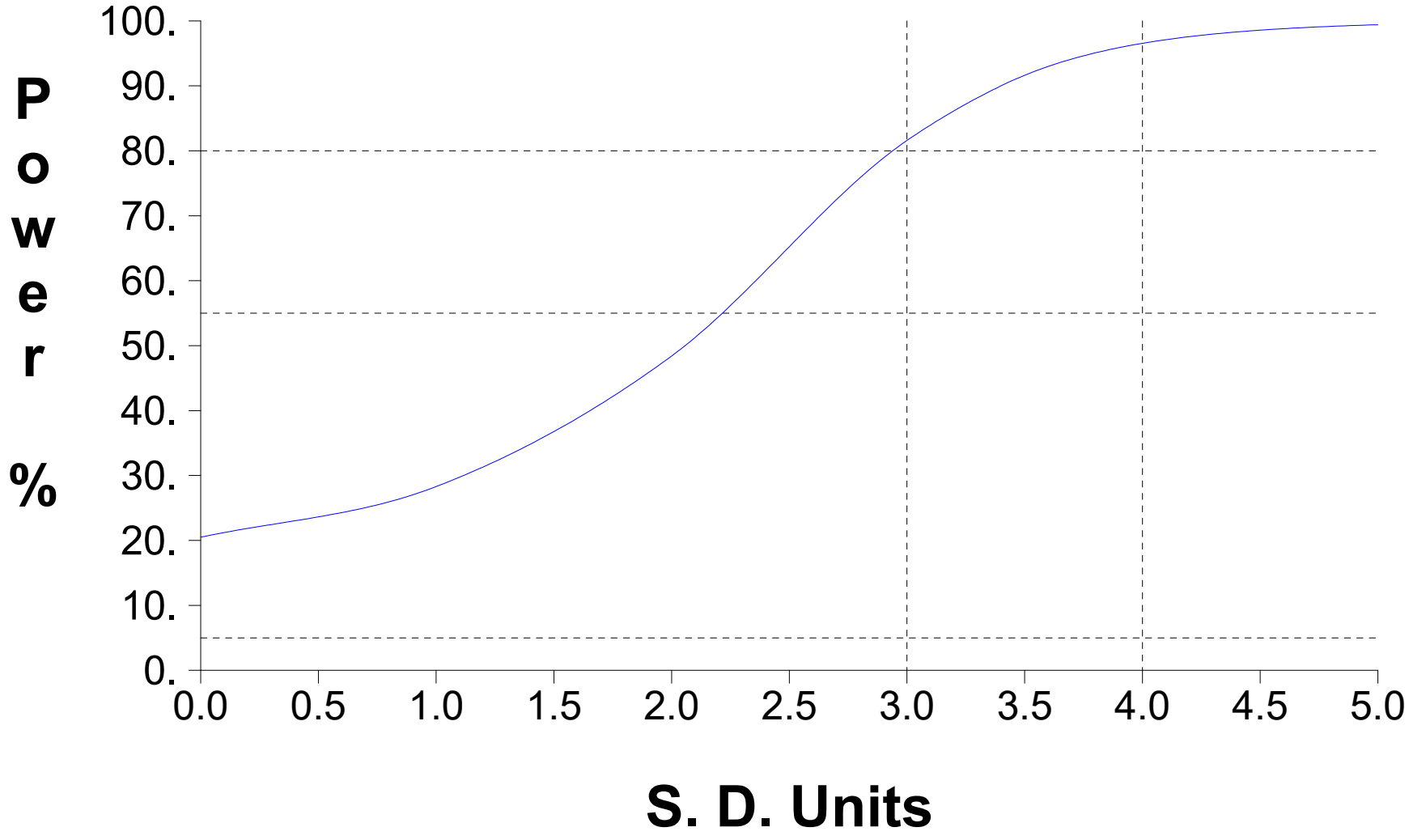


Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf
Barium, total	ug/L	MW-22	9	3	12	308.4444	65.5098	900.0000	327.0000	1027.5360	454.5360	734.2578	normal	
Chemical oxygen demand	mg/L	MW-22	9	3	12	7.5556	1.0138	100.0000	5.7000	98.9862	7.5556	14.1452	normal	
Cobalt, total	ug/L	MW-22	4	3	7	8.3275	0.9308	31.4000	14.2000	31.9109	14.7109	14.3776	normal	

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one verification resample (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

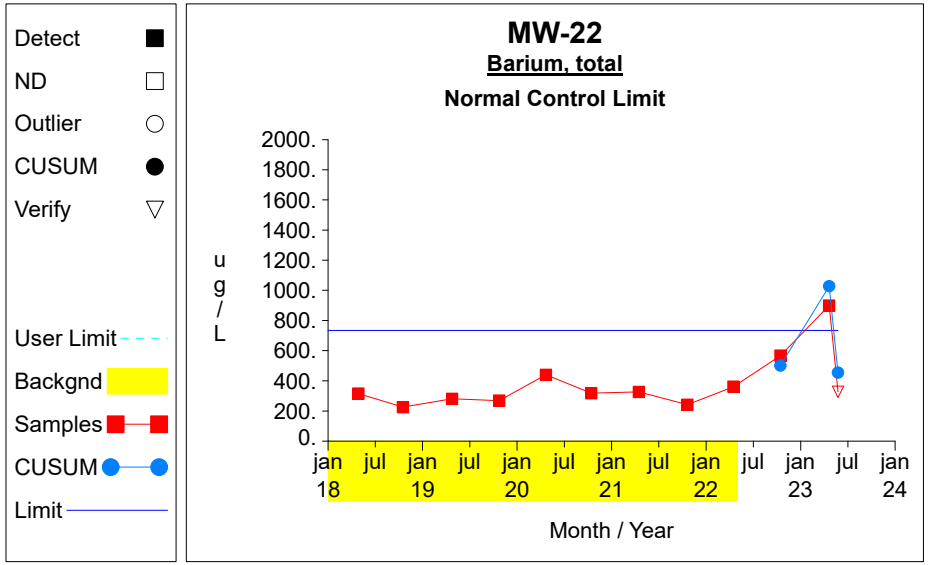
Table 2

Analytical Data and CUSUM Summary

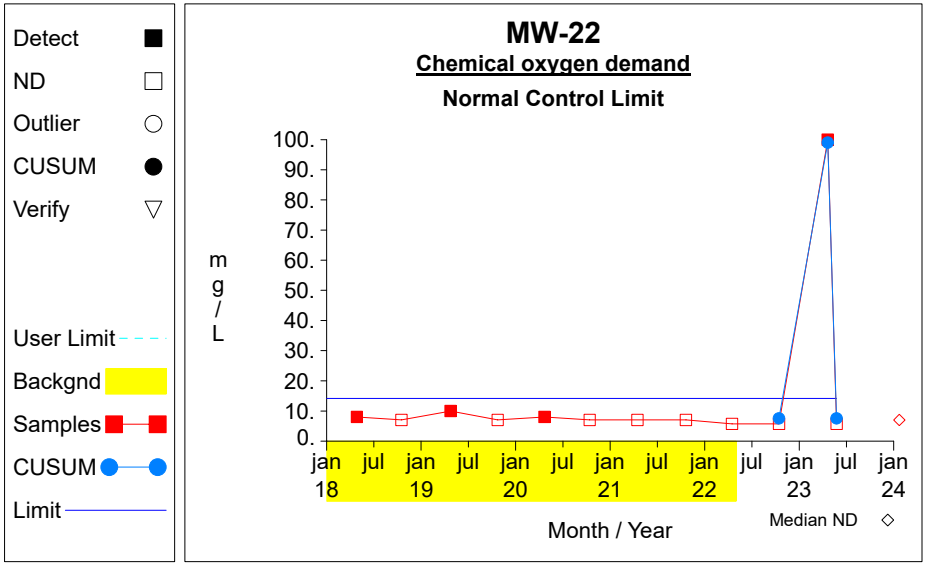
Constituent	Units	Well	Date	Background	Result		Outlier	CUSUM	Adjusted	
Barium, total	ug/L	MW-22	04/27/2018	yes	315.0000					
Barium, total	ug/L	MW-22	10/16/2018	yes	225.0000					
Barium, total	ug/L	MW-22	04/24/2019	yes	281.0000					
Barium, total	ug/L	MW-22	10/23/2019	yes	269.0000					
Barium, total	ug/L	MW-22	04/21/2020	yes	440.0000					
Barium, total	ug/L	MW-22	10/13/2020	yes	318.0000					
Barium, total	ug/L	MW-22	04/15/2021	yes	326.0000					
Barium, total	ug/L	MW-22	10/20/2021	yes	241.0000					
Barium, total	ug/L	MW-22	04/15/2022	yes	361.0000					
Barium, total	ug/L	MW-22	10/14/2022		567.0000			501.4902		
Barium, total	ug/L	MW-22	04/20/2023		900.0000			1027.5360		**
Barium, total	ug/L	MW-22	05/24/2023		327.0000			454.5360		
Chemical oxygen demand	mg/L	MW-22	04/27/2018	yes	8.0000					
Chemical oxygen demand	mg/L	MW-22	10/16/2018	yes	7.0000	ND				
Chemical oxygen demand	mg/L	MW-22	04/24/2019	yes	10.0000					
Chemical oxygen demand	mg/L	MW-22	10/23/2019	yes	7.0000	ND				
Chemical oxygen demand	mg/L	MW-22	04/21/2020	yes	8.0000					
Chemical oxygen demand	mg/L	MW-22	10/13/2020	yes	7.0000	ND				
Chemical oxygen demand	mg/L	MW-22	04/15/2021	yes	7.0000	ND				
Chemical oxygen demand	mg/L	MW-22	10/20/2021	yes	7.0000	ND				
Chemical oxygen demand	mg/L	MW-22	04/15/2022	yes	5.7000	ND			7.0000	***
Chemical oxygen demand	mg/L	MW-22	10/14/2022		5.7000	ND		7.5556		
Chemical oxygen demand	mg/L	MW-22	04/20/2023		100.0000			98.9862		**
Chemical oxygen demand	mg/L	MW-22	05/24/2023		5.7000	ND		7.5556		
Cobalt, total	ug/L	MW-22	10/13/2020	yes	8.0000					
Cobalt, total	ug/L	MW-22	04/15/2021	yes	8.2400					
Cobalt, total	ug/L	MW-22	10/20/2021	yes	7.4400					
Cobalt, total	ug/L	MW-22	04/15/2022	yes	9.6300					
Cobalt, total	ug/L	MW-22	10/14/2022		10.7000			9.7692		
Cobalt, total	ug/L	MW-22	04/20/2023		31.4000			31.9109		**
Cobalt, total	ug/L	MW-22	05/24/2023		14.2000			14.7109		**

* - Outlier for that well and constituent.
** - Non-outlier detected sample Result and / or CUSUM value exceeds limit.
*** - ND value replaced with median RL.
**** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

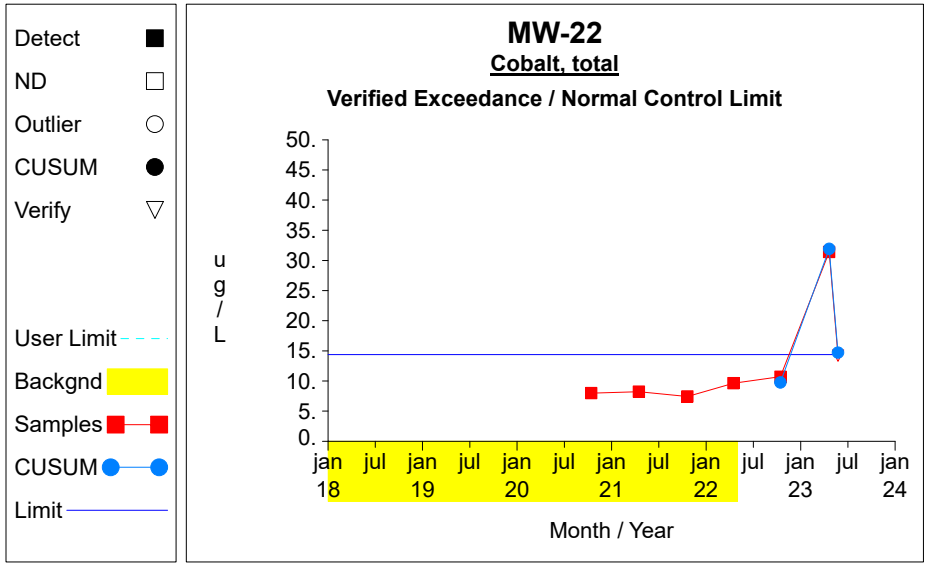
Intra-Well Sublist Control Charts / Prediction Limits



Graph 1



Graph 2



Graph 3

Prepared by: Otter Creek Environmental

Attachment D

Summary Tables and Graphs for the Interwell Comparisons
Second Semi-Annual Monitoring Event in 2023

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Ammonia	mg/L	MW-26	04/26/2018	ND	0.5000	0.1340	**
Ammonia	mg/L	MW-26	10/15/2018	ND	0.5000	0.1340	**
Ammonia	mg/L	MW-26	04/23/2019	ND	0.5000	0.1340	**
Ammonia	mg/L	MW-26	10/22/2019	ND	0.2000	0.1340	**
Ammonia	mg/L	MW-26	04/21/2020	ND	0.1000	0.1340	**
Ammonia	mg/L	MW-26	10/12/2020	ND	0.2800	0.1340	**
Ammonia	mg/L	MW-26	04/14/2021	ND	0.1340		
Ammonia	mg/L	MW-26	10/19/2021	ND	0.1340		
Ammonia	mg/L	MW-26	04/14/2022	ND	0.1340		
Ammonia	mg/L	MW-26	10/13/2022	ND	0.1140	0.1340	**
Ammonia	mg/L	MW-26	04/19/2023	ND	0.1040	0.1340	**
Ammonia	mg/L	MW-26	10/20/2023	ND	0.1040	0.1340	**
Arsenic, total	ug/L	MW-26	04/26/2018		0.4500		
Arsenic, total	ug/L	MW-26	10/15/2018	ND	0.5700	0.9000	**
Arsenic, total	ug/L	MW-26	04/23/2019		0.3600		
Arsenic, total	ug/L	MW-26	10/22/2019	ND	0.7500	0.9000	**
Arsenic, total	ug/L	MW-26	04/21/2020		2.2700		
Arsenic, total	ug/L	MW-26	10/12/2020		0.5500		
Arsenic, total	ug/L	MW-26	04/14/2021		0.4700		
Arsenic, total	ug/L	MW-26	10/19/2021	ND	5.7500	0.9000	**
Arsenic, total	ug/L	MW-26	04/14/2022	ND	1.1500	0.9000	**
Arsenic, total	ug/L	MW-26	10/13/2022		1.0900		
Arsenic, total	ug/L	MW-26	04/19/2023	ND	0.9000		
Arsenic, total	ug/L	MW-26	10/20/2023	ND	1.4500	0.9000	**
Barium, total	ug/L	MW-26	04/26/2018		137.0000		
Barium, total	ug/L	MW-26	10/15/2018		185.0000		
Barium, total	ug/L	MW-26	04/23/2019		193.0000		
Barium, total	ug/L	MW-26	10/22/2019		104.0000		
Barium, total	ug/L	MW-26	04/21/2020		176.0000		
Barium, total	ug/L	MW-26	10/12/2020		102.0000		
Barium, total	ug/L	MW-26	04/14/2021		155.0000		
Barium, total	ug/L	MW-26	10/19/2021		73.0000		
Barium, total	ug/L	MW-26	04/14/2022		139.0000		
Barium, total	ug/L	MW-26	10/13/2022		162.0000		
Barium, total	ug/L	MW-26	04/19/2023		176.0000		
Barium, total	ug/L	MW-26	10/20/2023		123.0000		
Chemical oxygen demand	mg/L	MW-26	04/26/2018		6.0000		
Chemical oxygen demand	mg/L	MW-26	10/15/2018	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/23/2019	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	10/22/2019	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/21/2020		8.0000		
Chemical oxygen demand	mg/L	MW-26	10/12/2020	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/14/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	10/19/2021	ND	7.0000		
Chemical oxygen demand	mg/L	MW-26	04/14/2022	ND	5.7000	7.0000	**
Chemical oxygen demand	mg/L	MW-26	10/13/2022	ND	5.7000	7.0000	**
Chemical oxygen demand	mg/L	MW-26	04/19/2023	ND	5.7000	7.0000	**
Chemical oxygen demand	mg/L	MW-26	10/20/2023	ND	5.7000	7.0000	**
Chloride	mg/L	MW-26	04/26/2018		33.7000		
Chloride	mg/L	MW-26	10/15/2018		51.4100		
Chloride	mg/L	MW-26	04/23/2019		71.5000		
Chloride	mg/L	MW-26	10/22/2019		20.0000		
Chloride	mg/L	MW-26	04/21/2020		41.4000		
Chloride	mg/L	MW-26	10/12/2020		27.3000		
Chloride	mg/L	MW-26	04/14/2021		58.6000		
Chloride	mg/L	MW-26	10/19/2021		28.9180		
Chloride	mg/L	MW-26	04/14/2022		54.8900		
Chloride	mg/L	MW-26	10/13/2022		78.4000		
Chloride	mg/L	MW-26	04/19/2023		71.9000		
Chloride	mg/L	MW-26	10/20/2023		48.1000		
Cobalt, total	ug/L	MW-26	10/12/2020		0.5200		
Cobalt, total	ug/L	MW-26	04/14/2021	ND	0.5000	0.7500	**
Cobalt, total	ug/L	MW-26	10/19/2021	ND	6.2500	0.7500	**
Cobalt, total	ug/L	MW-26	04/14/2022	ND	1.2500	0.7500	**
Cobalt, total	ug/L	MW-26	10/13/2022	ND	0.7500		
Cobalt, total	ug/L	MW-26	04/19/2023	ND	0.7500		
Cobalt, total	ug/L	MW-26	10/20/2023	ND	0.6500	0.7500	**
Iron, total	ug/L	MW-26	04/26/2018		310.0000		
Iron, total	ug/L	MW-26	10/15/2018		380.0000		
Iron, total	ug/L	MW-26	04/23/2019		252.0000		
Iron, total	ug/L	MW-26	10/22/2019		516.0000		
Iron, total	ug/L	MW-26	04/21/2020		50.0000		*
Iron, total	ug/L	MW-26	10/12/2020		615.0000		
Iron, total	ug/L	MW-26	04/14/2021		510.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 1

Upgradient Data

Constituent	Units	Well	Date		Result	Adjusted	
Iron, total	ug/L	MW-26	10/19/2021	ND	272.6000		
Iron, total	ug/L	MW-26	04/14/2022	ND	681.5000	272.6000	**
Iron, total	ug/L	MW-26	10/13/2022		376.0000		
Iron, total	ug/L	MW-26	04/19/2023		767.0000		
Iron, total	ug/L	MW-26	10/20/2023		610.0000		
Magnesium, total	mg/L	MW-26	04/26/2018		12.1000		
Magnesium, total	mg/L	MW-26	10/15/2018		17.6000		
Magnesium, total	mg/L	MW-26	04/23/2019		17.8000		
Magnesium, total	mg/L	MW-26	10/22/2019		9.7900		
Magnesium, total	mg/L	MW-26	04/21/2020		9.8300		
Magnesium, total	mg/L	MW-26	10/12/2020		8.6100		
Magnesium, total	mg/L	MW-26	04/14/2021		11.9000		
Magnesium, total	mg/L	MW-26	10/19/2021		6.4900		
Magnesium, total	mg/L	MW-26	04/14/2022		14.5000		
Magnesium, total	mg/L	MW-26	10/13/2022		16.3000		
Magnesium, total	mg/L	MW-26	04/19/2023		19.7000		
Magnesium, total	mg/L	MW-26	10/20/2023		12.5000		
pH	SU	MW-26	04/26/2018		6.0500		
pH	SU	MW-26	10/15/2018		6.3000		
pH	SU	MW-26	04/23/2019		6.2400		
pH	SU	MW-26	10/22/2019		6.3400		
pH	SU	MW-26	04/21/2020		6.0800		
pH	SU	MW-26	10/12/2020		6.2800		
pH	SU	MW-26	04/14/2021		6.1000		
pH	SU	MW-26	10/19/2021		6.3000		
pH	SU	MW-26	04/14/2022		6.8000		
pH	SU	MW-26	10/13/2022		6.3400		
pH	SU	MW-26	04/19/2023		6.5700		
pH	SU	MW-26	10/20/2023		6.4000		
Specific conductance	uS	MW-26	04/26/2018		143.0000		
Specific conductance	uS	MW-26	10/15/2018		545.0000		
Specific conductance	uS	MW-26	04/23/2019		649.0000		
Specific conductance	uS	MW-26	10/22/2019		305.0000		
Specific conductance	uS	MW-26	04/21/2020		389.0000		
Specific conductance	uS	MW-26	10/12/2020		319.0000		
Specific conductance	uS	MW-26	04/14/2021		546.0000		
Specific conductance	uS	MW-26	10/19/2021		355.0000		
Specific conductance	uS	MW-26	04/14/2022		538.0000		
Specific conductance	uS	MW-26	10/13/2022		646.0000		
Specific conductance	uS	MW-26	04/19/2023		709.0000		
Specific conductance	uS	MW-26	10/20/2023		461.0000		

* - Outlier for that well and constituent.
** - ND value replaced with median RL.
*** - ND value replaced with manual RL.
ND = Not detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Ammonia	mg/L	MW-1	10/20/2023		0.6300	***	0.1340
Arsenic, total	ug/L	MW-1	10/20/2023		2.2700	**	2.3779
Barium, total	ug/L	MW-1	10/20/2023		204.0000		249.7144
Chemical oxygen demand	mg/L	MW-1	10/20/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-1	10/20/2023		5.6100		102.9196
Cobalt, total	ug/L	MW-1	10/20/2023	ND	0.6500		0.7500
Iron, total	ug/L	MW-1	10/20/2023		779.0000	**	1104.8345
Magnesium, total	mg/L	MW-1	10/20/2023		31.9000	***	24.7158
pH	SU	MW-1	10/20/2023		7.2000	***	5.64 - 7.00
Specific conductance	uS	MW-1	10/20/2023		707.0000		943.2571
Ammonia	mg/L	MW-2	10/20/2023	ND	0.1040		0.1340
Arsenic, total	ug/L	MW-2	10/20/2023		2.3800	*	2.3779
Barium, total	ug/L	MW-2	10/20/2023		197.0000		249.7144
Chemical oxygen demand	mg/L	MW-2	10/20/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-2	10/20/2023		56.9000		102.9196
Cobalt, total	ug/L	MW-2	10/20/2023	ND	0.6500	**	0.7500
Iron, total	ug/L	MW-2	10/20/2023		757.0000		1104.8345
Magnesium, total	mg/L	MW-2	10/20/2023		31.4000	***	24.7158
pH	SU	MW-2	10/20/2023		6.7000		5.64 - 7.00
Specific conductance	uS	MW-2	10/20/2023		701.0000		943.2571
Ammonia	mg/L	MW-21	10/24/2023	ND	0.1040		0.1340
Arsenic, total	ug/L	MW-21	10/24/2023	ND	1.4500		2.3779
Barium, total	ug/L	MW-21	10/24/2023		301.0000	***	249.7144
Chemical oxygen demand	mg/L	MW-21	10/24/2023		6.0000		8.0000
Chloride	mg/L	MW-21	10/24/2023		174.0000	***	102.9196
Cobalt, total	ug/L	MW-21	10/24/2023	ND	0.6500		0.7500
Iron, total	ug/L	MW-21	10/24/2023		126.0000		1104.8345
Magnesium, total	mg/L	MW-21	10/24/2023		52.7000	***	24.7158
pH	SU	MW-21	10/24/2023		6.9000		5.64 - 7.00
Specific conductance	uS	MW-21	10/24/2023		1350.0000	***	943.2571
Ammonia	mg/L	MW-22	10/20/2023		2.0000	***	0.1340
Arsenic, total	ug/L	MW-22	10/20/2023		22.3000	***	2.3779
Barium, total	ug/L	MW-22	10/20/2023		259.0000	***	249.7144
Chemical oxygen demand	mg/L	MW-22	10/20/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-22	10/20/2023		70.7000		102.9196
Cobalt, total	ug/L	MW-22	10/20/2023		10.1000	***	0.7500
Iron, total	ug/L	MW-22	10/20/2023		6540.0000	***	1104.8345
Magnesium, total	mg/L	MW-22	10/20/2023		33.2000	***	24.7158
pH	SU	MW-22	10/20/2023		6.8000		5.64 - 7.00
Specific conductance	uS	MW-22	10/20/2023		927.0000	**	943.2571
Ammonia	mg/L	MW-23	10/18/2023		1.2000	***	0.1340
Arsenic, total	ug/L	MW-23	10/18/2023		10.9000	***	2.3779
Barium, total	ug/L	MW-23	10/18/2023		134.0000		249.7144
Chemical oxygen demand	mg/L	MW-23	10/18/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-23	10/18/2023		83.8000		102.9196
Cobalt, total	ug/L	MW-23	10/18/2023		1.3400	***	0.7500
Iron, total	ug/L	MW-23	10/18/2023		1330.0000	***	1104.8345
Magnesium, total	mg/L	MW-23	10/18/2023		44.3000	***	24.7158
pH	SU	MW-23	10/18/2023		6.8000		5.64 - 7.00
Specific conductance	uS	MW-23	10/18/2023		1118.0000	***	943.2571
Ammonia	mg/L	MW-24	10/18/2023		0.7700	***	0.1340
Arsenic, total	ug/L	MW-24	10/18/2023	ND	1.4500		2.3779
Barium, total	ug/L	MW-24	10/18/2023		158.0000		249.7144
Chemical oxygen demand	mg/L	MW-24	10/18/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-24	10/18/2023		83.2000		102.9196
Cobalt, total	ug/L	MW-24	10/18/2023	ND	0.6500	**	0.7500
Iron, total	ug/L	MW-24	10/18/2023		528.0000		1104.8345
Magnesium, total	mg/L	MW-24	10/18/2023		31.2000	***	24.7158
pH	SU	MW-24	10/18/2023		7.0000	*	5.64 - 7.00
Specific conductance	uS	MW-24	10/18/2023		885.0000		943.2571
Ammonia	mg/L	MW-3R1	10/20/2023		0.3000	***	0.1340
Arsenic, total	ug/L	MW-3R1	10/20/2023		30.0000	***	2.3779
Barium, total	ug/L	MW-3R1	10/20/2023		219.0000	**	249.7144
Chemical oxygen demand	mg/L	MW-3R1	10/20/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-3R1	10/20/2023		50.5000		102.9196
Cobalt, total	ug/L	MW-3R1	10/20/2023		11.4000	***	0.7500
Iron, total	ug/L	MW-3R1	10/20/2023		8350.0000	***	1104.8345
Magnesium, total	mg/L	MW-3R1	10/20/2023		27.1000	***	24.7158
pH	SU	MW-3R1	10/20/2023		6.7000		5.64 - 7.00
Specific conductance	uS	MW-3R1	10/20/2023		760.0000		943.2571
Ammonia	mg/L	MW-4	10/18/2023		1.6000	***	0.1340
Arsenic, total	ug/L	MW-4	10/18/2023		17.4000	***	2.3779

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 2

Most Current Downgradient Monitoring Data

Constituent	Units	Well	Date		Result		Pred. Limit
Barium, total	ug/L	MW-4	10/18/2023		458.0000	*	249.7144
Chemical oxygen demand	mg/L	MW-4	10/18/2023	ND	5.7000		8.0000
Chloride	mg/L	MW-4	10/18/2023		76.5000		102.9196
Cobalt, total	ug/L	MW-4	10/18/2023		7.8500	***	0.7500
Iron, total	ug/L	MW-4	10/18/2023		3930.0000	***	1104.8345
Magnesium, total	mg/L	MW-4	10/18/2023		36.9000	***	24.7158
pH	SU	MW-4	10/18/2023		6.8000		5.64 - 7.00
Specific conductance	uS	MW-4	10/18/2023		869.0000		943.2571

* - Current value failed - awaiting verification.
** - Current value passed - previous exceedance not verified.
*** - Current value failed - exceedance verified.
**** - Current value passed - awaiting one more verification.
***** - Insufficient background data to compute prediction limit.
ND = Not Detected, Result = detection limit.

Table 3

Detection Frequencies in Upgradient and Downgradient Wells

Constituent	Detect	Upgradient N	Proportion	Detect	Downgradient N	Proportion
Ammonia	0	12	0.000	73	97	0.753
Arsenic, total	6	12	0.500	86	97	0.887
Barium, total	12	12	1.000	97	97	1.000
Chemical oxygen demand	2	12	0.167	44	96	0.458
Chloride	12	12	1.000	97	97	1.000
Cobalt, total	1	7	0.143	41	57	0.719
Iron, total	9	11	0.818	86	97	0.887
Magnesium, total	12	12	1.000	97	97	1.000
pH	12	12	1.000	97	97	1.000
Specific conductance	12	12	1.000	97	97	1.000

N = Total number of measurements in all wells.
Detect = Total number of detections in all wells.
Proportion = Detect/N.

Table 4

Shapiro-Wilk Multiple Group Test of Normality

Constituent	Detect	N	Detect Freq	G raw	G log	G cbrt	G sqrt	G sqr	G cub	Crit Value	Dist Form	Model Type
Ammonia	0	12	0.000									nonpar
Arsenic, total	6	12	0.500	2.132	0.900					2.326	normal	normal
Barium, total	12	12	1.000	0.268	0.735					2.326	normal	normal
Chemical oxygen demand	2	12	0.167									nonpar
Chloride	12	12	1.000	0.425	0.092					2.326	normal	normal
Cobalt, total	1	7	0.143									nonpar
Iron, total	9	11	0.818	0.800	0.850					2.326	normal	normal
Magnesium, total	12	12	1.000	0.745	0.566					2.326	normal	normal
pH	12	12	1.000	0.840	0.686					2.326	normal	normal
Specific conductance	12	12	1.000	0.602	1.334					2.326	normal	normal

* - Distribution override for that constituent.
Fit to distribution is confirmed if G <= critical value.
Model type may not match distributional form when detection frequency < 50%.

Table 5

Summary Statistics and Prediction Limits

Constituent	Units	Detect	N	Mean	SD	alpha	Factor	Pred Limit	Type		Conf
Ammonia	mg/L	0	12					0.1340	nonpar	***	0.92
Arsenic, total	ug/L	6	12	0.4325	0.6890	0.0100	2.8234	2.3779	normal		
Barium, total	ug/L	12	12	143.7500	37.5309	0.0100	2.8234	249.7144	normal		
Chemical oxygen demand	mg/L	2	12					8.0000	nonpar		0.92
Chloride	mg/L	12	12	48.8432	19.1530	0.0100	2.8234	102.9196	normal		
Cobalt, total	ug/L	1	7					0.7500	nonpar	***	0.84
Iron, total	ug/L	9	11	394.1818	246.2130	0.0100	2.8863	1104.8345	normal		
Magnesium, total	mg/L	12	12	13.0933	4.1165	0.0100	2.8234	24.7158	normal		
pH	SU	12	12	6.3167	0.2106	0.0100	3.2222	5.64 - 7.00	normal		
Specific conductance	uS	12	12	467.0833	168.6532	0.0100	2.8234	943.2571	normal		

Conf = confidence level for passing initial test or one verification resample at all downgradient wells for a single constituent (nonparametric test only).
* - Insufficient Data.
** - Calculated limit raised to Manual Reporting Limit.
*** - Nonparametric limit based on ND value.
For transformed data, mean and SD in transformed units and prediction limit in original units.
All sample sizes and statistics are based on outlier free data.
For nonparametric limits, median reporting limits are substituted for extreme reporting limit values.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Ammonia	mg/L	MW-1	04/26/2018		1.0000	*	0.1340
Ammonia	mg/L	MW-1	10/15/2018		0.5300	*	0.1340
Ammonia	mg/L	MW-1	04/23/2019		1.1000	*	0.1340
Ammonia	mg/L	MW-1	10/22/2019		0.9100	*	0.1340
Ammonia	mg/L	MW-1	04/21/2020		0.5800	*	0.1340
Ammonia	mg/L	MW-1	10/13/2020		0.7100	*	0.1340
Ammonia	mg/L	MW-1	04/14/2021		0.6300	*	0.1340
Ammonia	mg/L	MW-1	10/19/2021		0.6500	*	0.1340
Ammonia	mg/L	MW-1	04/14/2022		0.7400	*	0.1340
Ammonia	mg/L	MW-1	10/13/2022		0.6300	*	0.1340
Ammonia	mg/L	MW-1	04/19/2023		0.6100	*	0.1340
Ammonia	mg/L	MW-1	10/20/2023		0.6300	*	0.1340
Arsenic, total	ug/L	MW-1	04/26/2018		2.4000	*	2.3779
Arsenic, total	ug/L	MW-1	10/15/2018		1.3700		2.3779
Arsenic, total	ug/L	MW-1	04/23/2019		4.0200	*	2.3779
Arsenic, total	ug/L	MW-1	10/22/2019		3.9600	*	2.3779
Arsenic, total	ug/L	MW-1	04/21/2020		3.6500	*	2.3779
Arsenic, total	ug/L	MW-1	10/13/2020		3.7500	*	2.3779
Arsenic, total	ug/L	MW-1	04/14/2021		5.6100	*	2.3779
Arsenic, total	ug/L	MW-1	10/19/2021	ND	0.2300		2.3779
Arsenic, total	ug/L	MW-1	04/14/2022		3.4700	*	2.3779
Arsenic, total	ug/L	MW-1	10/13/2022		3.7100	*	2.3779
Arsenic, total	ug/L	MW-1	04/19/2023		3.3200	*	2.3779
Arsenic, total	ug/L	MW-1	10/20/2023		2.2700		2.3779
Iron, total	ug/L	MW-1	04/26/2018		2840.0000	*	1104.8345
Iron, total	ug/L	MW-1	10/15/2018		1900.0000	*	1104.8345
Iron, total	ug/L	MW-1	04/23/2019		6880.0000	*	1104.8345
Iron, total	ug/L	MW-1	10/22/2019		5820.0000	*	1104.8345
Iron, total	ug/L	MW-1	04/21/2020		45.8000		1104.8345
Iron, total	ug/L	MW-1	10/13/2020		5900.0000	*	1104.8345
Iron, total	ug/L	MW-1	04/14/2021		9720.0000	*	1104.8345
Iron, total	ug/L	MW-1	10/19/2021		4090.0000	*	1104.8345
Iron, total	ug/L	MW-1	04/14/2022		4100.0000	*	1104.8345
Iron, total	ug/L	MW-1	10/13/2022		4910.0000	*	1104.8345
Iron, total	ug/L	MW-1	04/19/2023		1270.0000	*	1104.8345
Iron, total	ug/L	MW-1	10/20/2023		779.0000		1104.8345
Magnesium, total	mg/L	MW-1	04/26/2018		29.0000	*	24.7158
Magnesium, total	mg/L	MW-1	10/15/2018		32.0000	*	24.7158
Magnesium, total	mg/L	MW-1	04/23/2019		20.7000		24.7158
Magnesium, total	mg/L	MW-1	10/22/2019		25.8000	*	24.7158
Magnesium, total	mg/L	MW-1	04/21/2020		23.5000		24.7158
Magnesium, total	mg/L	MW-1	10/13/2020		24.2000		24.7158
Magnesium, total	mg/L	MW-1	04/14/2021		29.3000	*	24.7158
Magnesium, total	mg/L	MW-1	10/19/2021		20.9000		24.7158
Magnesium, total	mg/L	MW-1	04/14/2022		28.7000	*	24.7158
Magnesium, total	mg/L	MW-1	10/13/2022		29.2000	*	24.7158
Magnesium, total	mg/L	MW-1	04/19/2023		28.3000	*	24.7158
Magnesium, total	mg/L	MW-1	10/20/2023		31.9000	*	24.7158
pH	SU	MW-1	04/26/2018		6.5000		5.64 - 7.00
pH	SU	MW-1	10/15/2018		7.2200	*	5.64 - 7.00
pH	SU	MW-1	04/23/2019		7.0300	*	5.64 - 7.00
pH	SU	MW-1	10/22/2019		7.2100	*	5.64 - 7.00
pH	SU	MW-1	04/21/2020		7.2300	*	5.64 - 7.00
pH	SU	MW-1	10/13/2020		7.0300	*	5.64 - 7.00
pH	SU	MW-1	04/14/2021		7.4000	*	5.64 - 7.00
pH	SU	MW-1	10/19/2021		7.4000	*	5.64 - 7.00
pH	SU	MW-1	04/14/2022		7.5000	*	5.64 - 7.00
pH	SU	MW-1	10/13/2022		7.1700	*	5.64 - 7.00
pH	SU	MW-1	04/19/2023		7.3300	*	5.64 - 7.00
pH	SU	MW-1	10/20/2023		7.2000	*	5.64 - 7.00
Arsenic, total	ug/L	MW-2	04/27/2018		1.9000		2.3779
Arsenic, total	ug/L	MW-2	10/16/2018		1.7000		2.3779
Arsenic, total	ug/L	MW-2	04/24/2019		1.4700		2.3779
Arsenic, total	ug/L	MW-2	10/23/2019		1.4900		2.3779
Arsenic, total	ug/L	MW-2	04/21/2020		1.4500		2.3779
Arsenic, total	ug/L	MW-2	10/13/2020		1.3600		2.3779
Arsenic, total	ug/L	MW-2	04/15/2021		1.2300		2.3779
Arsenic, total	ug/L	MW-2	10/20/2021	ND	5.7500		2.3779
Arsenic, total	ug/L	MW-2	04/15/2022		1.3400		2.3779
Arsenic, total	ug/L	MW-2	10/14/2022		1.3900		2.3779
Arsenic, total	ug/L	MW-2	04/19/2023		1.1900		2.3779

* - Significantly increased over background.
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*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Arsenic, total	ug/L	MW-2	10/20/2023		2.3800	*	2.3779
Cobalt, total	ug/L	MW-2	10/13/2020		8.6300	*	0.7500
Cobalt, total	ug/L	MW-2	04/15/2021		2.1800	*	0.7500
Cobalt, total	ug/L	MW-2	10/20/2021		8.8000	*	0.7500
Cobalt, total	ug/L	MW-2	04/15/2022		6.1800	*	0.7500
Cobalt, total	ug/L	MW-2	10/14/2022		8.0600	*	0.7500
Cobalt, total	ug/L	MW-2	04/19/2023		1.2500	*	0.7500
Cobalt, total	ug/L	MW-2	10/20/2023	ND	0.6500		0.7500
Magnesium, total	mg/L	MW-2	04/27/2018		23.9000		24.7158
Magnesium, total	mg/L	MW-2	10/16/2018		23.3000		24.7158
Magnesium, total	mg/L	MW-2	04/24/2019		20.1000		24.7158
Magnesium, total	mg/L	MW-2	10/23/2019		22.3000		24.7158
Magnesium, total	mg/L	MW-2	04/21/2020		23.0000		24.7158
Magnesium, total	mg/L	MW-2	10/13/2020		21.5000		24.7158
Magnesium, total	mg/L	MW-2	04/15/2021		21.9000		24.7158
Magnesium, total	mg/L	MW-2	10/20/2021		17.1000		24.7158
Magnesium, total	mg/L	MW-2	04/15/2022		28.4000	*	24.7158
Magnesium, total	mg/L	MW-2	10/14/2022		21.2000		24.7158
Magnesium, total	mg/L	MW-2	04/19/2023		27.9000	*	24.7158
Magnesium, total	mg/L	MW-2	10/20/2023		31.4000	*	24.7158
Barium, total	ug/L	MW-21	04/26/2018		406.0000	*	249.7144
Barium, total	ug/L	MW-21	10/15/2018		372.0000	*	249.7144
Barium, total	ug/L	MW-21	04/24/2019		413.0000	*	249.7144
Barium, total	ug/L	MW-21	10/22/2019		438.0000	*	249.7144
Barium, total	ug/L	MW-21	04/21/2020		401.0000	*	249.7144
Barium, total	ug/L	MW-21	10/13/2020		338.0000	*	249.7144
Barium, total	ug/L	MW-21	04/14/2021		347.0000	*	249.7144
Barium, total	ug/L	MW-21	10/20/2021		229.0000		249.7144
Barium, total	ug/L	MW-21	04/14/2022		325.0000	*	249.7144
Barium, total	ug/L	MW-21	10/13/2022		307.0000	*	249.7144
Barium, total	ug/L	MW-21	04/19/2023		269.0000	*	249.7144
Barium, total	ug/L	MW-21	10/24/2023		301.0000	*	249.7144
Chloride	mg/L	MW-21	04/26/2018		224.0000	*	102.9196
Chloride	mg/L	MW-21	10/15/2018		194.9500	*	102.9196
Chloride	mg/L	MW-21	04/24/2019		224.0000	*	102.9196
Chloride	mg/L	MW-21	10/22/2019		217.0000	*	102.9196
Chloride	mg/L	MW-21	04/21/2020		227.0000	*	102.9196
Chloride	mg/L	MW-21	10/13/2020		245.0000	*	102.9196
Chloride	mg/L	MW-21	04/14/2021		238.0000	*	102.9196
Chloride	mg/L	MW-21	10/20/2021		195.9450	*	102.9196
Chloride	mg/L	MW-21	04/14/2022		178.0400	*	102.9196
Chloride	mg/L	MW-21	10/13/2022		162.0000	*	102.9196
Chloride	mg/L	MW-21	04/19/2023		167.0000	*	102.9196
Chloride	mg/L	MW-21	10/24/2023		174.0000	*	102.9196
Magnesium, total	mg/L	MW-21	04/26/2018		60.1000	*	24.7158
Magnesium, total	mg/L	MW-21	10/15/2018		55.3000	*	24.7158
Magnesium, total	mg/L	MW-21	04/24/2019		58.7000	*	24.7158
Magnesium, total	mg/L	MW-21	10/22/2019		58.0000	*	24.7158
Magnesium, total	mg/L	MW-21	04/21/2020		59.6000	*	24.7158
Magnesium, total	mg/L	MW-21	10/13/2020		56.8000	*	24.7158
Magnesium, total	mg/L	MW-21	04/14/2021		55.4000	*	24.7158
Magnesium, total	mg/L	MW-21	10/20/2021		36.9000	*	24.7158
Magnesium, total	mg/L	MW-21	04/14/2022		51.5000	*	24.7158
Magnesium, total	mg/L	MW-21	10/13/2022		43.9000	*	24.7158
Magnesium, total	mg/L	MW-21	04/19/2023		47.0000	*	24.7158
Magnesium, total	mg/L	MW-21	10/24/2023		52.7000	*	24.7158
Specific conductance	uS	MW-21	04/26/2018		1554.0000	*	943.2571
Specific conductance	uS	MW-21	10/15/2018		1391.0000	*	943.2571
Specific conductance	uS	MW-21	04/24/2019		1590.0000	*	943.2571
Specific conductance	uS	MW-21	10/22/2019		1532.0000	*	943.2571
Specific conductance	uS	MW-21	04/21/2020		1661.0000	*	943.2571
Specific conductance	uS	MW-21	10/13/2020		1542.0000	*	943.2571
Specific conductance	uS	MW-21	04/14/2021		1649.0000	*	943.2571
Specific conductance	uS	MW-21	10/20/2021		1480.0000	*	943.2571
Specific conductance	uS	MW-21	04/14/2022		1484.0000	*	943.2571
Specific conductance	uS	MW-21	10/13/2022		1520.0000	*	943.2571
Specific conductance	uS	MW-21	04/19/2023		1443.0000	*	943.2571
Specific conductance	uS	MW-21	10/24/2023		1350.0000	*	943.2571
Ammonia	mg/L	MW-22	04/27/2018		6.4000	*	0.1340
Ammonia	mg/L	MW-22	10/16/2018		4.0000	*	0.1340
Ammonia	mg/L	MW-22	04/24/2019		3.7000	*	0.1340

* - Significantly increased over background.
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*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Ammonia	mg/L	MW-22	10/23/2019		3.9000	*	0.1340
Ammonia	mg/L	MW-22	04/21/2020		5.9000	*	0.1340
Ammonia	mg/L	MW-22	10/13/2020		4.9000	*	0.1340
Ammonia	mg/L	MW-22	04/15/2021		3.6000	*	0.1340
Ammonia	mg/L	MW-22	10/20/2021		2.8000	*	0.1340
Ammonia	mg/L	MW-22	04/15/2022		3.8000	*	0.1340
Ammonia	mg/L	MW-22	10/14/2022		2.8000	*	0.1340
Ammonia	mg/L	MW-22	04/20/2023		2.6000	*	0.1340
Ammonia	mg/L	MW-22	05/24/2023		2.2000	*	0.1340
Ammonia	mg/L	MW-22	10/20/2023		2.0000	*	0.1340
Arsenic, total	ug/L	MW-22	04/27/2018		19.0000	*	2.3779
Arsenic, total	ug/L	MW-22	10/16/2018		14.6000	*	2.3779
Arsenic, total	ug/L	MW-22	04/24/2019		19.8000	*	2.3779
Arsenic, total	ug/L	MW-22	10/23/2019		16.0000	*	2.3779
Arsenic, total	ug/L	MW-22	04/21/2020		11.6000	*	2.3779
Arsenic, total	ug/L	MW-22	10/13/2020		7.4200	*	2.3779
Arsenic, total	ug/L	MW-22	04/15/2021		15.0000	*	2.3779
Arsenic, total	ug/L	MW-22	10/20/2021		15.2000	*	2.3779
Arsenic, total	ug/L	MW-22	04/15/2022		16.0000	*	2.3779
Arsenic, total	ug/L	MW-22	10/14/2022		25.0000	*	2.3779
Arsenic, total	ug/L	MW-22	04/20/2023		17.8000	*	2.3779
Arsenic, total	ug/L	MW-22	05/24/2023		23.7000	*	2.3779
Arsenic, total	ug/L	MW-22	10/20/2023		22.3000	*	2.3779
Barium, total	ug/L	MW-22	04/27/2018		315.0000	*	249.7144
Barium, total	ug/L	MW-22	10/16/2018		225.0000		249.7144
Barium, total	ug/L	MW-22	04/24/2019		281.0000	*	249.7144
Barium, total	ug/L	MW-22	10/23/2019		269.0000	*	249.7144
Barium, total	ug/L	MW-22	04/21/2020		440.0000	*	249.7144
Barium, total	ug/L	MW-22	10/13/2020		318.0000	*	249.7144
Barium, total	ug/L	MW-22	04/15/2021		326.0000	*	249.7144
Barium, total	ug/L	MW-22	10/20/2021		241.0000		249.7144
Barium, total	ug/L	MW-22	04/15/2022		361.0000	*	249.7144
Barium, total	ug/L	MW-22	10/14/2022		567.0000	*	249.7144
Barium, total	ug/L	MW-22	04/20/2023		900.0000	*	249.7144
Barium, total	ug/L	MW-22	05/24/2023		327.0000	*	249.7144
Barium, total	ug/L	MW-22	10/20/2023		259.0000	*	249.7144
Cobalt, total	ug/L	MW-22	10/13/2020		8.0000	*	0.7500
Cobalt, total	ug/L	MW-22	04/15/2021		8.2400	*	0.7500
Cobalt, total	ug/L	MW-22	10/20/2021		7.4400	*	0.7500
Cobalt, total	ug/L	MW-22	04/15/2022		9.6300	*	0.7500
Cobalt, total	ug/L	MW-22	10/14/2022		10.7000	*	0.7500
Cobalt, total	ug/L	MW-22	04/20/2023		31.4000	*	0.7500
Cobalt, total	ug/L	MW-22	05/24/2023		14.2000	*	0.7500
Cobalt, total	ug/L	MW-22	10/20/2023		10.1000	*	0.7500
Iron, total	ug/L	MW-22	04/27/2018		12800.0000	*	1104.8345
Iron, total	ug/L	MW-22	10/16/2018		8130.0000	*	1104.8345
Iron, total	ug/L	MW-22	04/24/2019		18200.0000	*	1104.8345
Iron, total	ug/L	MW-22	10/23/2019		13600.0000	*	1104.8345
Iron, total	ug/L	MW-22	04/21/2020		93.3000		1104.8345
Iron, total	ug/L	MW-22	10/13/2020		3990.0000	*	1104.8345
Iron, total	ug/L	MW-22	04/15/2021		11700.0000	*	1104.8345
Iron, total	ug/L	MW-22	10/20/2021		9990.0000	*	1104.8345
Iron, total	ug/L	MW-22	04/15/2022		12000.0000	*	1104.8345
Iron, total	ug/L	MW-22	10/14/2022		19600.0000	*	1104.8345
Iron, total	ug/L	MW-22	04/20/2023		18300.0000	*	1104.8345
Iron, total	ug/L	MW-22	05/24/2023		19400.0000	*	1104.8345
Iron, total	ug/L	MW-22	10/20/2023		6540.0000	*	1104.8345
Magnesium, total	mg/L	MW-22	04/27/2018		33.6000	*	24.7158
Magnesium, total	mg/L	MW-22	10/16/2018		27.9000	*	24.7158
Magnesium, total	mg/L	MW-22	04/24/2019		31.6000	*	24.7158
Magnesium, total	mg/L	MW-22	10/23/2019		28.5000	*	24.7158
Magnesium, total	mg/L	MW-22	04/21/2020		33.1000	*	24.7158
Magnesium, total	mg/L	MW-22	10/13/2020		32.6000	*	24.7158
Magnesium, total	mg/L	MW-22	04/15/2021		32.9000	*	24.7158
Magnesium, total	mg/L	MW-22	10/20/2021		24.6000		24.7158
Magnesium, total	mg/L	MW-22	04/15/2022		35.1000	*	24.7158
Magnesium, total	mg/L	MW-22	10/14/2022		33.2000	*	24.7158
Magnesium, total	mg/L	MW-22	04/20/2023		46.0000	*	24.7158
Magnesium, total	mg/L	MW-22	05/24/2023		31.7000	*	24.7158
Magnesium, total	mg/L	MW-22	10/20/2023		33.2000	*	24.7158
Specific conductance	uS	MW-22	04/27/2018		1340.0000	*	943.2571

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Constituent	Units	Well	Date		Result		Pred. Limit
Specific conductance	uS	MW-22	10/16/2018		1033.0000	*	943.2571
Specific conductance	uS	MW-22	04/24/2019		1142.0000	*	943.2571
Specific conductance	uS	MW-22	10/23/2019		972.0000	*	943.2571
Specific conductance	uS	MW-22	04/21/2020		1149.0000	*	943.2571
Specific conductance	uS	MW-22	10/13/2020		1041.0000	*	943.2571
Specific conductance	uS	MW-22	04/15/2021		1090.0000	*	943.2571
Specific conductance	uS	MW-22	10/20/2021		1028.0000	*	943.2571
Specific conductance	uS	MW-22	04/15/2022		1004.0000	*	943.2571
Specific conductance	uS	MW-22	10/14/2022		1035.0000	*	943.2571
Specific conductance	uS	MW-22	04/20/2023		988.0000	*	943.2571
Specific conductance	uS	MW-22	05/24/2023		948.0000	*	943.2571
Specific conductance	uS	MW-22	10/20/2023		927.0000		943.2571
Ammonia	mg/L	MW-23	04/26/2018		1.7000	*	0.1340
Ammonia	mg/L	MW-23	10/16/2018		1.6000	*	0.1340
Ammonia	mg/L	MW-23	04/24/2019		1.7000	*	0.1340
Ammonia	mg/L	MW-23	10/23/2019		1.8000	*	0.1340
Ammonia	mg/L	MW-23	04/21/2020		1.1000	*	0.1340
Ammonia	mg/L	MW-23	10/12/2020		1.5000	*	0.1340
Ammonia	mg/L	MW-23	04/14/2021		1.1000	*	0.1340
Ammonia	mg/L	MW-23	10/19/2021		1.3000	*	0.1340
Ammonia	mg/L	MW-23	04/15/2022		1.4000	*	0.1340
Ammonia	mg/L	MW-23	10/13/2022		1.3000	*	0.1340
Ammonia	mg/L	MW-23	04/19/2023		1.2000	*	0.1340
Ammonia	mg/L	MW-23	10/18/2023		1.2000	*	0.1340
Arsenic, total	ug/L	MW-23	04/26/2018		32.2000	*	2.3779
Arsenic, total	ug/L	MW-23	10/16/2018		15.2000	*	2.3779
Arsenic, total	ug/L	MW-23	04/24/2019		18.8000	*	2.3779
Arsenic, total	ug/L	MW-23	10/23/2019		14.6000	*	2.3779
Arsenic, total	ug/L	MW-23	04/21/2020		30.4000	*	2.3779
Arsenic, total	ug/L	MW-23	10/12/2020		31.8000	*	2.3779
Arsenic, total	ug/L	MW-23	04/14/2021		21.9000	*	2.3779
Arsenic, total	ug/L	MW-23	10/19/2021		9.4000	*	2.3779
Arsenic, total	ug/L	MW-23	04/15/2022		16.5000	*	2.3779
Arsenic, total	ug/L	MW-23	10/13/2022		11.5000	*	2.3779
Arsenic, total	ug/L	MW-23	04/19/2023		18.1000	*	2.3779
Arsenic, total	ug/L	MW-23	10/18/2023		10.9000	*	2.3779
Cobalt, total	ug/L	MW-23	10/12/2020		2.3900	*	0.7500
Cobalt, total	ug/L	MW-23	04/14/2021		1.8400	*	0.7500
Cobalt, total	ug/L	MW-23	10/19/2021	ND	6.2500		0.7500
Cobalt, total	ug/L	MW-23	04/15/2022		2.2400	*	0.7500
Cobalt, total	ug/L	MW-23	10/13/2022		2.3700	*	0.7500
Cobalt, total	ug/L	MW-23	04/19/2023		2.0000	*	0.7500
Cobalt, total	ug/L	MW-23	10/18/2023		1.3400	*	0.7500
Iron, total	ug/L	MW-23	04/26/2018		14400.0000	*	1104.8345
Iron, total	ug/L	MW-23	10/16/2018		7000.0000	*	1104.8345
Iron, total	ug/L	MW-23	04/24/2019		8360.0000	*	1104.8345
Iron, total	ug/L	MW-23	10/23/2019		7430.0000	*	1104.8345
Iron, total	ug/L	MW-23	04/21/2020		118.0000		1104.8345
Iron, total	ug/L	MW-23	10/12/2020		12400.0000	*	1104.8345
Iron, total	ug/L	MW-23	04/14/2021		10300.0000	*	1104.8345
Iron, total	ug/L	MW-23	10/19/2021		4970.0000	*	1104.8345
Iron, total	ug/L	MW-23	04/15/2022		7520.0000	*	1104.8345
Iron, total	ug/L	MW-23	10/13/2022		5370.0000	*	1104.8345
Iron, total	ug/L	MW-23	04/19/2023		2460.0000	*	1104.8345
Iron, total	ug/L	MW-23	10/18/2023		1330.0000	*	1104.8345
Magnesium, total	mg/L	MW-23	04/26/2018		37.4000	*	24.7158
Magnesium, total	mg/L	MW-23	10/16/2018		35.4000	*	24.7158
Magnesium, total	mg/L	MW-23	04/24/2019		39.5000	*	24.7158
Magnesium, total	mg/L	MW-23	10/23/2019		37.9000	*	24.7158
Magnesium, total	mg/L	MW-23	04/21/2020		36.9000	*	24.7158
Magnesium, total	mg/L	MW-23	10/12/2020		38.8000	*	24.7158
Magnesium, total	mg/L	MW-23	04/14/2021		38.1000	*	24.7158
Magnesium, total	mg/L	MW-23	10/19/2021		29.7000	*	24.7158
Magnesium, total	mg/L	MW-23	04/15/2022		40.6000	*	24.7158
Magnesium, total	mg/L	MW-23	10/13/2022		40.4000	*	24.7158
Magnesium, total	mg/L	MW-23	04/19/2023		39.4000	*	24.7158
Magnesium, total	mg/L	MW-23	10/18/2023		44.3000	*	24.7158
Specific conductance	uS	MW-23	04/26/2018		1201.0000	*	943.2571
Specific conductance	uS	MW-23	10/16/2018		1117.0000	*	943.2571
Specific conductance	uS	MW-23	04/24/2019		1149.0000	*	943.2571
Specific conductance	uS	MW-23	10/23/2019		1112.0000	*	943.2571

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Specific conductance	uS	MW-23	04/21/2020		1093.0000	*	943.2571
Specific conductance	uS	MW-23	10/12/2020		1067.0000	*	943.2571
Specific conductance	uS	MW-23	04/14/2021		1124.0000	*	943.2571
Specific conductance	uS	MW-23	10/19/2021		1158.0000	*	943.2571
Specific conductance	uS	MW-23	04/15/2022		1177.0000	*	943.2571
Specific conductance	uS	MW-23	10/13/2022		1215.0000	*	943.2571
Specific conductance	uS	MW-23	04/19/2023		1151.0000	*	943.2571
Specific conductance	uS	MW-23	10/18/2023		1118.0000	*	943.2571
Ammonia	mg/L	MW-24	04/26/2018		2.8000	*	0.1340
Ammonia	mg/L	MW-24	10/16/2018		2.0000	*	0.1340
Ammonia	mg/L	MW-24	04/24/2019		1.5000	*	0.1340
Ammonia	mg/L	MW-24	10/23/2019		1.5000	*	0.1340
Ammonia	mg/L	MW-24	04/21/2020		1.0000	*	0.1340
Ammonia	mg/L	MW-24	10/12/2020		1.2000	*	0.1340
Ammonia	mg/L	MW-24	04/14/2021		1.0000	*	0.1340
Ammonia	mg/L	MW-24	10/19/2021		1.1000	*	0.1340
Ammonia	mg/L	MW-24	04/14/2022		1.1000	*	0.1340
Ammonia	mg/L	MW-24	10/13/2022		0.8200	*	0.1340
Ammonia	mg/L	MW-24	04/19/2023		0.7600	*	0.1340
Ammonia	mg/L	MW-24	10/18/2023		0.7700	*	0.1340
Cobalt, total	ug/L	MW-24	10/12/2020		3.2400	*	0.7500
Cobalt, total	ug/L	MW-24	04/14/2021		1.7200	*	0.7500
Cobalt, total	ug/L	MW-24	10/19/2021	ND	6.2500		0.7500
Cobalt, total	ug/L	MW-24	04/14/2022		2.4500	*	0.7500
Cobalt, total	ug/L	MW-24	10/13/2022		4.3100	*	0.7500
Cobalt, total	ug/L	MW-24	04/19/2023		2.0900	*	0.7500
Cobalt, total	ug/L	MW-24	10/18/2023	ND	0.6500		0.7500
Magnesium, total	mg/L	MW-24	04/26/2018		44.9000	*	24.7158
Magnesium, total	mg/L	MW-24	10/16/2018		40.8000	*	24.7158
Magnesium, total	mg/L	MW-24	04/24/2019		36.8000	*	24.7158
Magnesium, total	mg/L	MW-24	10/23/2019		36.7000	*	24.7158
Magnesium, total	mg/L	MW-24	04/21/2020		39.5000	*	24.7158
Magnesium, total	mg/L	MW-24	10/12/2020		43.3000	*	24.7158
Magnesium, total	mg/L	MW-24	04/14/2021		38.8000	*	24.7158
Magnesium, total	mg/L	MW-24	10/19/2021		28.0000	*	24.7158
Magnesium, total	mg/L	MW-24	04/14/2022		36.8000	*	24.7158
Magnesium, total	mg/L	MW-24	10/13/2022		35.9000	*	24.7158
Magnesium, total	mg/L	MW-24	04/19/2023		28.8000	*	24.7158
Magnesium, total	mg/L	MW-24	10/18/2023		31.2000	*	24.7158
pH	SU	MW-24	04/26/2018		6.8900		5.64 - 7.00
pH	SU	MW-24	10/16/2018		7.0300	*	5.64 - 7.00
pH	SU	MW-24	04/24/2019		6.7500		5.64 - 7.00
pH	SU	MW-24	10/23/2019		6.8200		5.64 - 7.00
pH	SU	MW-24	04/21/2020		6.9600		5.64 - 7.00
pH	SU	MW-24	10/12/2020		7.0300	*	5.64 - 7.00
pH	SU	MW-24	04/14/2021		6.9000		5.64 - 7.00
pH	SU	MW-24	10/19/2021		6.9000		5.64 - 7.00
pH	SU	MW-24	04/14/2022		7.0000	*	5.64 - 7.00
pH	SU	MW-24	10/13/2022		7.0400	*	5.64 - 7.00
pH	SU	MW-24	04/19/2023		6.9100		5.64 - 7.00
pH	SU	MW-24	10/18/2023		7.0000	*	5.64 - 7.00
Ammonia	mg/L	MW-3R1	06/05/2018		0.8200	*	0.1340
Ammonia	mg/L	MW-3R1	10/16/2018		0.9800	*	0.1340
Ammonia	mg/L	MW-3R1	04/24/2019		1.5000	*	0.1340
Ammonia	mg/L	MW-3R1	10/23/2019		1.3000	*	0.1340
Ammonia	mg/L	MW-3R1	04/21/2020		0.5700	*	0.1340
Ammonia	mg/L	MW-3R1	10/13/2020		0.7500	*	0.1340
Ammonia	mg/L	MW-3R1	04/15/2021	ND	0.1340		0.1340
Ammonia	mg/L	MW-3R1	10/20/2021		0.5600	*	0.1340
Ammonia	mg/L	MW-3R1	04/15/2022	ND	0.1340		0.1340
Ammonia	mg/L	MW-3R1	10/14/2022		0.6100	*	0.1340
Ammonia	mg/L	MW-3R1	04/19/2023		0.4000	*	0.1340
Ammonia	mg/L	MW-3R1	10/20/2023		0.3000	*	0.1340
Arsenic, total	ug/L	MW-3R1	06/05/2018		372.0000	*	2.3779
Arsenic, total	ug/L	MW-3R1	10/16/2018		59.6000	*	2.3779
Arsenic, total	ug/L	MW-3R1	04/24/2019		62.3000	*	2.3779
Arsenic, total	ug/L	MW-3R1	10/23/2019		62.9000	*	2.3779
Arsenic, total	ug/L	MW-3R1	04/21/2020		82.5000	*	2.3779
Arsenic, total	ug/L	MW-3R1	10/13/2020		50.3000	*	2.3779
Arsenic, total	ug/L	MW-3R1	04/15/2021		77.6000	*	2.3779
Arsenic, total	ug/L	MW-3R1	10/20/2021		30.7000	*	2.3779

* - Significantly increased over background.
** - Detect at limit for 100% NDs in background (NPPL only).
*** - Manual exclusion.
ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Arsenic, total	ug/L	MW-3R1	04/15/2022		64.7000	*	2.3779
Arsenic, total	ug/L	MW-3R1	10/14/2022		57.0000	*	2.3779
Arsenic, total	ug/L	MW-3R1	04/19/2023		61.2000	*	2.3779
Arsenic, total	ug/L	MW-3R1	10/20/2023		30.0000	*	2.3779
Barium, total	ug/L	MW-3R1	06/05/2018		1920.0000	*	249.7144
Barium, total	ug/L	MW-3R1	10/16/2018		484.0000	*	249.7144
Barium, total	ug/L	MW-3R1	04/24/2019		405.0000	*	249.7144
Barium, total	ug/L	MW-3R1	10/23/2019		388.0000	*	249.7144
Barium, total	ug/L	MW-3R1	04/21/2020		496.0000	*	249.7144
Barium, total	ug/L	MW-3R1	10/13/2020		375.0000	*	249.7144
Barium, total	ug/L	MW-3R1	04/15/2021		616.0000	*	249.7144
Barium, total	ug/L	MW-3R1	10/20/2021		248.0000		249.7144
Barium, total	ug/L	MW-3R1	04/15/2022		369.0000	*	249.7144
Barium, total	ug/L	MW-3R1	10/14/2022		377.0000	*	249.7144
Barium, total	ug/L	MW-3R1	04/19/2023		294.0000	*	249.7144
Barium, total	ug/L	MW-3R1	10/20/2023		219.0000		249.7144
Cobalt, total	ug/L	MW-3R1	10/13/2020		10.2000	*	0.7500
Cobalt, total	ug/L	MW-3R1	04/15/2021		11.9000	*	0.7500
Cobalt, total	ug/L	MW-3R1	10/20/2021		9.7300	*	0.7500
Cobalt, total	ug/L	MW-3R1	04/15/2022		12.0000	*	0.7500
Cobalt, total	ug/L	MW-3R1	10/14/2022		13.1000	*	0.7500
Cobalt, total	ug/L	MW-3R1	04/19/2023		13.0000	*	0.7500
Cobalt, total	ug/L	MW-3R1	10/20/2023		11.4000	*	0.7500
Iron, total	ug/L	MW-3R1	06/05/2018		357000.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	10/16/2018		66400.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	04/24/2019		54900.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	10/23/2019		44700.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	04/21/2020		535.0000		1104.8345
Iron, total	ug/L	MW-3R1	10/13/2020		43100.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	04/15/2021		61000.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	10/20/2021		30000.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	04/15/2022		52400.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	10/14/2022		46000.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	04/19/2023		14900.0000	*	1104.8345
Iron, total	ug/L	MW-3R1	10/20/2023		8350.0000	*	1104.8345
Magnesium, total	mg/L	MW-3R1	06/05/2018		525.0000	*	24.7158
Magnesium, total	mg/L	MW-3R1	10/16/2018		127.0000	*	24.7158
Magnesium, total	mg/L	MW-3R1	04/24/2019		62.4000	*	24.7158
Magnesium, total	mg/L	MW-3R1	10/23/2019		39.9000	*	24.7158
Magnesium, total	mg/L	MW-3R1	04/21/2020		45.8000	*	24.7158
Magnesium, total	mg/L	MW-3R1	10/13/2020		33.7000	*	24.7158
Magnesium, total	mg/L	MW-3R1	04/15/2021		53.0000	*	24.7158
Magnesium, total	mg/L	MW-3R1	10/20/2021		33.9000	*	24.7158
Magnesium, total	mg/L	MW-3R1	04/15/2022		35.3000	*	24.7158
Magnesium, total	mg/L	MW-3R1	10/14/2022		46.5000	*	24.7158
Magnesium, total	mg/L	MW-3R1	04/19/2023		33.2000	*	24.7158
Magnesium, total	mg/L	MW-3R1	10/20/2023		27.1000	*	24.7158
Ammonia	mg/L	MW-4	04/26/2018		2.9000	*	0.1340
Ammonia	mg/L	MW-4	10/15/2018		1.3000	*	0.1340
Ammonia	mg/L	MW-4	04/23/2019		0.9000	*	0.1340
Ammonia	mg/L	MW-4	10/22/2019		1.2000	*	0.1340
Ammonia	mg/L	MW-4	04/21/2020		0.8400	*	0.1340
Ammonia	mg/L	MW-4	10/12/2020		1.4000	*	0.1340
Ammonia	mg/L	MW-4	04/14/2021		1.0000	*	0.1340
Ammonia	mg/L	MW-4	10/19/2021		2.0000	*	0.1340
Ammonia	mg/L	MW-4	04/14/2022		1.6000	*	0.1340
Ammonia	mg/L	MW-4	10/13/2022		1.5000	*	0.1340
Ammonia	mg/L	MW-4	04/19/2023		0.6200	*	0.1340
Ammonia	mg/L	MW-4	10/18/2023		1.6000	*	0.1340
Arsenic, total	ug/L	MW-4	04/26/2018		25.7000	*	2.3779
Arsenic, total	ug/L	MW-4	10/15/2018		26.5000	*	2.3779
Arsenic, total	ug/L	MW-4	04/23/2019		13.4000	*	2.3779
Arsenic, total	ug/L	MW-4	10/22/2019		26.3000	*	2.3779
Arsenic, total	ug/L	MW-4	04/21/2020		14.7000	*	2.3779
Arsenic, total	ug/L	MW-4	10/12/2020		15.1000	*	2.3779
Arsenic, total	ug/L	MW-4	04/14/2021		14.2000	*	2.3779
Arsenic, total	ug/L	MW-4	10/19/2021		18.8000	*	2.3779
Arsenic, total	ug/L	MW-4	04/14/2022		31.5000	*	2.3779
Arsenic, total	ug/L	MW-4	10/13/2022		22.3000	*	2.3779
Arsenic, total	ug/L	MW-4	04/19/2023		11.7000	*	2.3779
Arsenic, total	ug/L	MW-4	10/18/2023		17.4000	*	2.3779

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ND = Not Detected, Result = detection limit.

Table 8

Historical Downgradient Data for Constituent-Well Combinations that Failed the Current Statistical Evaluation or are in Verification Resampling Mode

Constituent	Units	Well	Date		Result		Pred. Limit
Barium, total	ug/L	MW-4	04/26/2018		372.0000	*	249.7144
Barium, total	ug/L	MW-4	10/15/2018		270.0000	*	249.7144
Barium, total	ug/L	MW-4	04/23/2019		282.0000	*	249.7144
Barium, total	ug/L	MW-4	10/22/2019		350.0000	*	249.7144
Barium, total	ug/L	MW-4	04/21/2020		301.0000	*	249.7144
Barium, total	ug/L	MW-4	10/12/2020		279.0000	*	249.7144
Barium, total	ug/L	MW-4	04/14/2021		343.0000	*	249.7144
Barium, total	ug/L	MW-4	10/19/2021		378.0000	*	249.7144
Barium, total	ug/L	MW-4	04/14/2022		500.0000	*	249.7144
Barium, total	ug/L	MW-4	10/13/2022		404.0000	*	249.7144
Barium, total	ug/L	MW-4	04/19/2023		235.0000		249.7144
Barium, total	ug/L	MW-4	10/18/2023		458.0000	*	249.7144
Cobalt, total	ug/L	MW-4	10/12/2020		4.1500	*	0.7500
Cobalt, total	ug/L	MW-4	04/14/2021		2.4200	*	0.7500
Cobalt, total	ug/L	MW-4	10/19/2021	ND	6.2500		0.7500
Cobalt, total	ug/L	MW-4	04/14/2022		7.1400	*	0.7500
Cobalt, total	ug/L	MW-4	10/13/2022		15.1000	*	0.7500
Cobalt, total	ug/L	MW-4	04/19/2023		8.2900	*	0.7500
Cobalt, total	ug/L	MW-4	10/18/2023		7.8500	*	0.7500
Iron, total	ug/L	MW-4	04/26/2018		6740.0000	*	1104.8345
Iron, total	ug/L	MW-4	10/15/2018		6260.0000	*	1104.8345
Iron, total	ug/L	MW-4	04/23/2019		3690.0000	*	1104.8345
Iron, total	ug/L	MW-4	10/22/2019		7270.0000	*	1104.8345
Iron, total	ug/L	MW-4	04/21/2020		36.2000		1104.8345
Iron, total	ug/L	MW-4	10/12/2020		4910.0000	*	1104.8345
Iron, total	ug/L	MW-4	04/14/2021		4320.0000	*	1104.8345
Iron, total	ug/L	MW-4	10/19/2021		5800.0000	*	1104.8345
Iron, total	ug/L	MW-4	04/14/2022		8470.0000	*	1104.8345
Iron, total	ug/L	MW-4	10/13/2022		11600.0000	*	1104.8345
Iron, total	ug/L	MW-4	04/19/2023		3230.0000	*	1104.8345
Iron, total	ug/L	MW-4	10/18/2023		3930.0000	*	1104.8345
Magnesium, total	mg/L	MW-4	04/26/2018		35.8000	*	24.7158
Magnesium, total	mg/L	MW-4	10/15/2018		27.7000	*	24.7158
Magnesium, total	mg/L	MW-4	04/23/2019		30.3000	*	24.7158
Magnesium, total	mg/L	MW-4	10/22/2019		22.7000		24.7158
Magnesium, total	mg/L	MW-4	04/21/2020		23.6000		24.7158
Magnesium, total	mg/L	MW-4	10/12/2020		23.0000		24.7158
Magnesium, total	mg/L	MW-4	04/14/2021		28.9000	*	24.7158
Magnesium, total	mg/L	MW-4	10/19/2021		25.1000	*	24.7158
Magnesium, total	mg/L	MW-4	04/14/2022		32.1000	*	24.7158
Magnesium, total	mg/L	MW-4	10/13/2022		32.5000	*	24.7158
Magnesium, total	mg/L	MW-4	04/19/2023		25.2000	*	24.7158
Magnesium, total	mg/L	MW-4	10/18/2023		36.9000	*	24.7158

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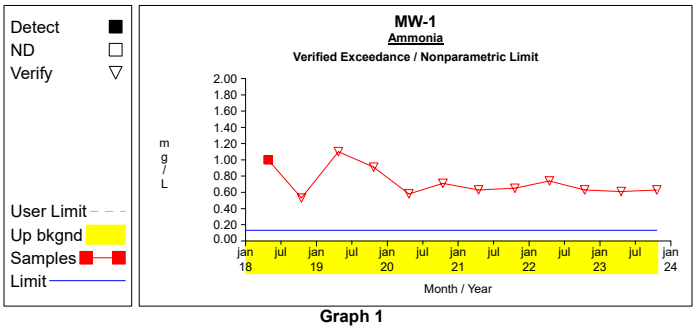
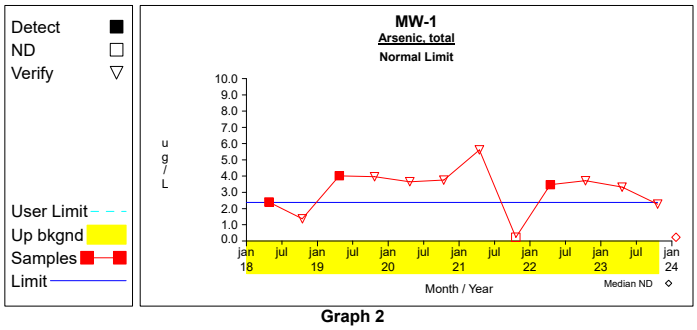
ND = Not Detected, Result = detection limit.

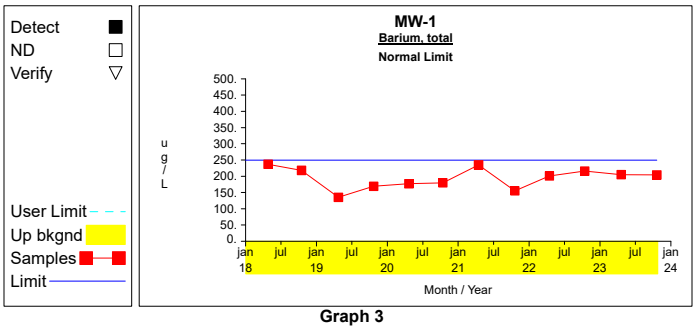
Up vs. Down Prediction Limits



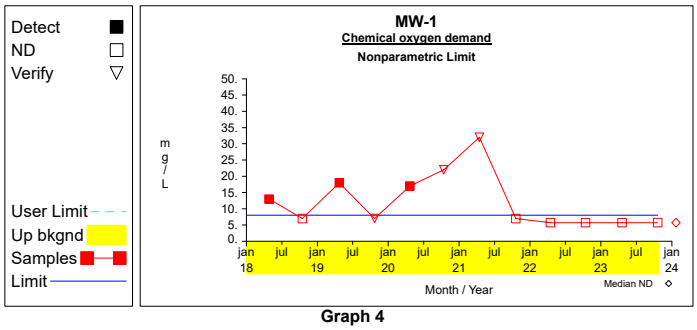
Graph 1



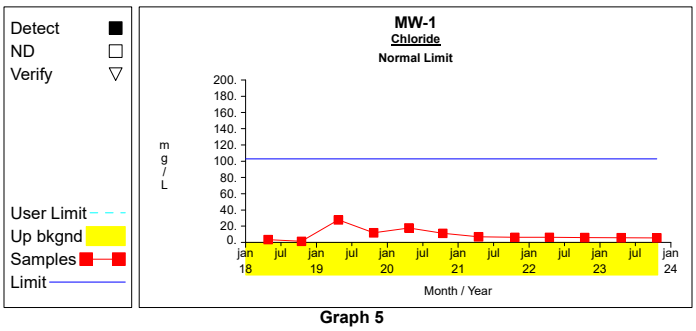
Graph 2



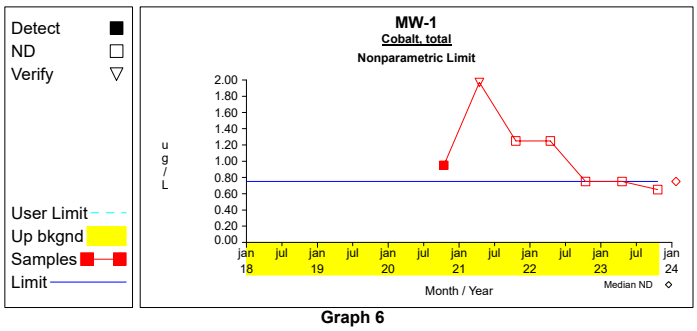
Graph 3



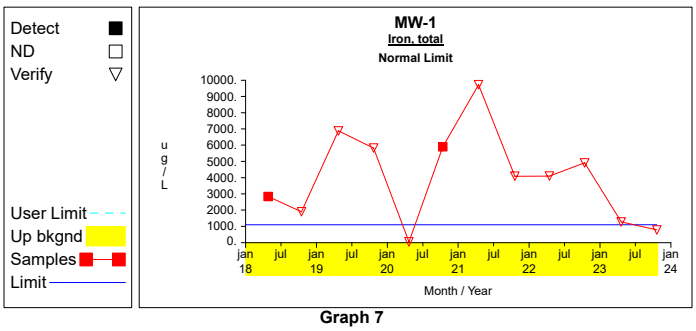
Graph 4



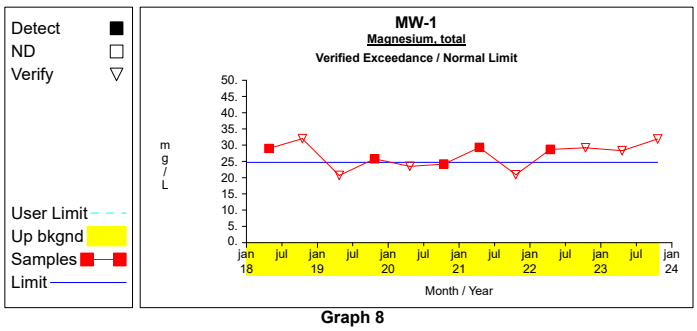
Graph 5



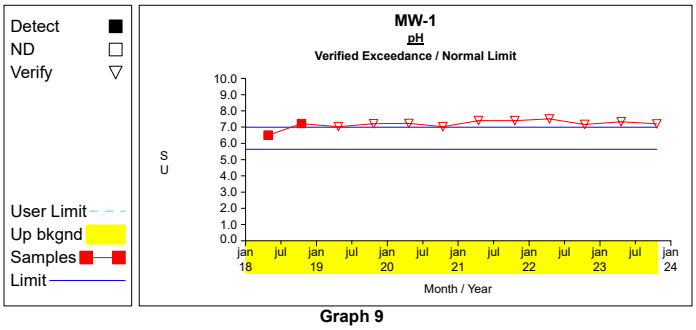
Graph 6



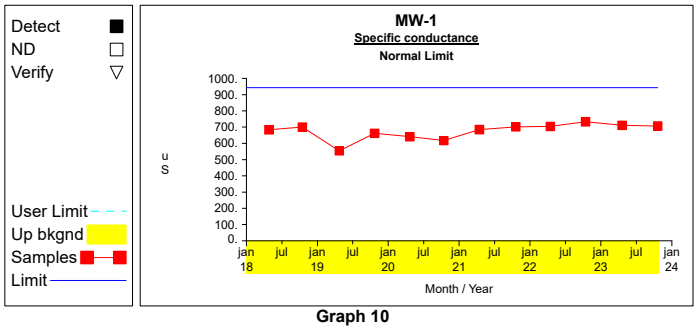
Graph 7



Graph 8



Graph 9



Graph 10

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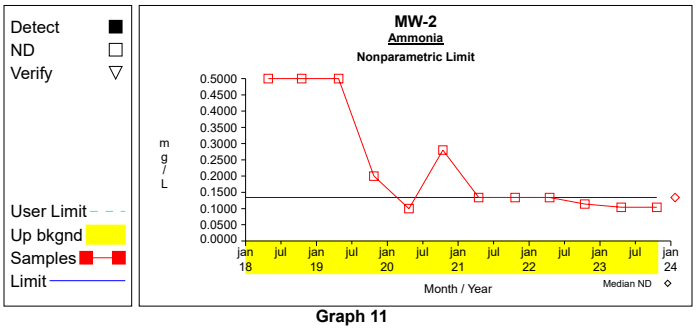
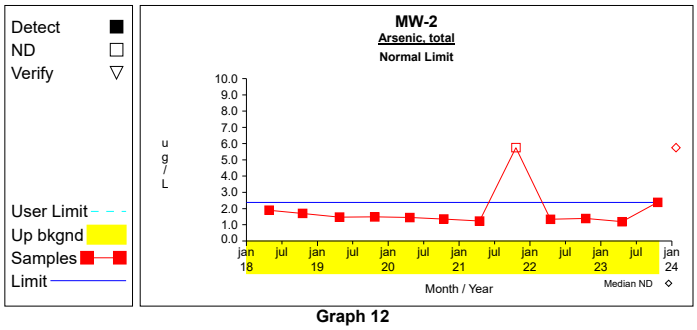
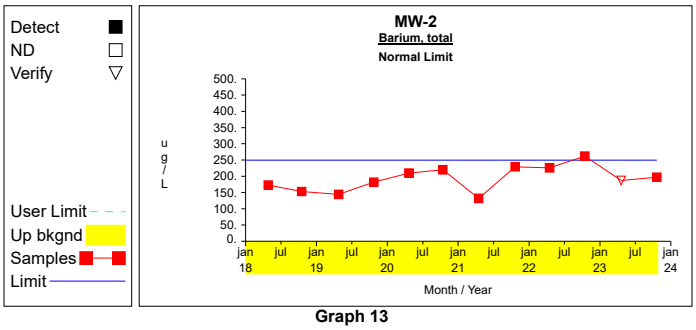
Up vs. Down Prediction Limits



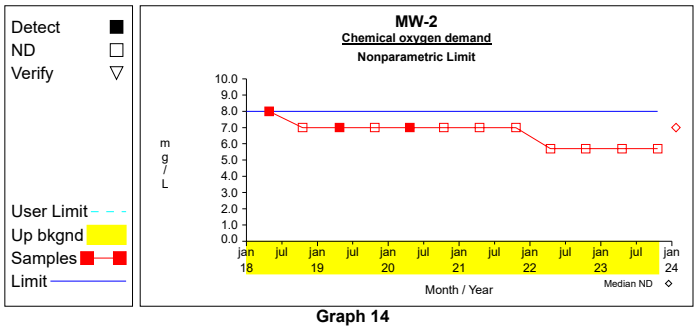
Graph 11



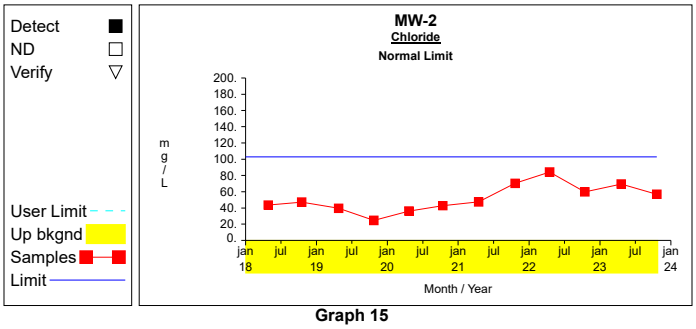
Graph 12



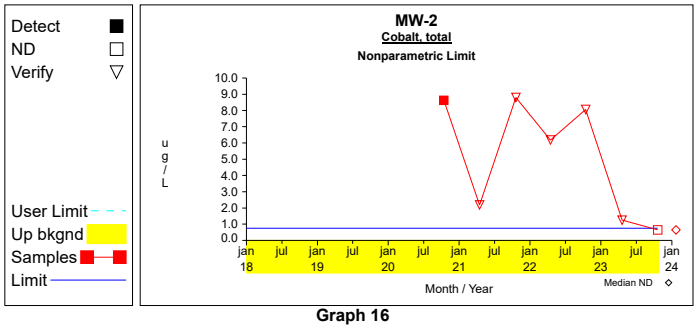
Graph 13



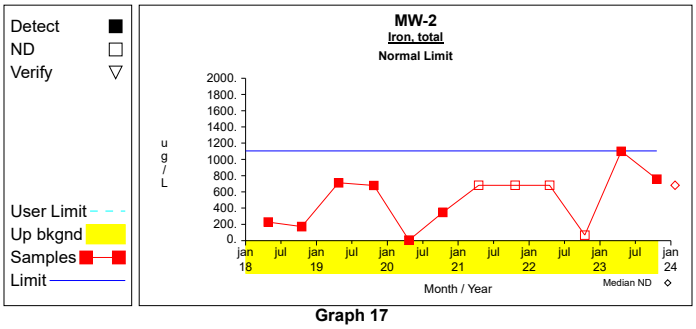
Graph 14



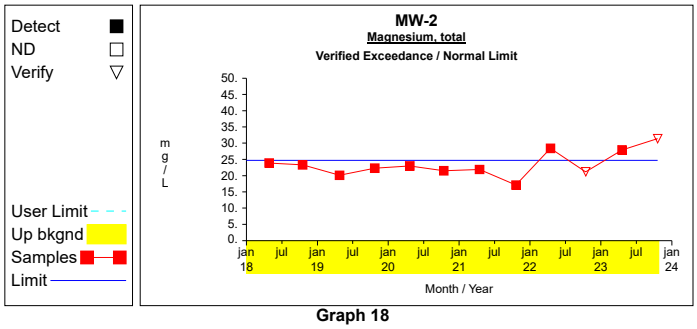
Graph 15



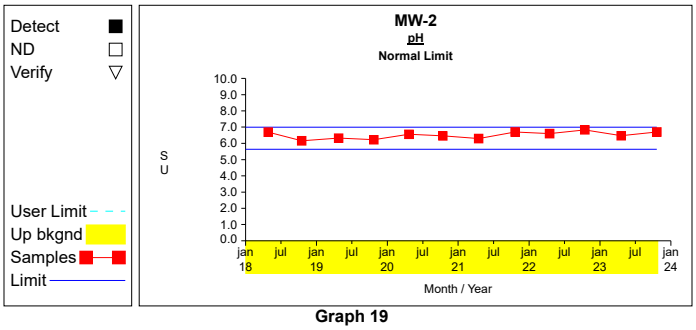
Graph 16



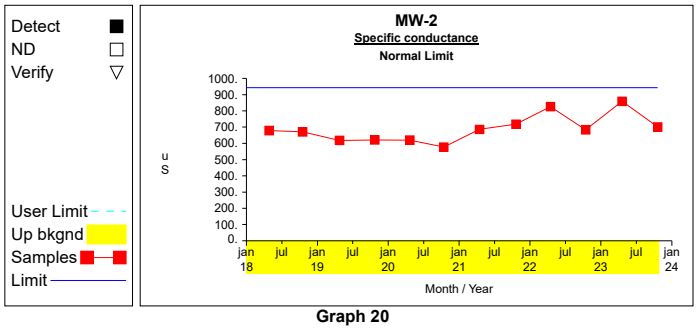
Graph 17



Graph 18



Graph 19



Graph 20

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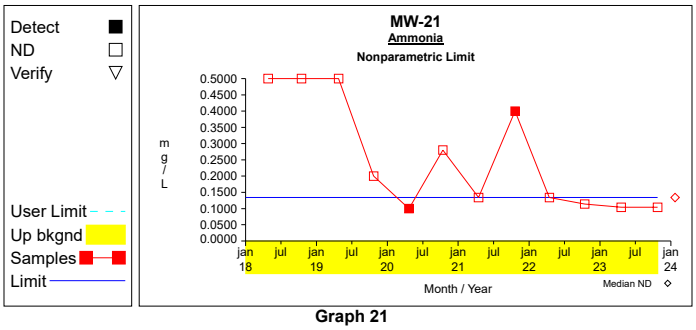
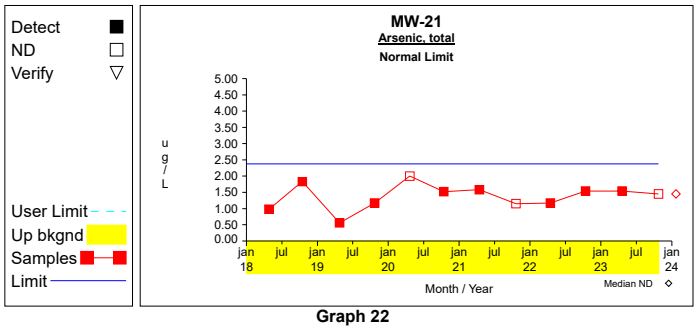
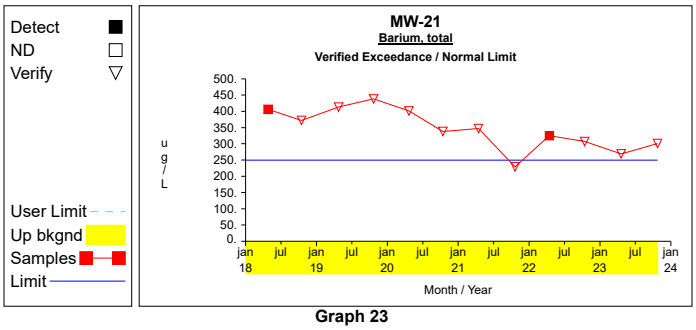
Up vs. Down Prediction Limits



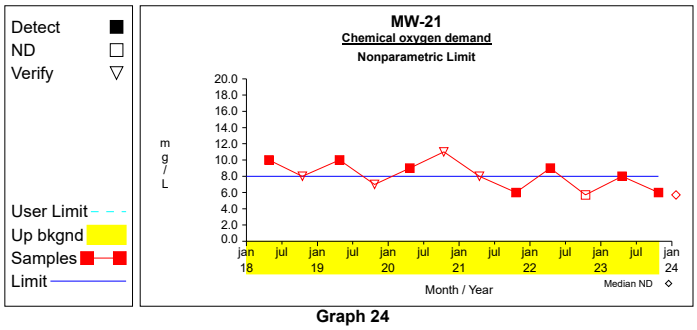
Graph 21



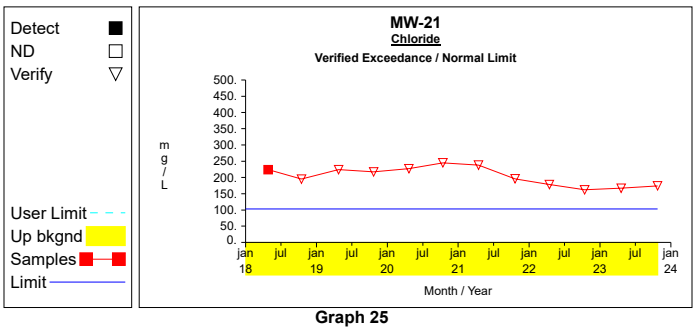
Graph 22



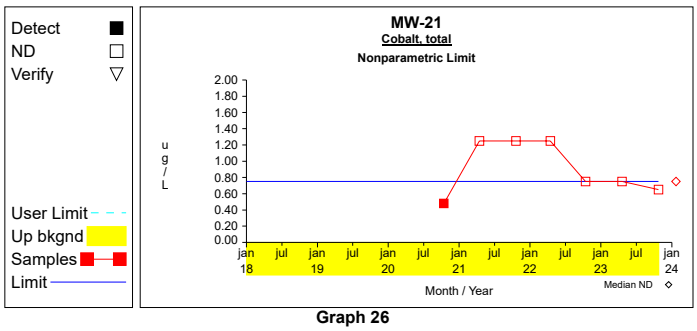
Graph 23



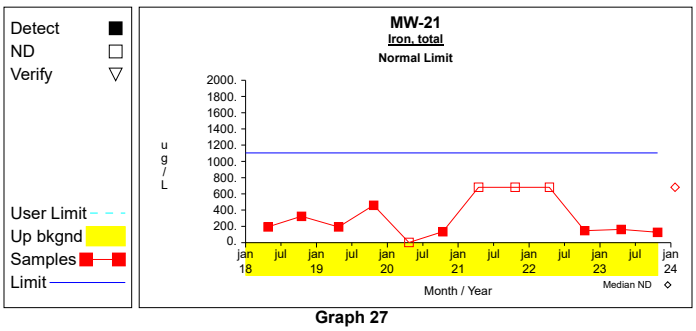
Graph 24



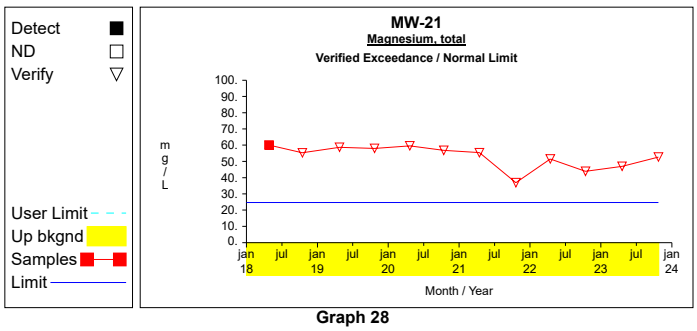
Graph 25



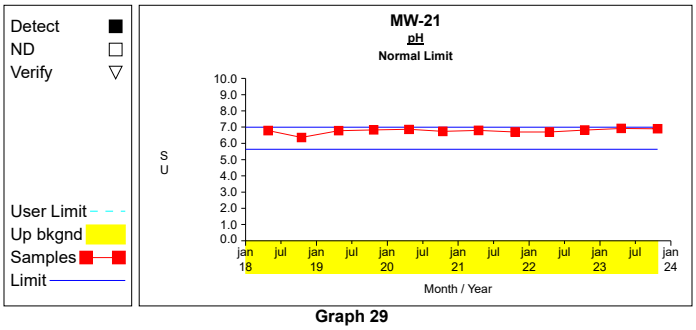
Graph 26



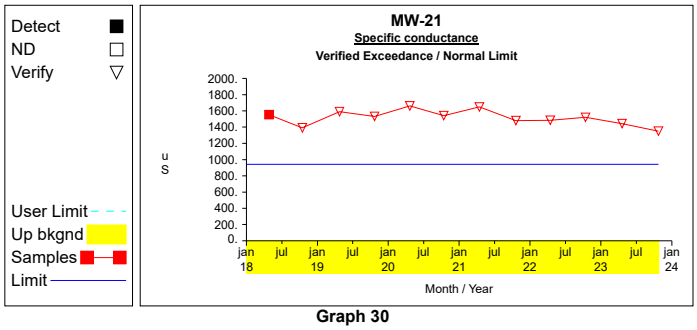
Graph 27



Graph 28



Graph 29



Graph 30

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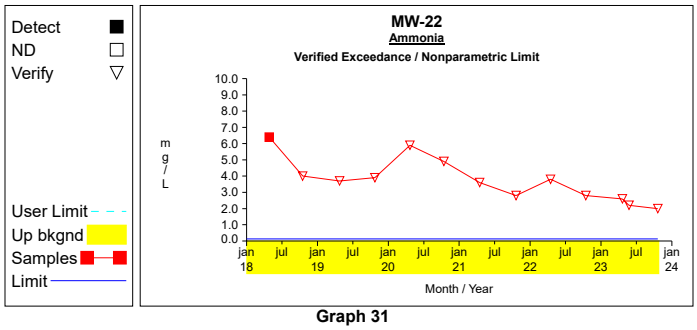
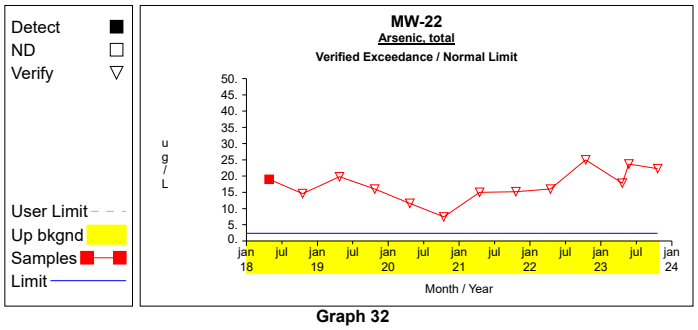
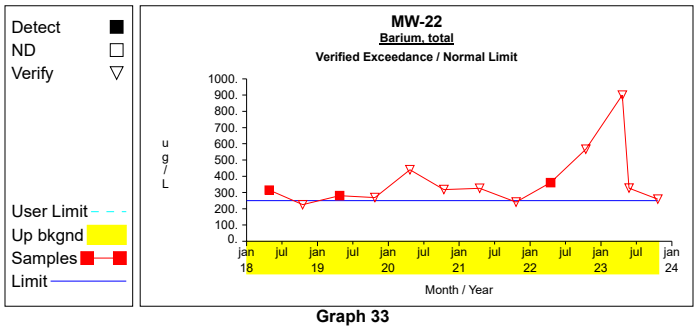
Up vs. Down Prediction Limits



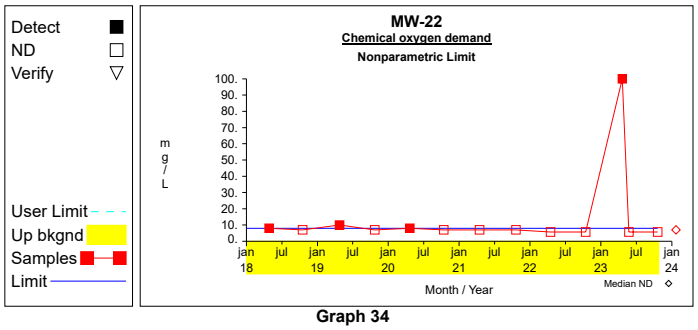
Graph 31



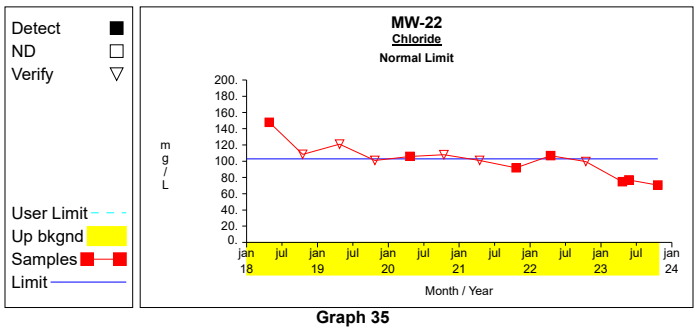
Graph 32



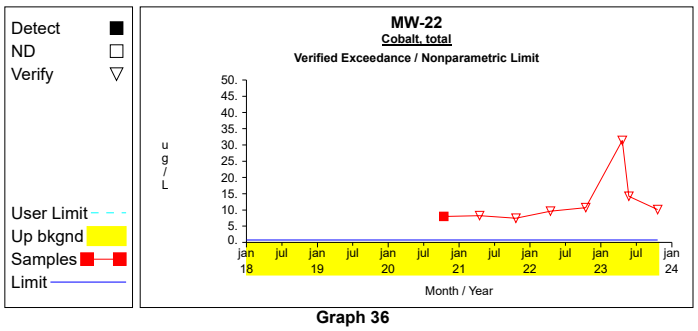
Graph 33



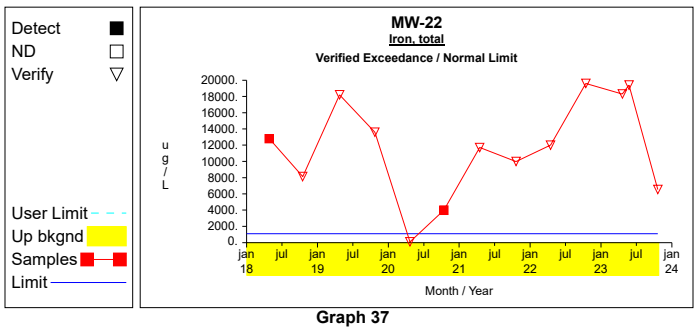
Graph 34



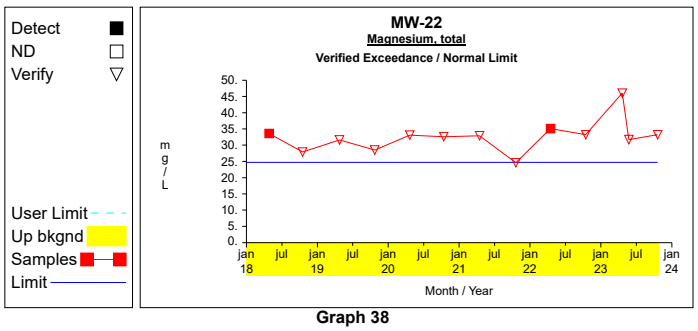
Graph 35



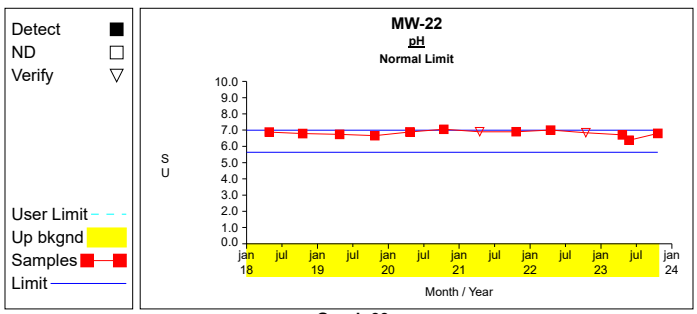
Graph 36



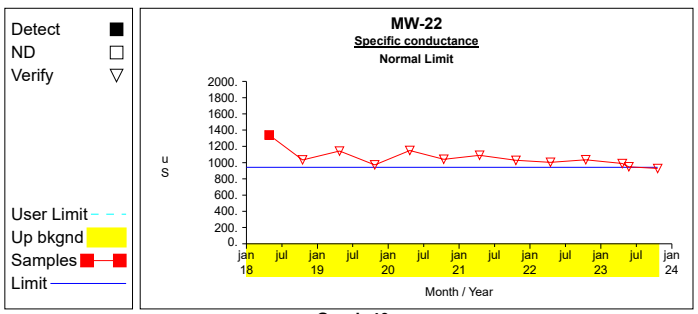
Graph 37



Graph 38



Graph 39



Graph 40

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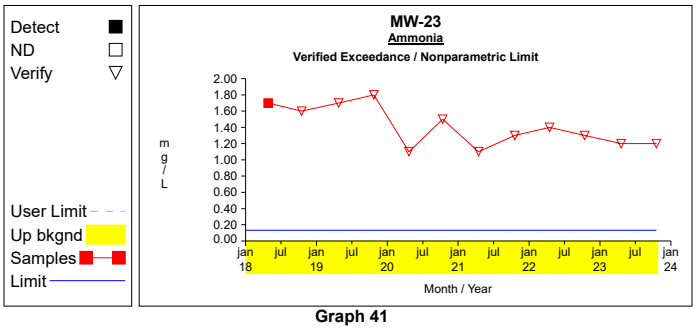
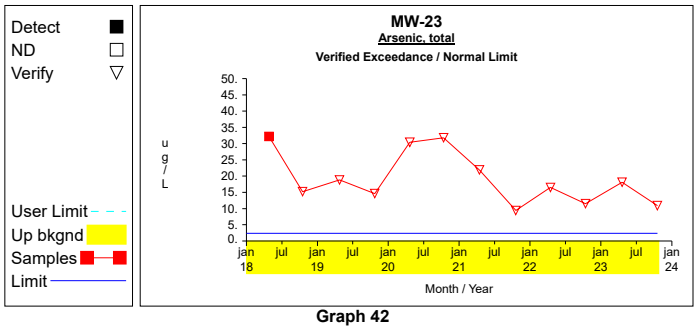
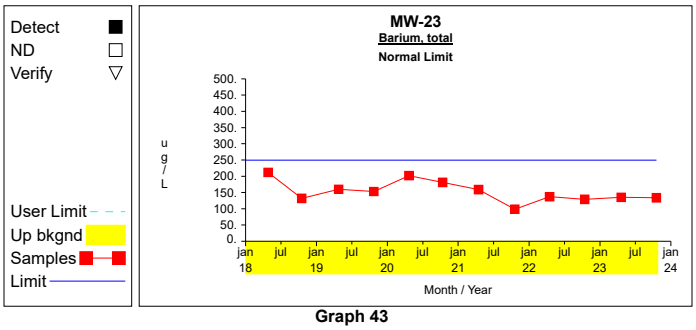
Up vs. Down Prediction Limits



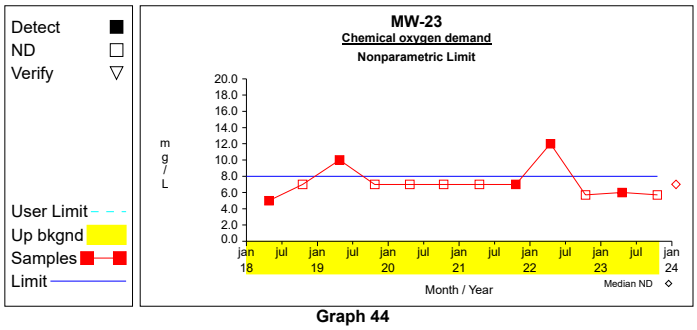
Graph 41



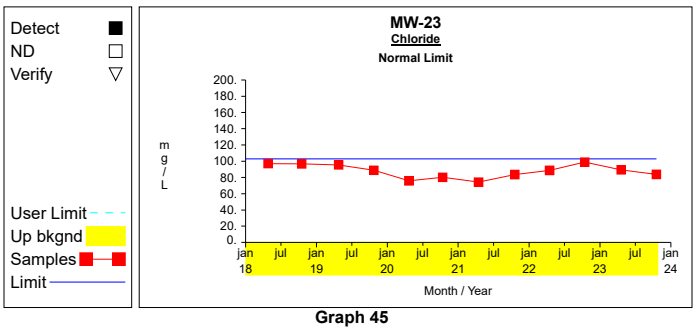
Graph 42



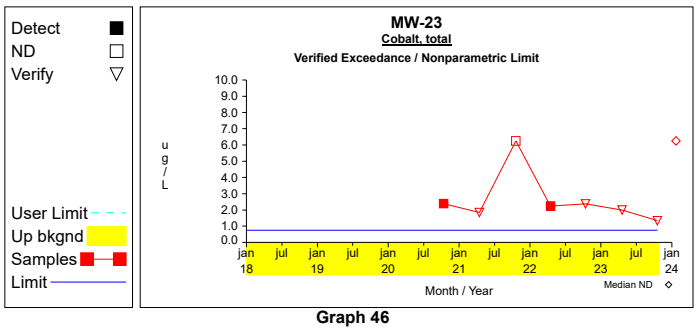
Graph 43



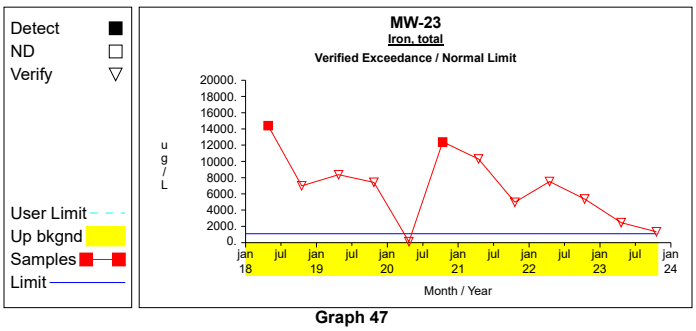
Graph 44



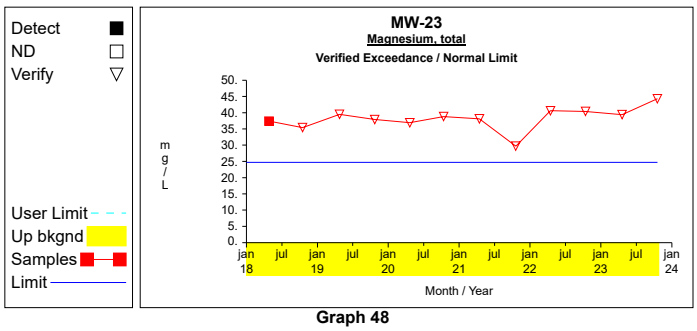
Graph 45



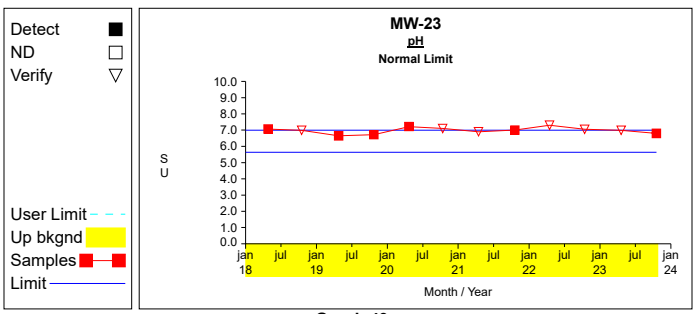
Graph 46



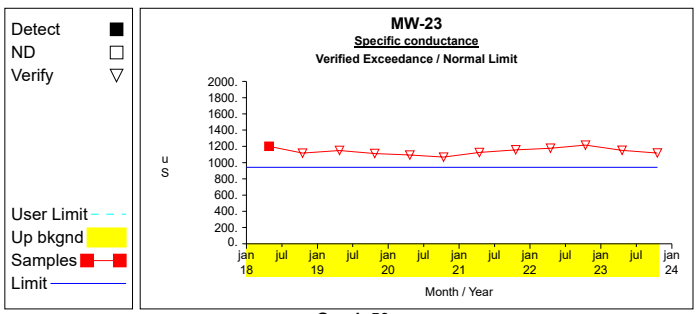
Graph 47



Graph 48



Graph 49



Graph 50

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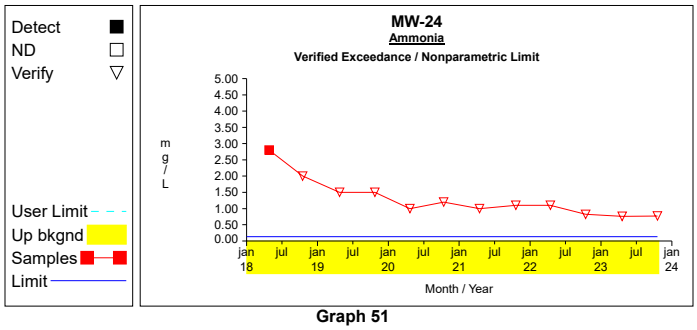
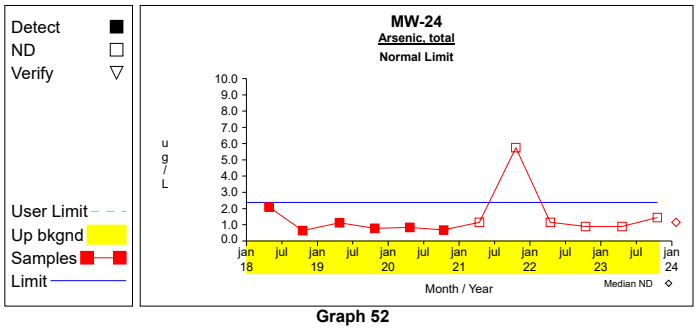
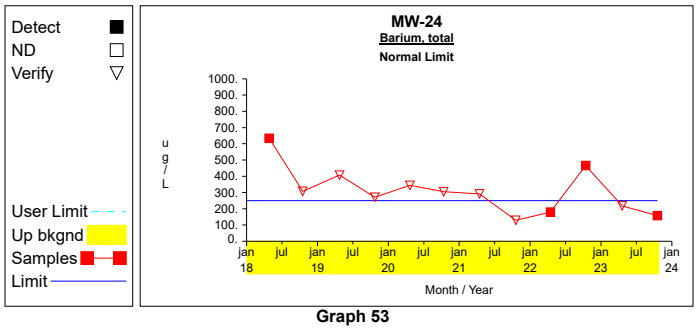
Up vs. Down Prediction Limits



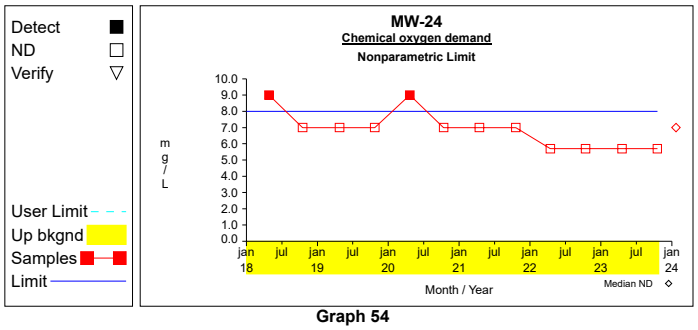
Graph 51



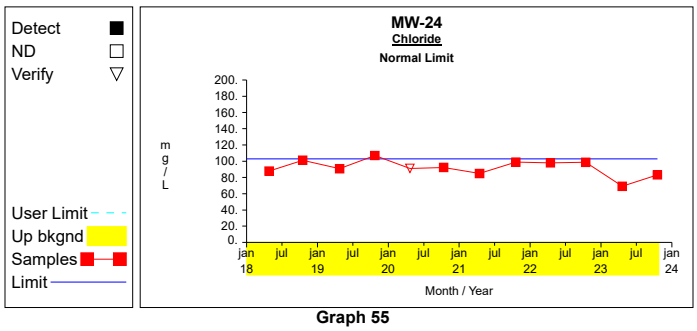
Graph 52



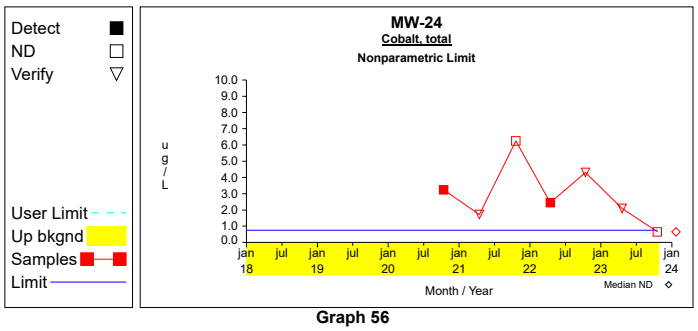
Graph 53



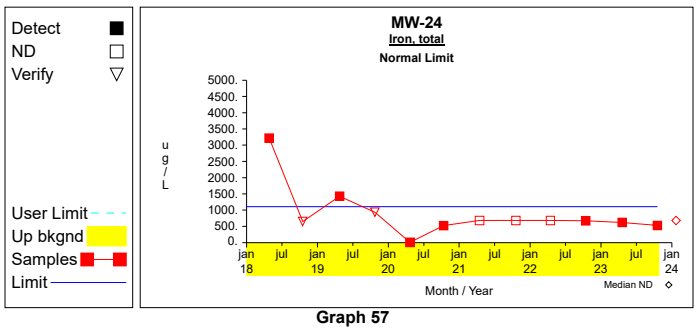
Graph 54



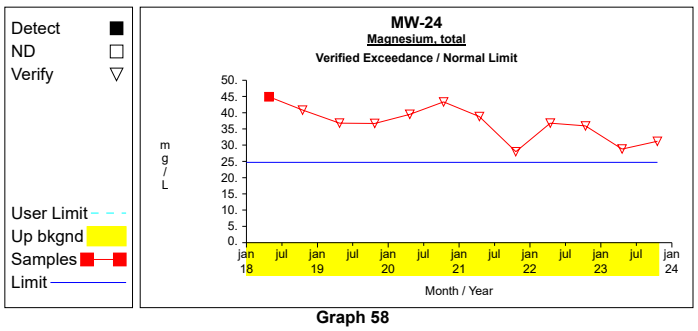
Graph 55



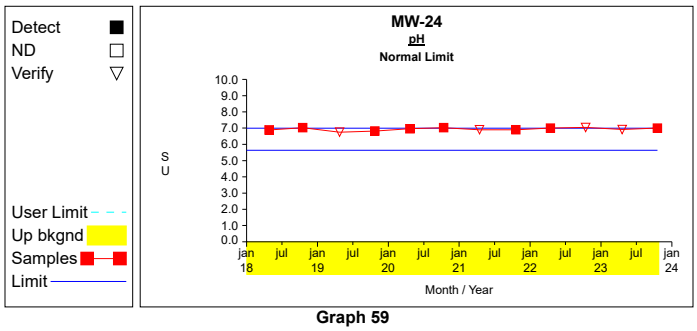
Graph 56



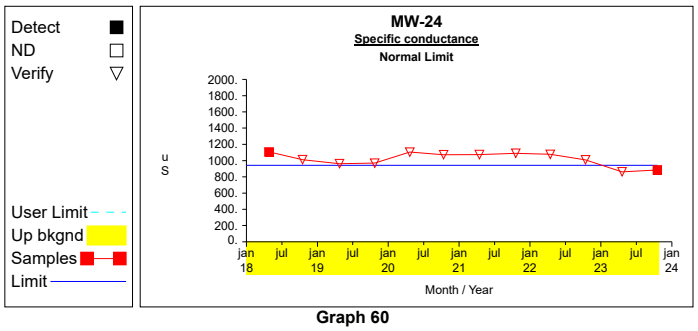
Graph 57



Graph 58



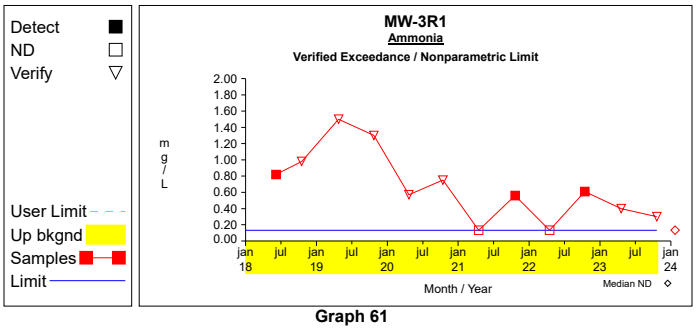
Graph 59



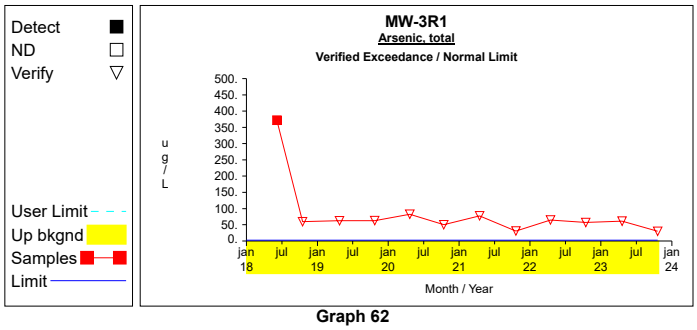
Graph 60

Prepared by: Otter Creek Environmental

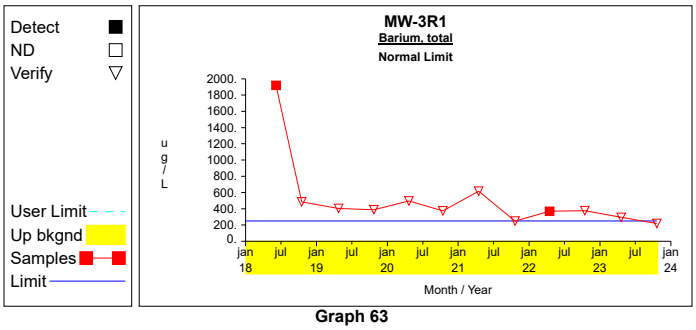
Up vs. Down Prediction Limits



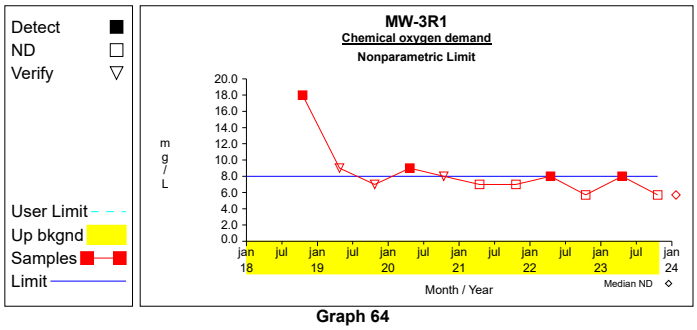
Graph 61



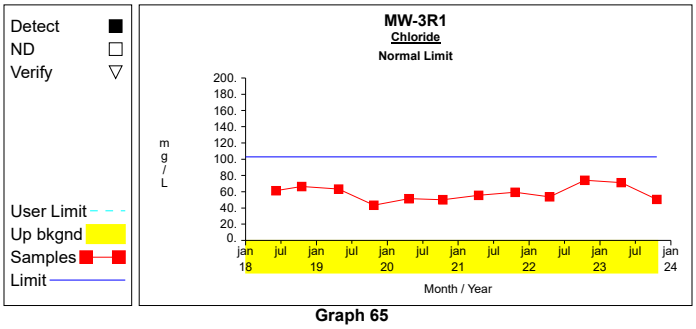
Graph 62



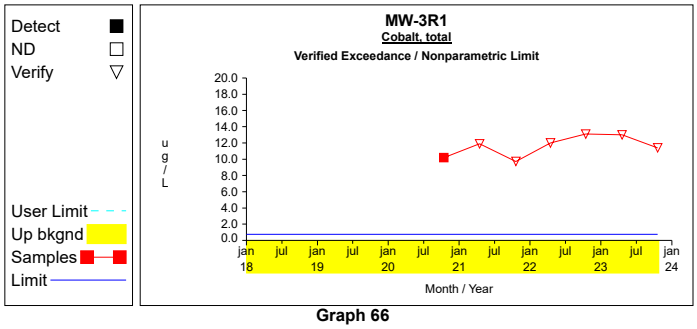
Graph 63



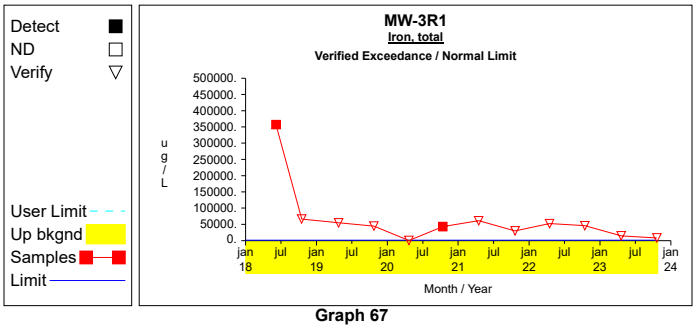
Graph 64



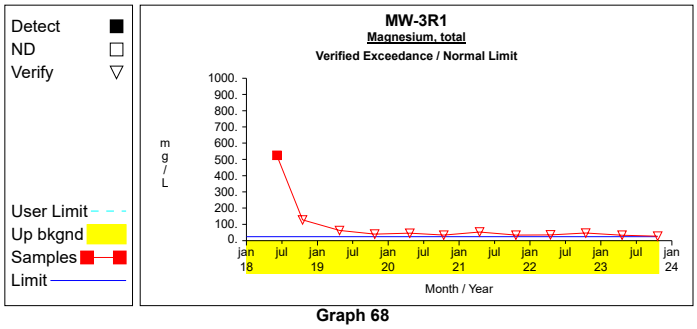
Graph 65



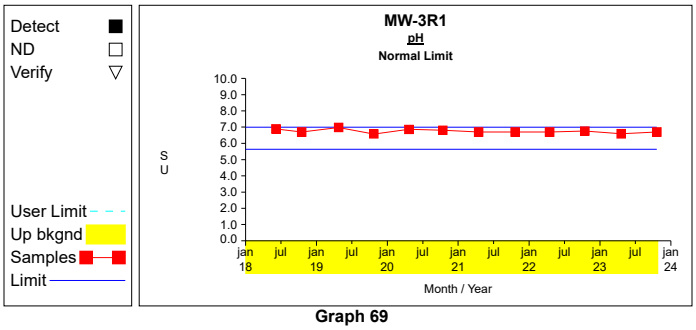
Graph 66



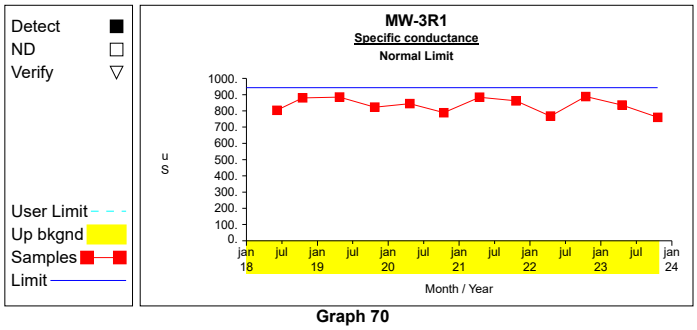
Graph 67



Graph 68



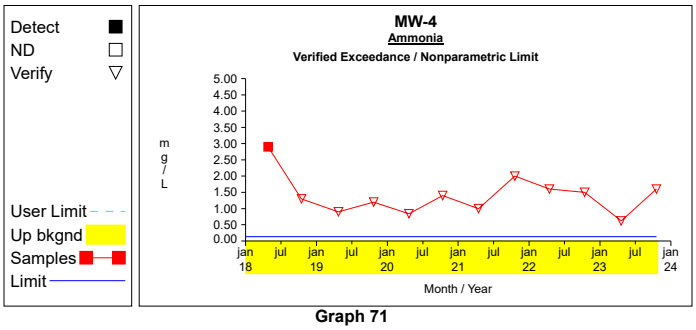
Graph 69



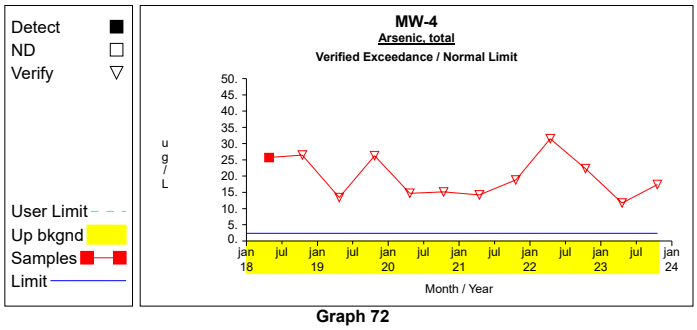
Graph 70

Prepared by: Otter Creek Environmental

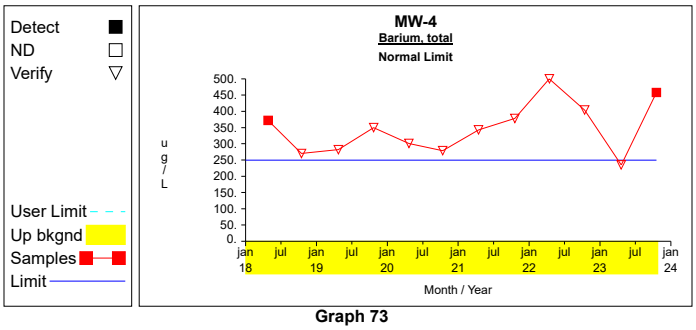
Up vs. Down Prediction Limits



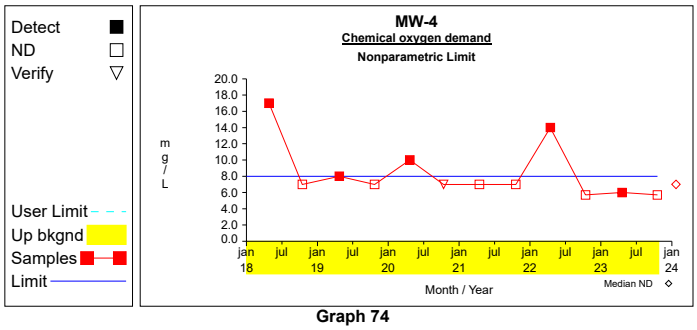
Graph 71



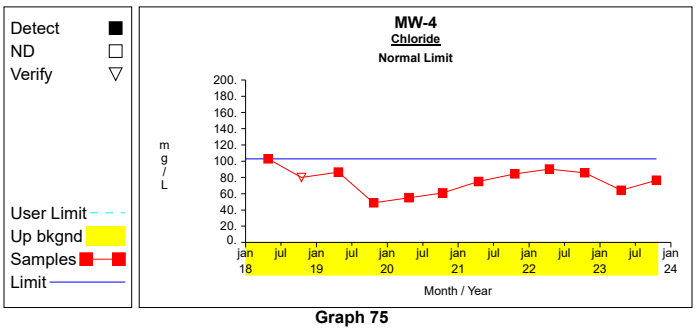
Graph 72



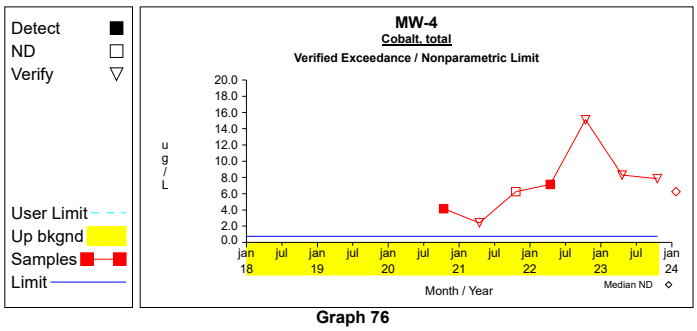
Graph 73



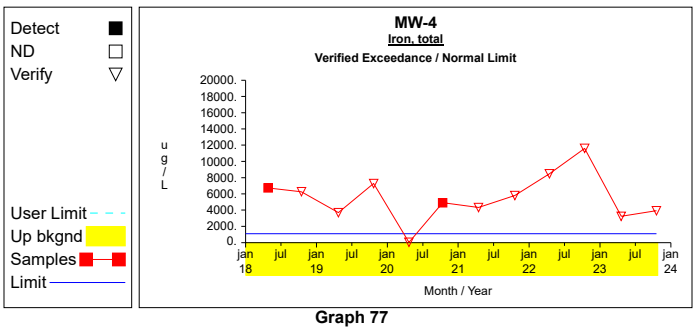
Graph 74



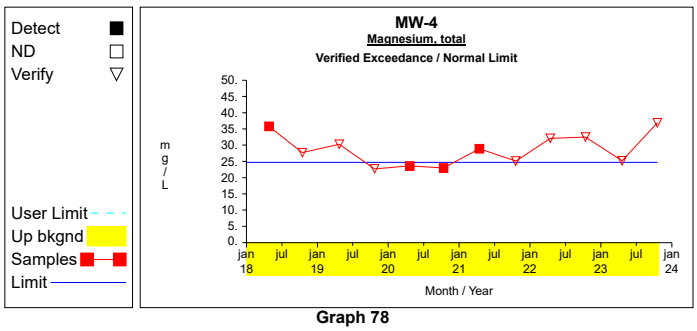
Graph 75



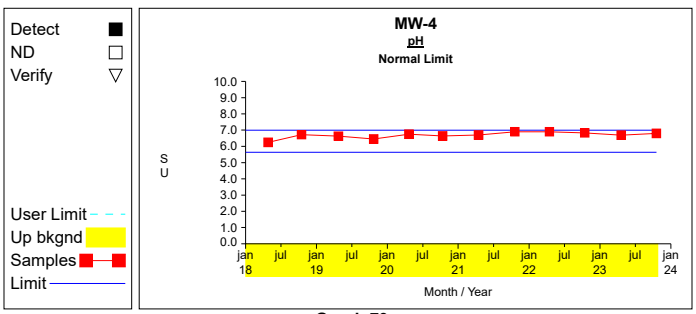
Graph 76



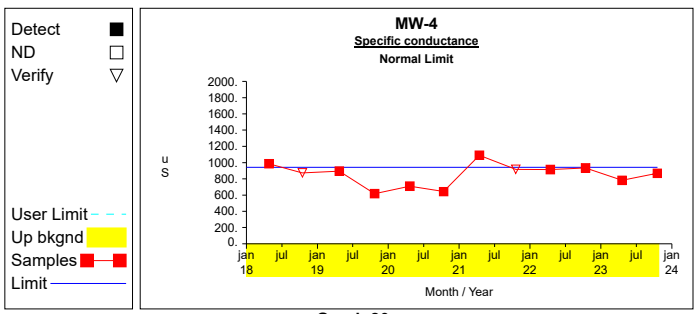
Graph 77



Graph 78



Graph 79

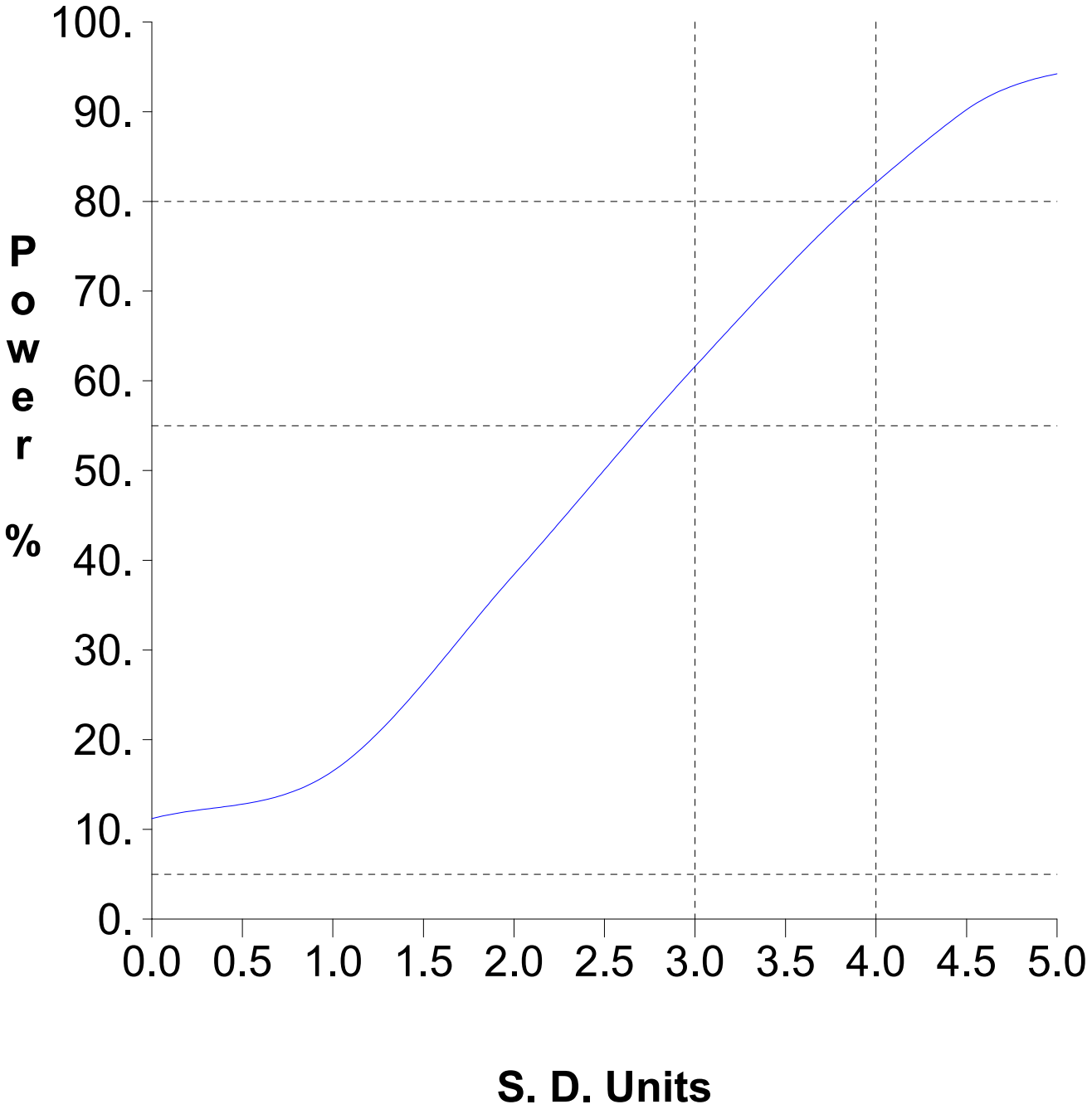


Graph 80

Prepared by: Otter Creek Environmental

False Positive and False Negative Rates for Current

Upgradient vs. Downgradient Monitoring Program



Attachment E

Summary Tables and Graphs for the Intrawell Comparisons
Second Semi-Annual Monitoring Event in 2023

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Ammonia	mg/L	MW-1	9	3	12	0.7611	0.1978	0.6100	0.6300	0.7611	0.7611	2.0466	normal		
Arsenic, total	ug/L	MW-1	9	3	12	3.1622	1.5982	3.3200	2.2700	3.1622	3.1622	13.5503	normal		
Barium, total	ug/L	MW-1	9	3	12	189.6667	35.5282	205.0000	204.0000	189.6667	189.6667	420.5997	normal		
Chemical oxygen demand	mg/L	MW-1	9	3	12	14.4444	8.7194	5.7000	5.7000	14.4444	14.4444	71.1205	normal		
Chloride	mg/L	MW-1	9	3	12	10.3244	8.1872	5.8300	5.6100	10.3244	10.3244	63.5412	normal		
Cobalt, total	ug/L	MW-1	4	3	7	1.3550	0.4337	0.7500	0.6500	1.3550	1.3550	4.1741	normal		
Iron, total	ug/L	MW-1	8	3	12	5156.2500	2478.8704	1270.0000	779.0000	5156.2500	5156.2500	21268.9073	normal		
Magnesium, total	mg/L	MW-1	9	3	12	26.0111	3.9813	28.3000	31.9000	26.0111	27.9187	51.8899	normal		
pH	SU	MW-1	9	3	12	7.1689	0.2980	7.3300	7.2000	7.1689	7.1689	5.23 - 9.11	normal		
Specific conductance	uS	MW-1	9	3	12	661.0000	49.9274	711.0000	707.0000	683.1451	679.2177	985.5284	normal		
Ammonia	mg/L	MW-2	9	3	12								nonpar *		**
Arsenic, total	ug/L	MW-2	8	3	12	1.4925	0.2142	1.1900	2.3800	1.4925	2.1658	2.8848	normal		
Barium, total	ug/L	MW-2	9	3	12	185.4444	37.3032	187.0000	197.0000	188.9492	185.4444	427.9152	normal		
Chemical oxygen demand	mg/L	MW-2	9	3	12	7.1111	0.3333	5.7000	5.7000	7.1111	7.1111	9.2778	normal		
Chloride	mg/L	MW-2	9	3	12	48.4391	18.0710	69.5000	56.9000	51.4290	48.4391	165.9005	normal		
Cobalt, total	ug/L	MW-2	4	3	7	6.4475	3.0866	1.2500	0.6500	6.4475	6.4475	26.5102	normal		
Iron, total	ug/L	MW-2	8	3	12	523.0625	231.6665	1100.0000	757.0000	868.3335	870.6044	2028.8950	normal		
Magnesium, total	mg/L	MW-2	9	3	12	22.3889	3.0387	27.9000	31.4000	24.8613	30.8337	42.1403	normal		
pH	SU	MW-2	9	3	12	6.4456	0.2034	6.4700	6.7000	6.4476	6.4986	5.12 - 7.77	normal		
Specific conductance	uS	MW-2	9	3	12	668.4444	73.4934	859.0000	701.0000	785.5066	744.5688	1146.1515	normal		
Ammonia	mg/L	MW-21	9	3	12								nonpar *		**
Arsenic, total	ug/L	MW-21	9	3	12	1.2344	0.3704	1.5400	1.4500	1.2344	1.2344	3.6423	normal		
Barium, total	ug/L	MW-21	9	3	12	363.2222	63.0273	269.0000	301.0000	363.2222	363.2222	772.8999	normal		
Chemical oxygen demand	mg/L	MW-21	9	3	12	8.6667	1.5811	8.0000	6.0000	8.6667	8.6667	18.9441	normal		
Chloride	mg/L	MW-21	9	3	12	215.9928	21.9695	167.0000	174.0000	215.9928	215.9928	358.7944	normal		
Cobalt, total	ug/L	MW-21	4	3	7	1.0575	0.3850	0.7500	0.6500	1.0575	1.0575	3.5600	normal		
Iron, total	ug/L	MW-21	8	3	12	418.5625	239.2071	162.0000	126.0000	418.5625	418.5625	1973.4086	normal		
Magnesium, total	mg/L	MW-21	9	3	12	54.7000	7.1798	47.0000	52.7000	54.7000	54.7000	101.3689	normal		
pH	SU	MW-21	9	3	12	6.7289	0.1486	6.9200	6.9000	6.7714	6.7939	5.76 - 7.69	normal		
Specific conductance	uS	MW-21	9	3	12	1542.5556	85.2674	1443.0000	1350.0000	1542.5556	1542.5556	2096.7936	normal		
Ammonia	mg/L	MW-22	9	4	13	4.3333	1.1683	2.2000	2.0000	4.3333	4.3333	11.9275	normal		
Arsenic, total	ug/L	MW-22	9	4	13	14.9578	3.7121	23.7000	22.3000	25.4480	29.0781	39.0867	normal		
Barium, total	ug/L	MW-22	9	4	13	308.4444	65.5098	327.0000	259.0000	454.5360	339.5819	734.2578	normal		
Chemical oxygen demand	mg/L	MW-22	9	4	13	7.5556	1.0138	5.7000	5.7000	7.5556	7.5556	14.1452	normal		
Chloride	mg/L	MW-22	9	4	13	110.2439	16.1508	76.8876	70.7000	110.2439	110.2439	215.2241	normal		
Cobalt, total	ug/L	MW-22	4	4	8	8.3275	0.9308	14.2000	10.1000	14.7109	10.6109	14.3776	normal		
Iron, total	ug/L	MW-22	8	4	13	11301.2500	4157.6279	19400.0000	6540.0000	22224.6163	13305.7385	38325.8313	normal		
Magnesium, total	mg/L	MW-22	9	4	13	31.1000	3.3771	31.7000	33.2000	39.8457	38.5686	53.0513	normal		
pH	SU	MW-22	9	4	13	6.8678	0.1219	6.3800	6.8000	6.8678	6.8678	6.08 - 7.66	normal		
Specific conductance	uS	MW-22	9	4	13	1088.7778	111.5154	948.0000	927.0000	1088.7778	1088.7778	1813.6282	normal		
Ammonia	mg/L	MW-23	9	3	12	1.4667	0.2598	1.2000	1.2000	1.4667	1.4667	3.1554	normal		
Arsenic, total	ug/L	MW-23	9	3	12	21.2000	8.4049	18.1000	10.9000	21.2000	21.2000	75.8319	normal		
Barium, total	ug/L	MW-23	9	3	12	159.4000	35.4237	135.0000	134.0000	159.4000	159.4000	389.6542	normal		
Chemical oxygen demand	mg/L	MW-23	9	3	12	7.6667	2.0616	6.0000	5.7000	7.6667	7.6667	21.0668	normal		
Chloride	mg/L	MW-23	9	3	12	86.7652	8.7783	89.3000	83.8000	86.7652	86.7652	143.8243	normal		
Cobalt, total	ug/L	MW-23	4	3	7	3.1800	2.0598	2.0000	1.3400	3.1800	3.1800	16.5686	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one verification resample (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

Table 1

Summary Statistics and Intermediate Computations for Combined Shewhart-CUSUM Control Charts

Constituent	Units	Well	N(back)	N(mon)	N(tot)	Mean	SD	R(i-1)	R(i)	S(i-1)	S(i)	Limit	Type	Conf	
Iron, total	ug/L	MW-23	8	3	12	9047.5000	3109.8404	2460.0000	1330.0000	9047.5000	9047.5000	29261.4624	normal		
Magnesium, total	mg/L	MW-23	9	3	12	37.1444	3.1682	39.4000	44.3000	37.1444	41.1318	57.7380	normal		
pH	SU	MW-23	9	3	12	6.9944	0.2133	6.9900	6.8000	6.9944	6.9944	5.61 - 8.38	normal		
Specific conductance	uS	MW-23	9	3	12	1133.1111	42.0935	1151.0000	1118.0000	1148.7019	1133.1111	1406.7187	normal		
Ammonia	mg/L	MW-24	9	3	12	1.4667	0.5958	0.7600	0.7700	1.4667	1.4667	5.3395	normal		
Arsenic, total	ug/L	MW-24	9	3	12	1.0689	0.4413	0.9000	1.4500	1.0689	1.0689	3.9371	normal		
Barium, total	ug/L	MW-24	9	3	12	318.6667	144.3373	218.0000	158.0000	318.6667	318.6667	1256.8590	normal		
Chemical oxygen demand	mg/L	MW-24	9	3	12								nonpar *		**
Chloride	mg/L	MW-24	9	3	12	94.6720	7.0513	69.2000	83.2000	94.6720	94.6720	140.5052	normal		
Cobalt, total	ug/L	MW-24	4	3	7	3.4150	1.9893	2.0900	0.6500	3.4150	3.4150	16.3455	normal		
Iron, total	ug/L	MW-24	8	3	12	1100.5625	901.5777	622.0000	528.0000	1100.5625	1100.5625	6960.8174	normal		
Magnesium, total	mg/L	MW-24	9	3	12	38.4000	4.8678	28.8000	31.2000	38.4000	38.4000	70.0404	normal		
pH	SU	MW-24	9	3	12	6.9200	0.0954	6.9100	7.0000	6.9200	6.9200	6.30 - 7.54	normal		
Specific conductance	uS	MW-24	9	3	12	1052.0000	56.4424	862.0000	885.0000	1052.0000	1052.0000	1418.8759	normal		
Ammonia	mg/L	MW-26	9	3	12								nonpar *		**
Arsenic, total	ug/L	MW-26	9	3	12	0.7889	0.5763	0.9000	1.4500	0.7889	0.7889	4.5351	normal		
Barium, total	ug/L	MW-26	9	3	12	140.4444	41.2193	176.0000	123.0000	140.4444	140.4444	408.3697	normal		
Chemical oxygen demand	mg/L	MW-26	9	3	12								nonpar *		**
Chloride	mg/L	MW-26	9	3	12	43.0798	17.0679	71.9000	48.1000	73.0845	61.0369	154.0209	normal		
Cobalt, total	ug/L	MW-26	4	3	7	1.0675	0.3650	0.7500	0.6500	1.0675	1.0675	3.4400	normal		
Iron, total	ug/L	MW-26	8	3	12	391.0250	138.3588	767.0000	610.0000	628.6412	709.2574	1290.3572	normal		
Magnesium, total	mg/L	MW-26	9	3	12	12.0689	3.9159	19.7000	12.5000	16.0994	12.6146	37.5221	normal		
pH	SU	MW-26	9	3	12	6.2767	0.2241	6.5700	6.4000	6.3459	6.2767	4.82 - 7.73	normal		
Specific conductance	uS	MW-26	9	3	12	421.0000	159.3730	709.0000	461.0000	615.2540	495.8810	1456.9244	normal		
Ammonia	mg/L	MW-3R1	9	3	12	0.7498	0.4677	0.4000	0.3000	0.7498	0.7498	3.7901	normal		
Arsenic, total	ug/L	MW-3R1	8	3	12	61.3250	15.9933	61.2000	30.0000	61.3250	61.3250	165.2813	normal		
Barium, total	ug/L	MW-3R1	8	3	12	422.6250	109.3434	294.0000	219.0000	422.6250	422.6250	1133.3572	normal		
Chemical oxygen demand	mg/L	MW-3R1	8	3	11	9.1250	3.6815	8.0000	5.7000	9.1250	9.1250	33.0549	normal		
Chloride	mg/L	MW-3R1	9	3	12	56.0031	7.2377	71.2000	50.5000	74.8215	62.0807	103.0481	normal		
Cobalt, total	ug/L	MW-3R1	4	3	7	10.9575	1.1627	13.0000	11.4000	12.8171	12.0969	18.5151	normal		
Iron, total	ug/L	MW-3R1	7	3	12	50357.1429	12210.2221	14900.0000	8350.0000	50357.1429	50357.1429	129723.5865	normal		
Magnesium, total	mg/L	MW-3R1	9	3	12	106.2222	159.7377	33.2000	27.1000	106.2222	106.2222	1144.5170	normal		
pH	SU	MW-3R1	9	3	12	6.7689	0.1244	6.5900	6.7000	6.7689	6.7689	5.96 - 7.58	normal		
Specific conductance	uS	MW-3R1	9	3	12	837.7778	43.8685	836.0000	760.0000	837.7778	837.7778	1122.9230	normal		
Ammonia	mg/L	MW-4	9	3	12	1.4600	0.6511	0.6200	1.6000	1.4600	1.4600	5.6920	normal		
Arsenic, total	ug/L	MW-4	9	3	12	20.6889	6.8296	11.7000	17.4000	20.6889	20.6889	65.0814	normal		
Barium, total	ug/L	MW-4	9	3	12	341.6667	72.1613	235.0000	458.0000	341.6667	385.8387	810.7150	normal		
Chemical oxygen demand	mg/L	MW-4	9	3	12	9.3333	3.7081	6.0000	5.7000	9.3333	9.3333	33.4360	normal		
Chloride	mg/L	MW-4	9	3	12	76.0033	17.8265	64.2000	76.5000	76.0033	76.0033	191.8759	normal		
Cobalt, total	ug/L	MW-4	4	3	7	4.9900	2.1229	8.2900	7.8500	14.1541	14.8912	18.7891	normal		
Iron, total	ug/L	MW-4	8	3	12	5932.5000	1589.2114	3230.0000	3930.0000	5932.5000	5932.5000	16262.3741	normal		
Magnesium, total	mg/L	MW-4	9	3	12	27.6889	4.5253	25.2000	36.9000	27.6889	32.3747	57.1035	normal		
pH	SU	MW-4	9	3	12	6.6600	0.2068	6.6900	6.8000	6.6600	6.6600	5.32 - 8.00	normal		
Specific conductance	uS	MW-4	9	3	12	849.6667	159.6731	782.0000	869.0000	849.6667	849.6667	1887.5418	normal		

N(back) and N(mon) = Non-outlier measurements in the background and monitoring periods.
N(tot) = All independent measurements for that constituent and well.
For transformed data, mean and SD in transformed units and control limit in original units.
Conf = confidence level for passing initial test or one verification resample (nonparametric test only).
* - Insufficient Data.
** - Detection Frequency < 25%.
*** - Zero Variance.

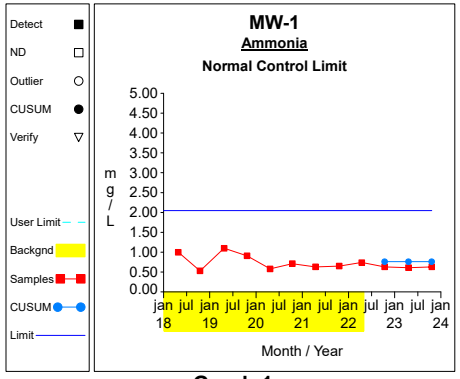
Table 4

Dixon's Test Outliers
1% Significance Level

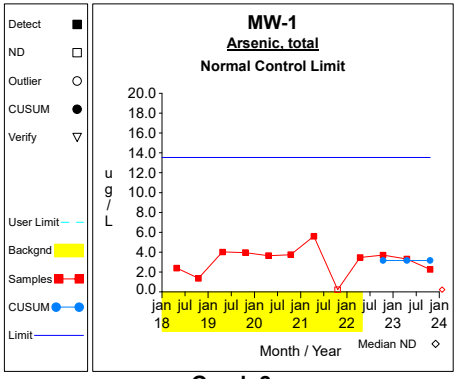
Constituent	Units	Well	Date	Result	ND Qualifier	Date Range	N	Critical Value
Iron, total	ug/L	MW-1	04/21/2020	45.8000		04/26/2018-04/14/2022	9	0.6346
Arsenic, total	ug/L	MW-2	10/20/2021	5.7500	< 5.7500	04/27/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-2	04/21/2020	5.7200		04/27/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-21	04/21/2020	2.0000	< 2.0000	04/26/2018-04/14/2022	9	0.6346
Iron, total	ug/L	MW-22	04/21/2020	93.3000		04/27/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-23	04/21/2020	118.0000		04/26/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-24	04/21/2020	9.3400		04/26/2018-04/14/2022	9	0.6346
Arsenic, total	ug/L	MW-3R1	06/05/2018	372.0000		06/05/2018-04/15/2022	9	0.6346
Barium, total	ug/L	MW-3R1	06/05/2018	1920.0000		06/05/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-3R1	06/05/2018	357000.0000		06/05/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-3R1	04/21/2020	535.0000		06/05/2018-04/15/2022	9	0.6346
Iron, total	ug/L	MW-4	04/21/2020	36.2000		04/26/2018-04/14/2022	9	0.6346

N = Total number of independent measurements in background at each well.
Date Range = Dates of the first and last measurements included in background at each well.
Critical Value depends on the significance level and on N-1 when the two most extreme values are tested or N for the most extreme value.

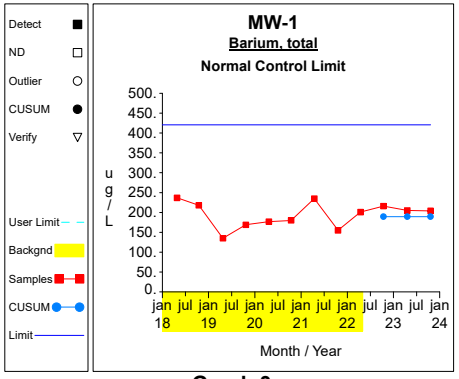
Intra-Well Control Charts / Prediction Limits



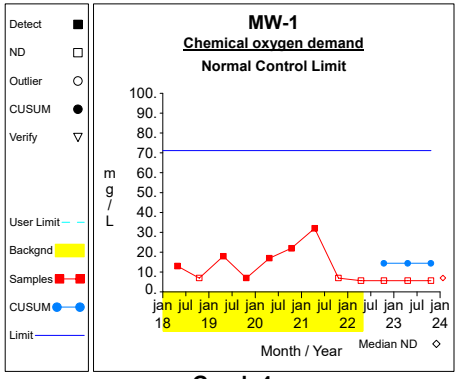
Graph 1



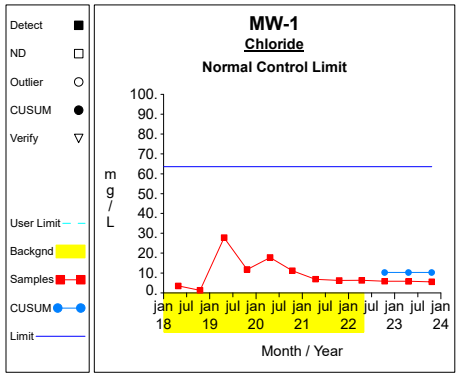
Graph 2



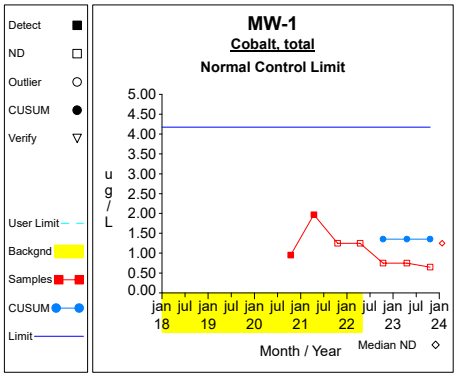
Graph 3



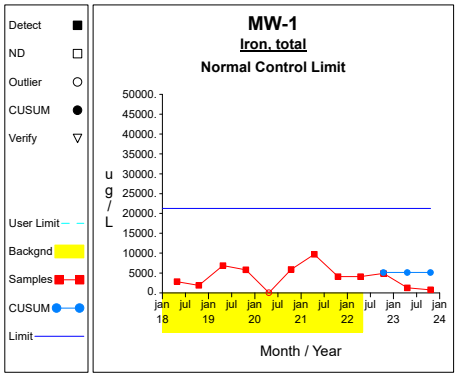
Graph 4



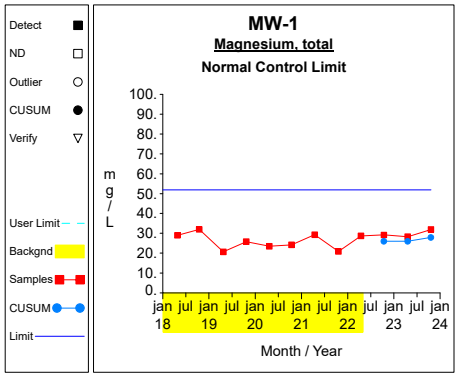
Graph 5



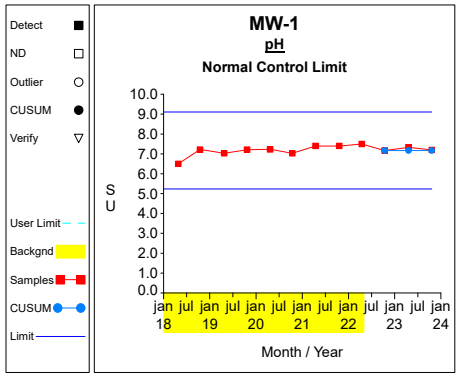
Graph 6



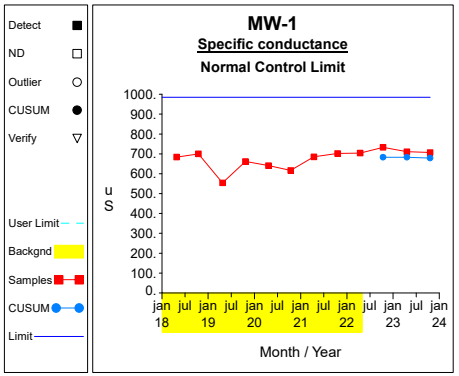
Graph 7



Graph 8



Graph 9



Graph 10

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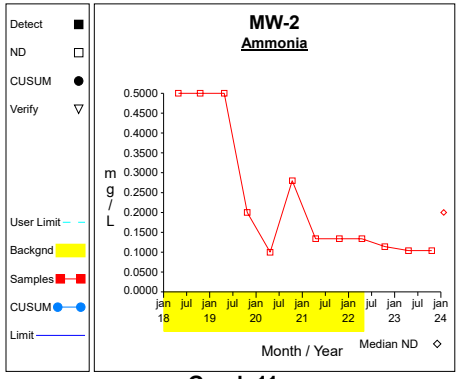
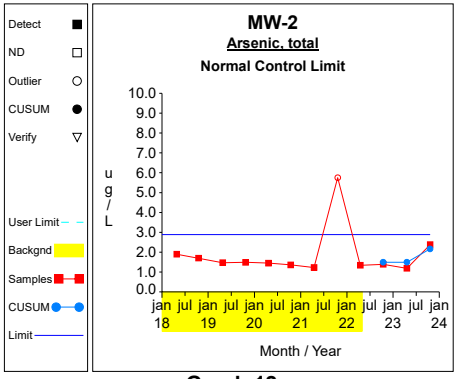
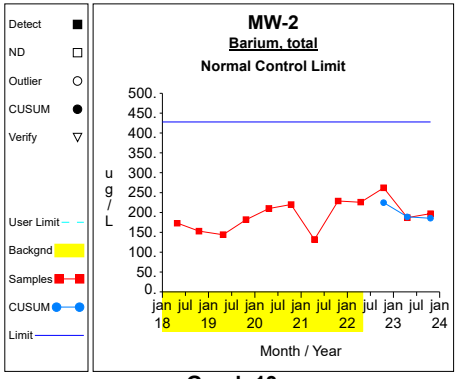
Intra-Well Control Charts / Prediction Limits



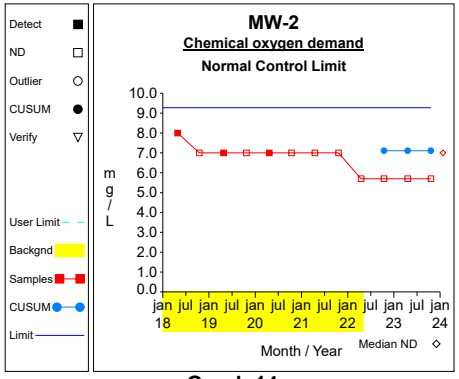
Graph 11



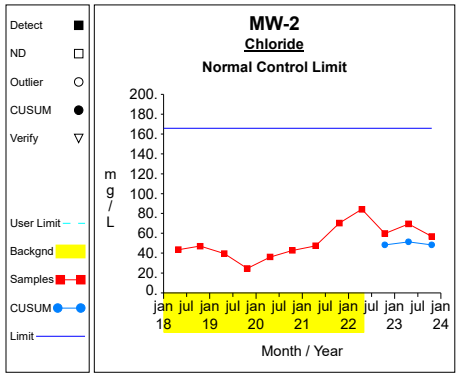
Graph 12



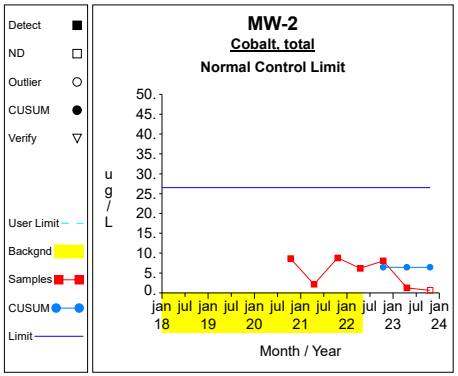
Graph 13



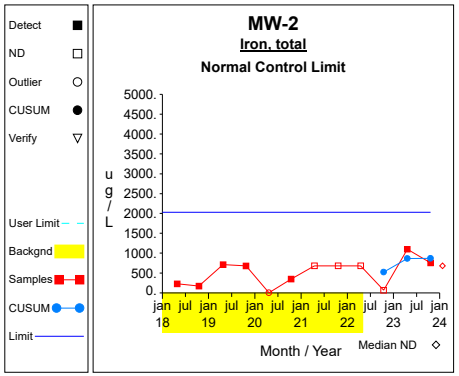
Graph 14



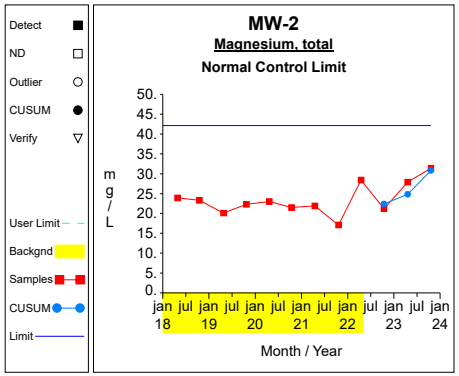
Graph 15



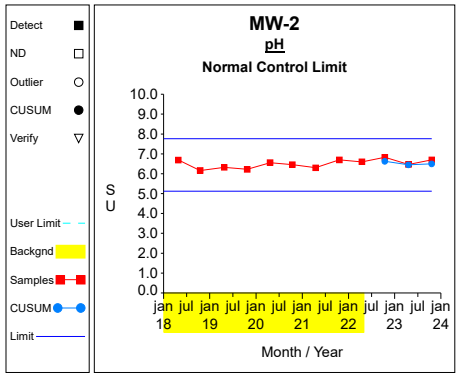
Graph 16



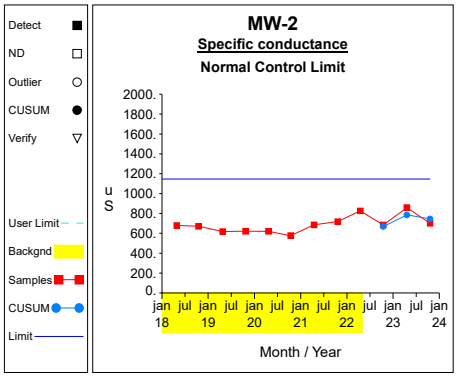
Graph 17



Graph 18

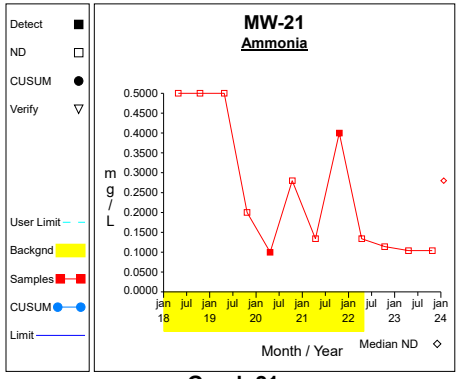


Graph 19

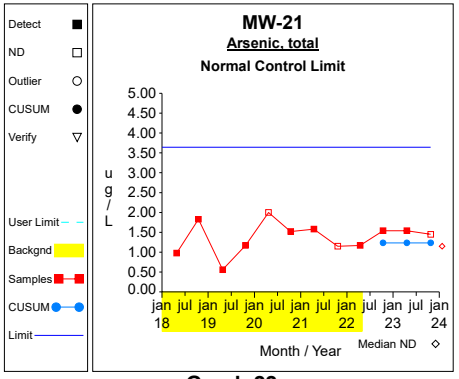


Graph 20

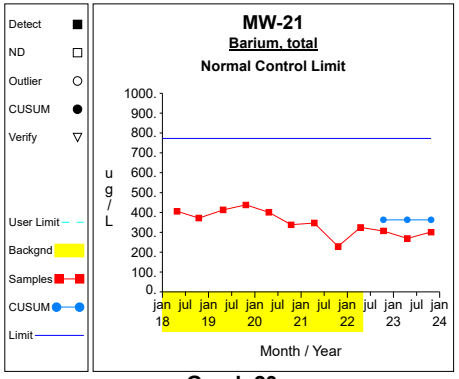
Intra-Well Control Charts / Prediction Limits



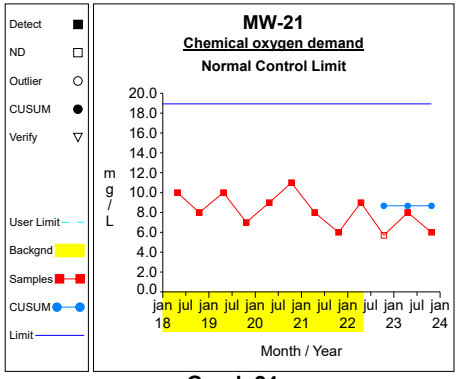
Graph 21



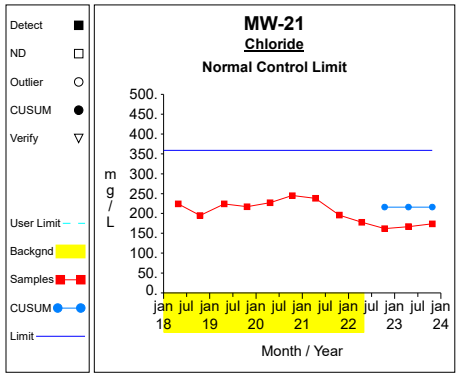
Graph 22



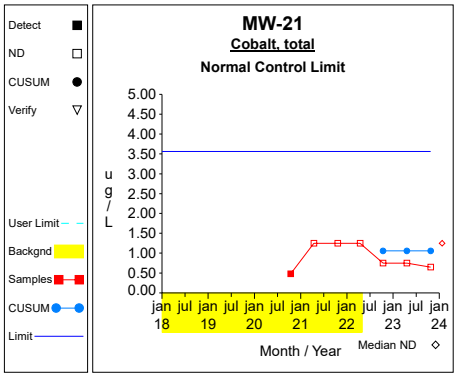
Graph 23



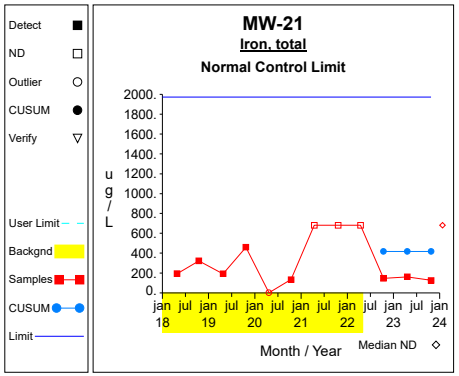
Graph 24



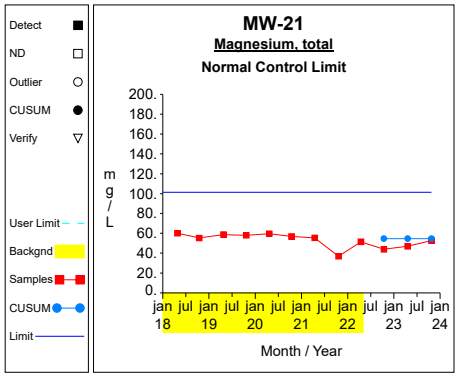
Graph 25



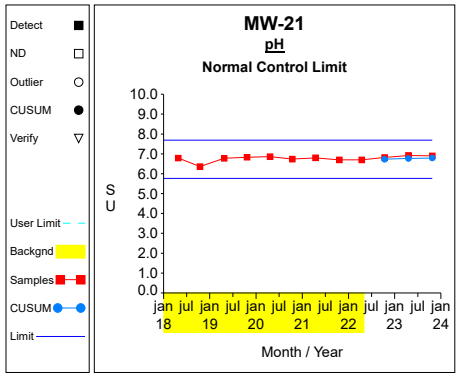
Graph 26



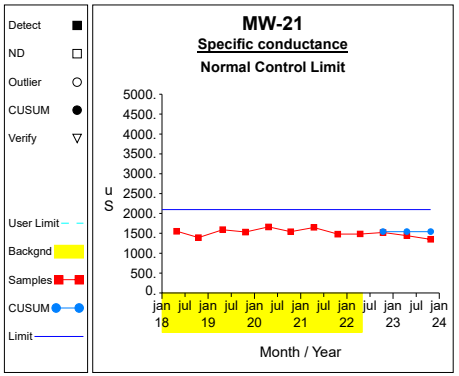
Graph 27



Graph 28

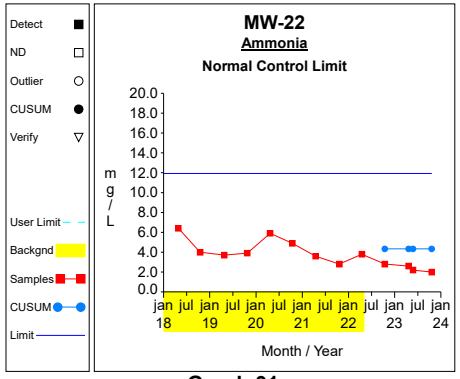


Graph 29

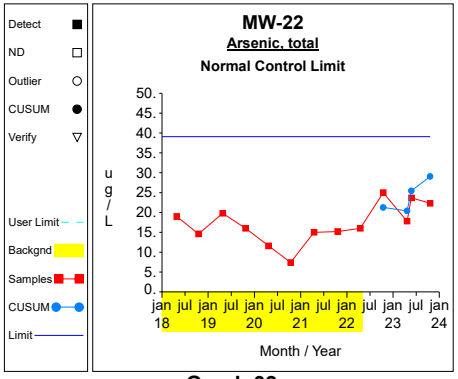


Graph 30

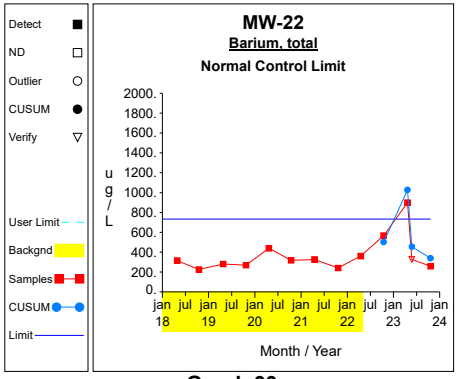
Intra-Well Control Charts / Prediction Limits



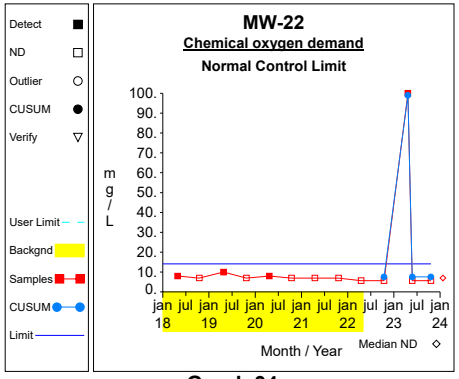
Graph 31



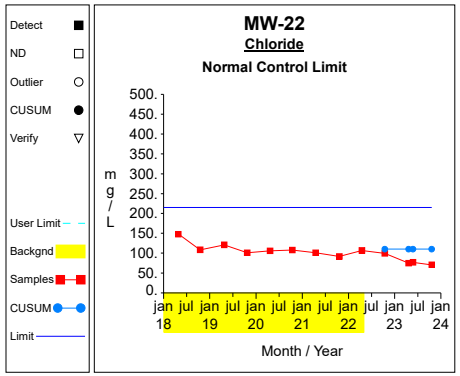
Graph 32



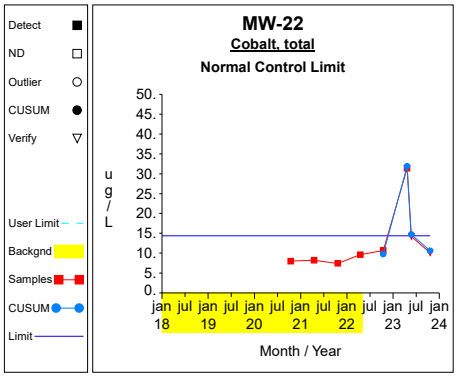
Graph 33



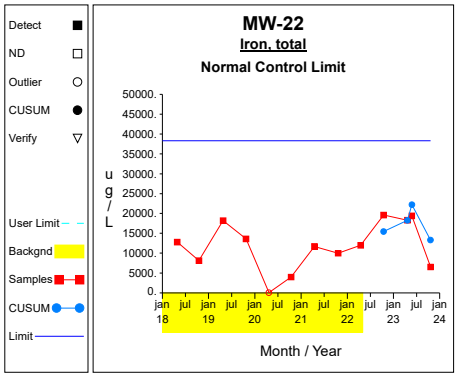
Graph 34



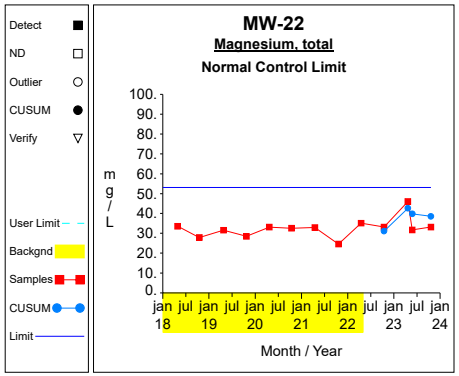
Graph 35



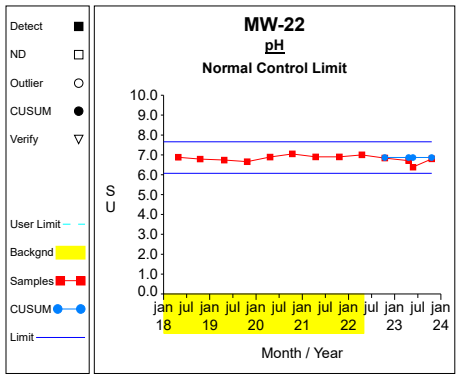
Graph 36



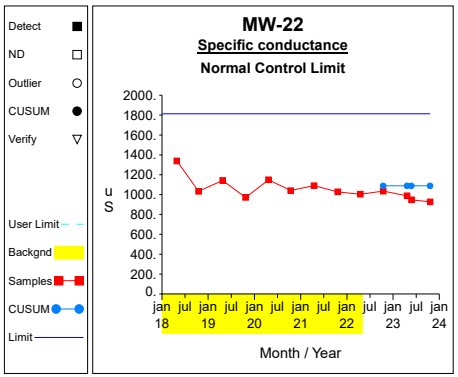
Graph 37



Graph 38



Graph 39



Graph 40

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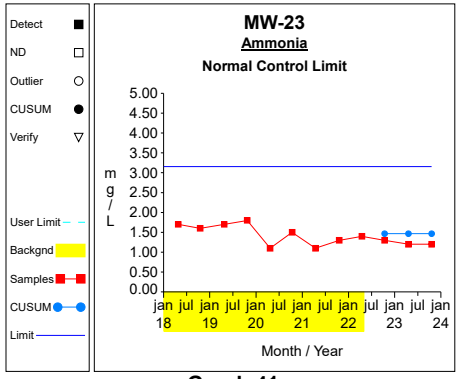
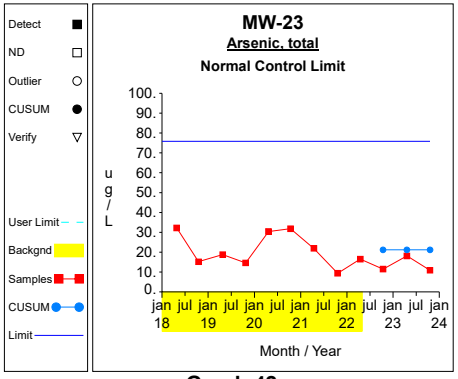
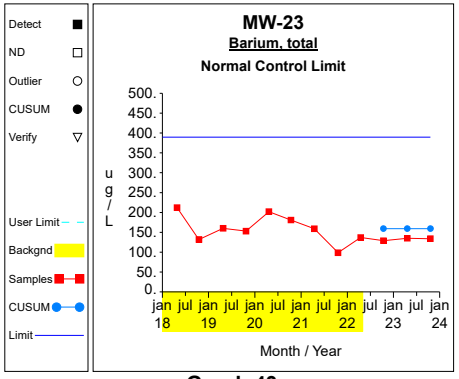
Intra-Well Control Charts / Prediction Limits



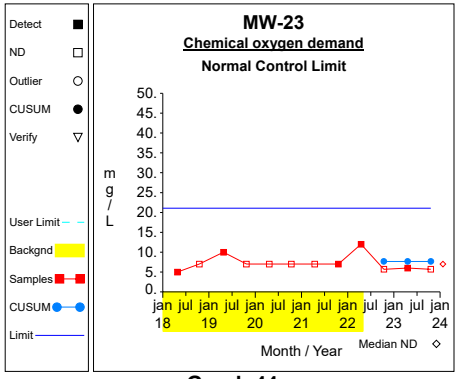
Graph 41



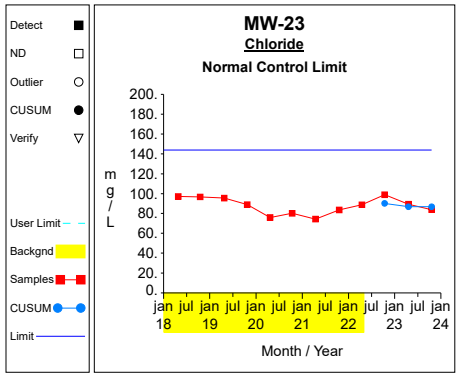
Graph 42



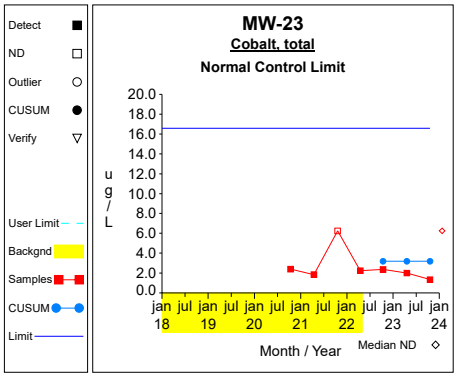
Graph 43



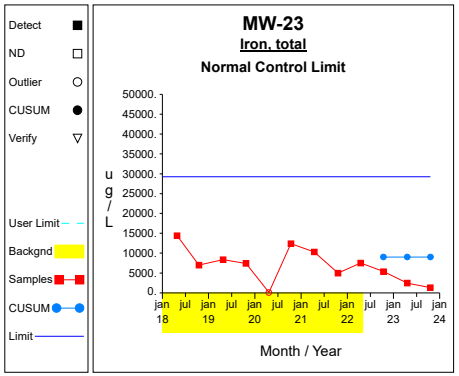
Graph 44



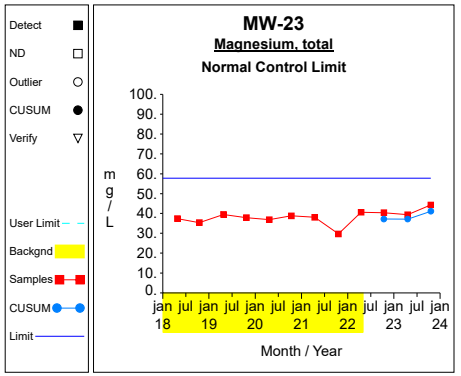
Graph 45



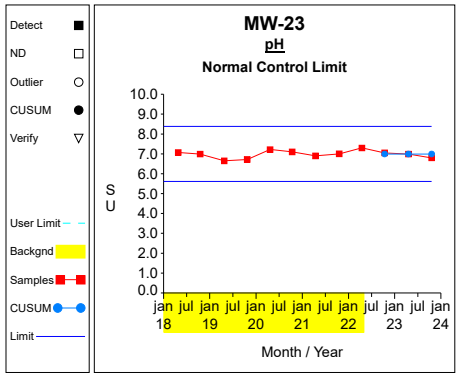
Graph 46



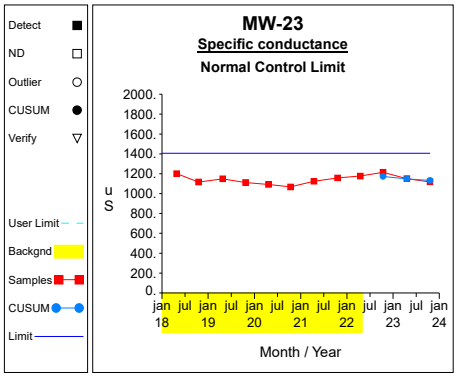
Graph 47



Graph 48

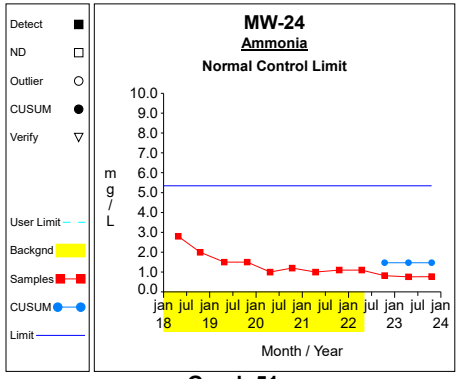


Graph 49

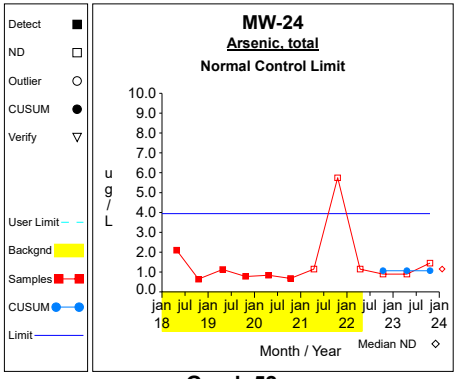


Graph 50

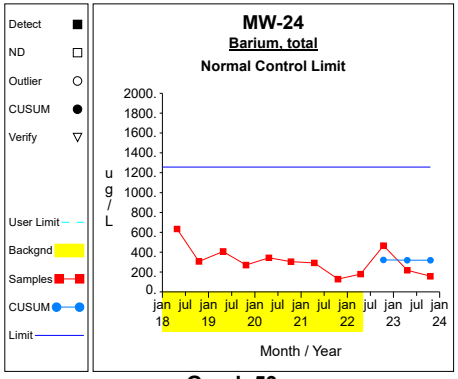
Intra-Well Control Charts / Prediction Limits



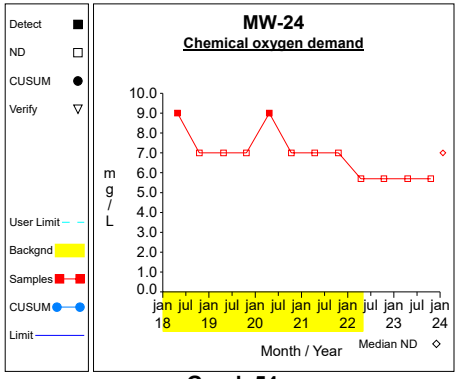
Graph 51



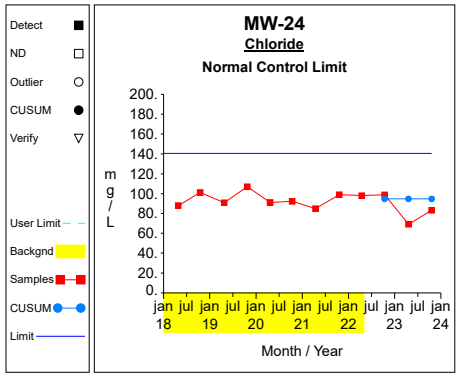
Graph 52



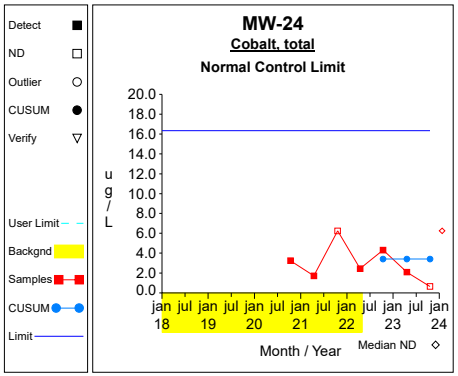
Graph 53



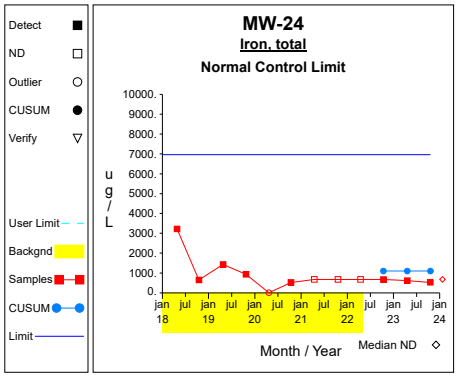
Graph 54



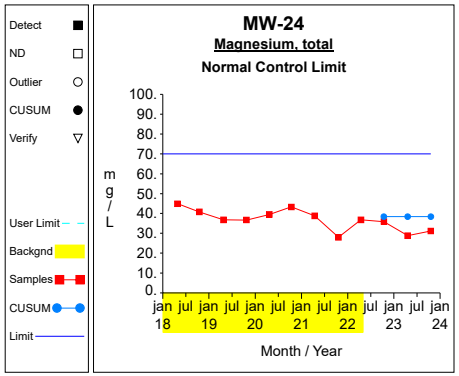
Graph 55



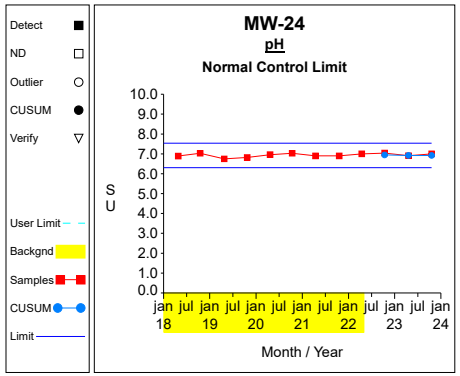
Graph 56



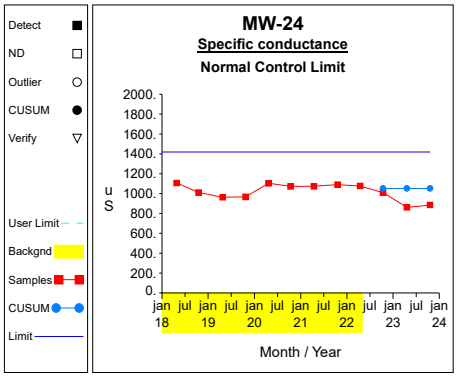
Graph 57



Graph 58

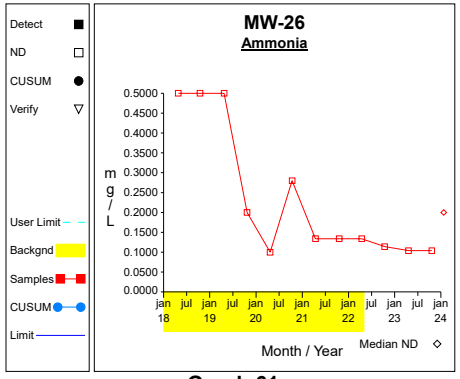


Graph 59

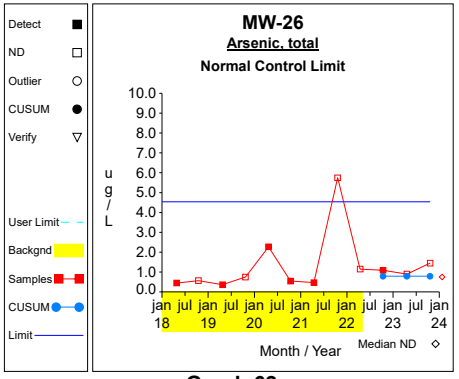


Graph 60

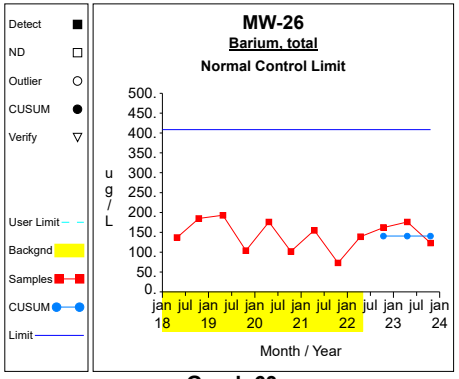
Intra-Well Control Charts / Prediction Limits



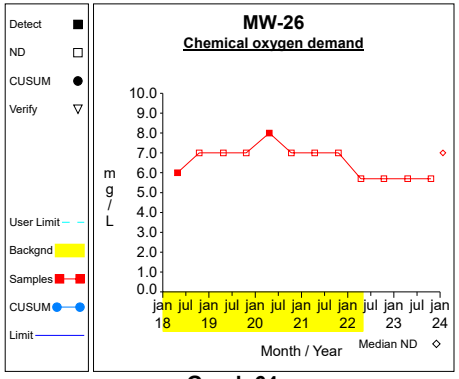
Graph 61



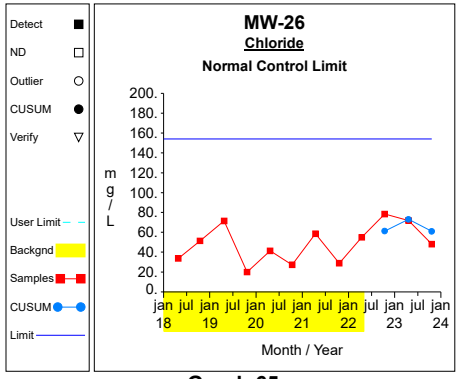
Graph 62



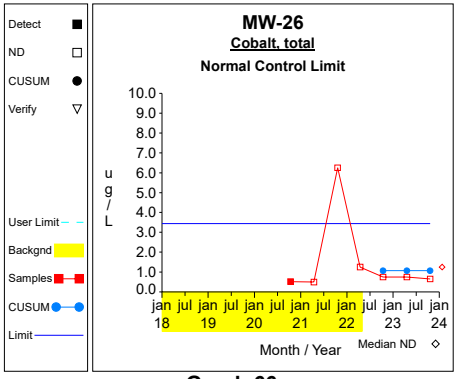
Graph 63



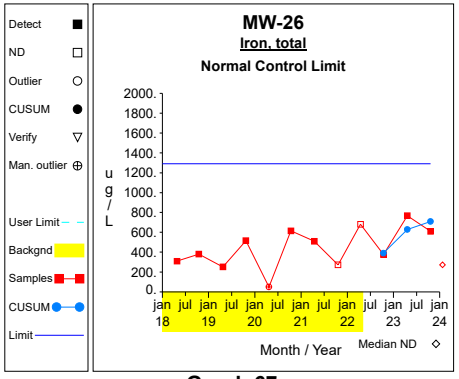
Graph 64



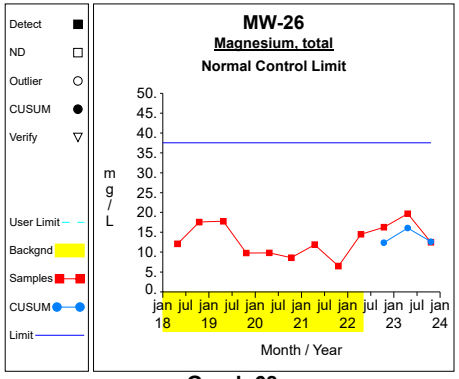
Graph 65



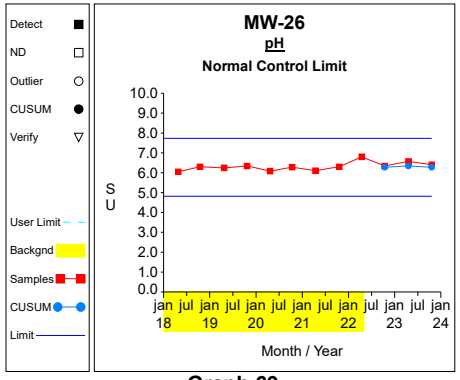
Graph 66



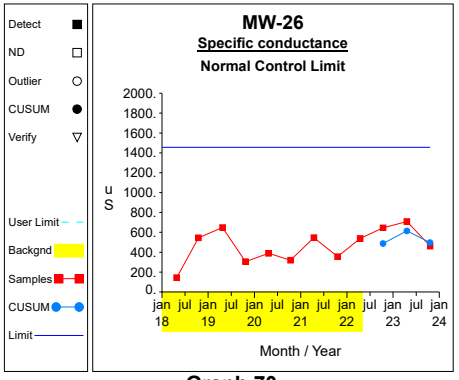
Graph 67



Graph 68

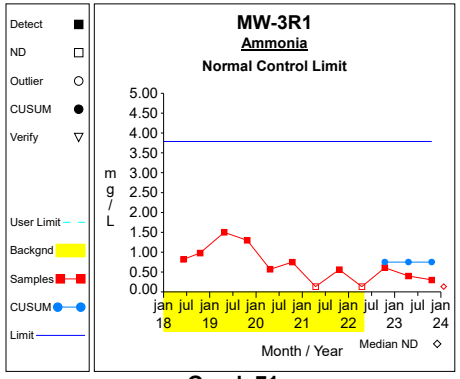


Graph 69

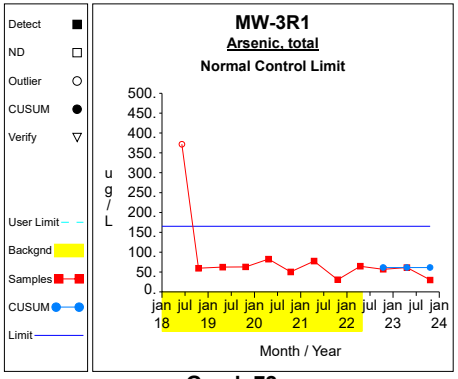


Graph 70

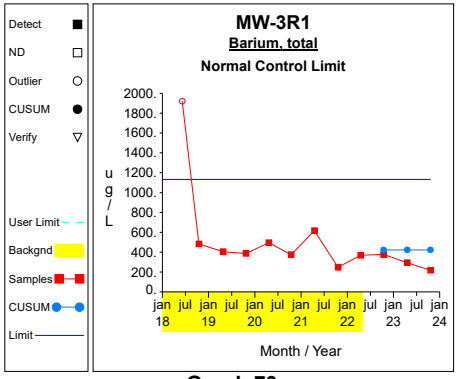
Intra-Well Control Charts / Prediction Limits



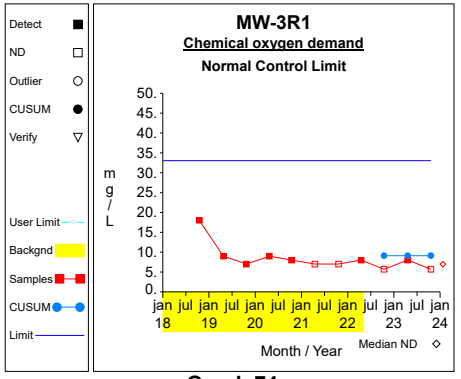
Graph 71



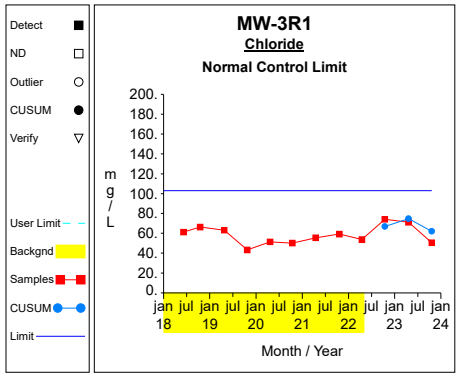
Graph 72



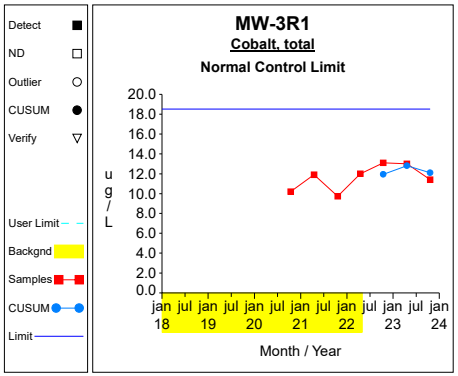
Graph 73



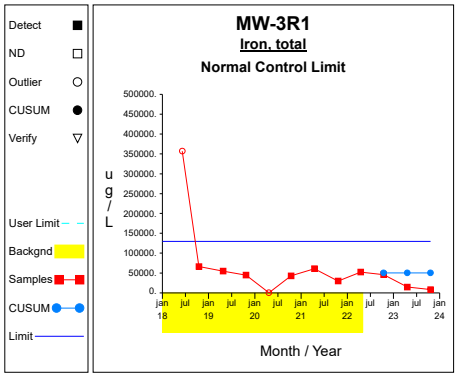
Graph 74



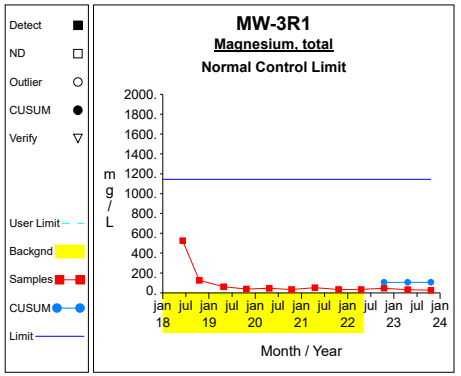
Graph 75



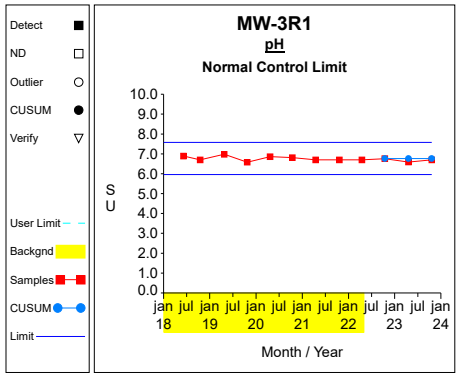
Graph 76



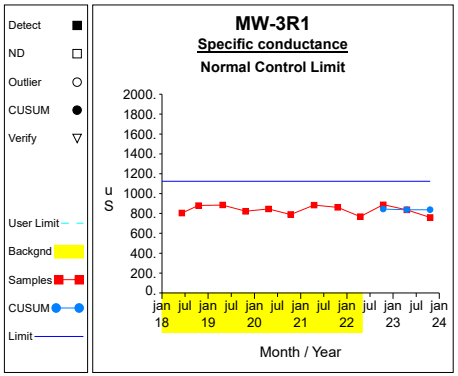
Graph 77



Graph 78

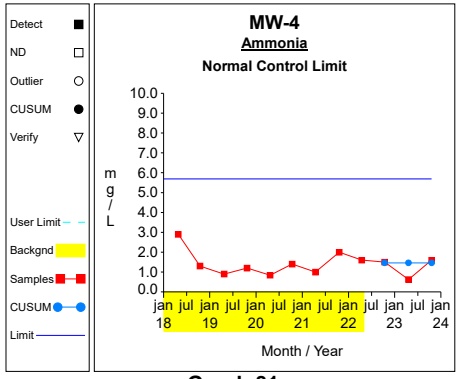


Graph 79

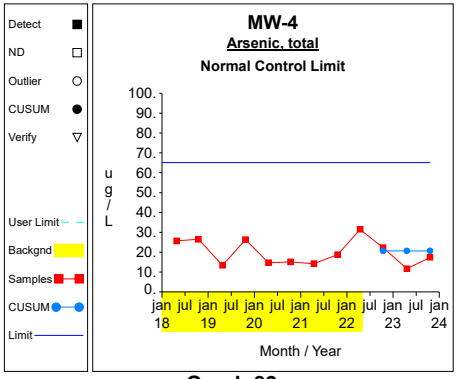


Graph 80

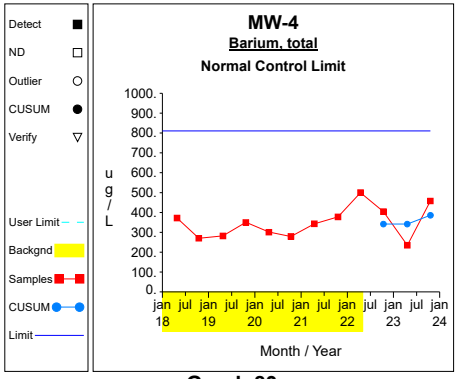
Intra-Well Control Charts / Prediction Limits



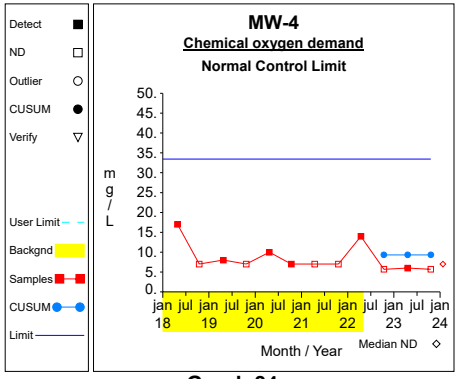
Graph 81



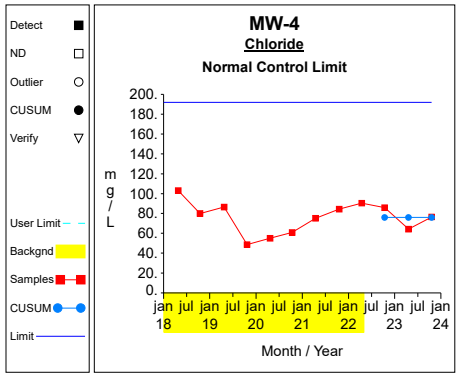
Graph 82



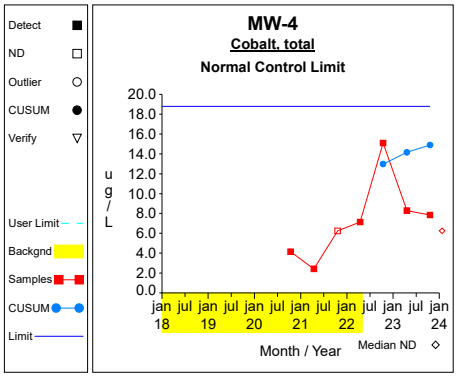
Graph 83



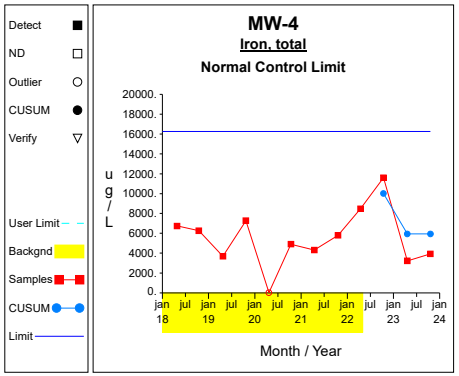
Graph 84



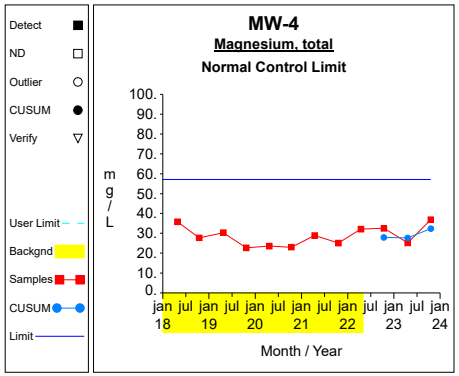
Graph 85



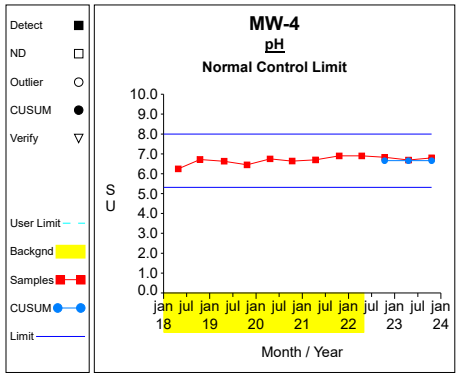
Graph 86



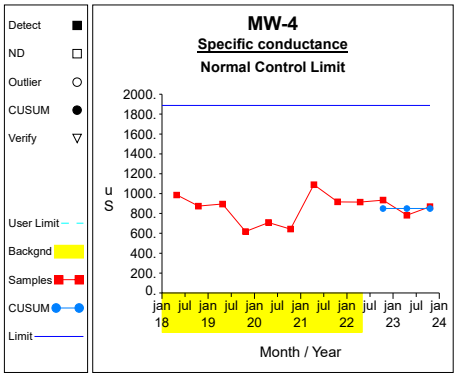
Graph 87



Graph 88

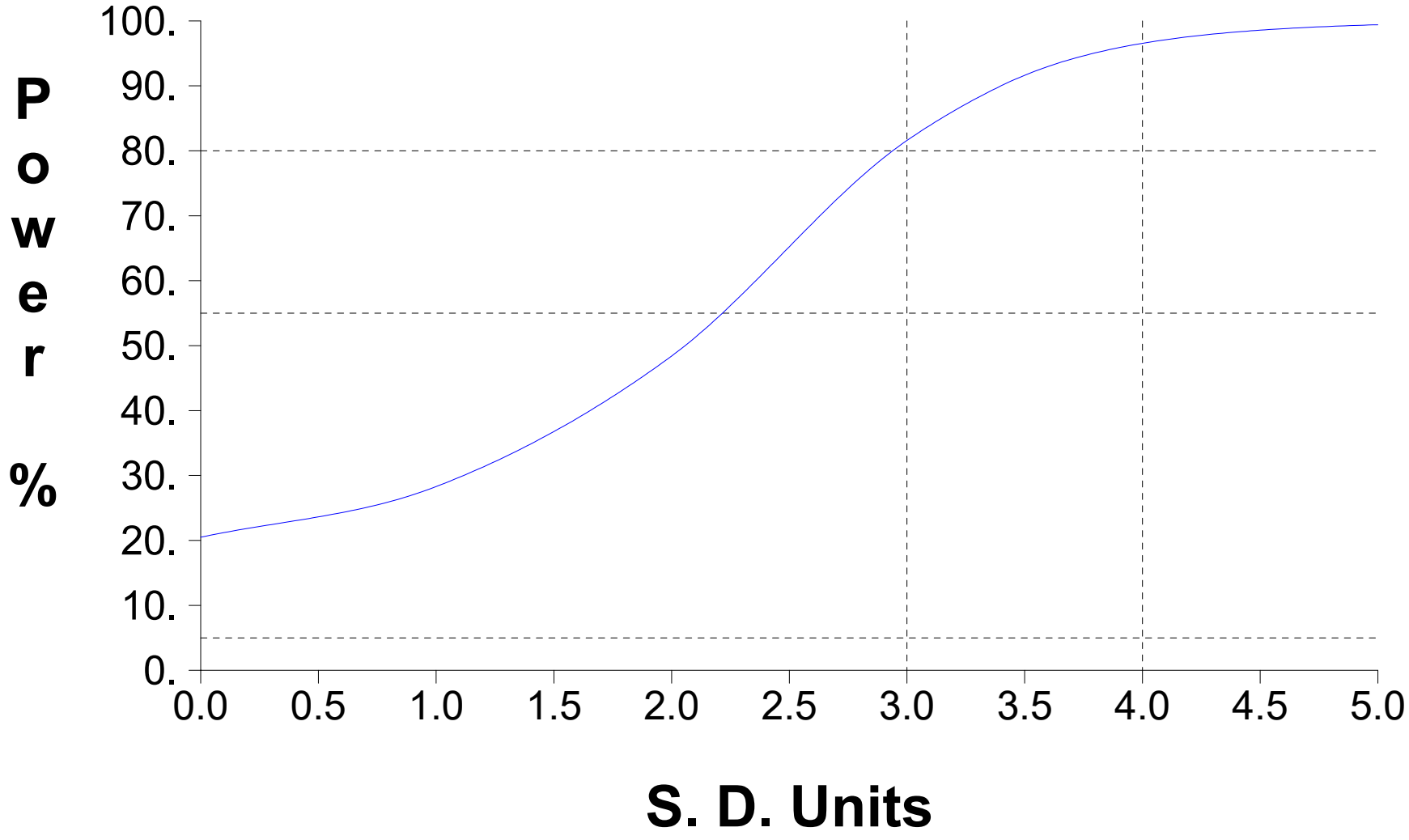


Graph 89



Graph 90

False Positive and False Negative Rates for Current Intra-Well Control Charts Monitoring Program



APPENDIX C

Laboratory Analytical Data

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW26**

Lab Sample ID: AF86693

Sample Collection Date: 4/19/2023 Time: 13:26
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	25.79	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	20.39	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	6.57	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	709	µS	1	EPA 9050	JMH	4/19/2023
Temperature	13.3	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	<0.31	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	71.9	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	<0.0009	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.176	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	0.767	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	19.7	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	<0.00075	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

I certify under penalty of law that I believe the reported information above is true, accurate, and complete

ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW21**

Lab Sample ID: AF86694

Sample Collection Date: 4/19/2023 Time: 13:44
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	27.42	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	6.38	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	6.92	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	1443	µS	1	EPA 9050	JMH	4/19/2023
Temperature	12.0	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	8	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	<0.31	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	167	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.00154	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.269	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	0.162	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	47.0	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	<0.00075	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

I certify under penalty of law that I believe the reported information above is true, accurate, and complete

ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW1**

Lab Sample ID: AF86695

Sample Collection Date: 4/19/2023 Time: 8:53
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	34.91	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	20.20	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	7.33	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	711	µS	1	EPA 9050	JMH	4/19/2023
Temperature	12.6	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	0.61	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	5.83	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.00332	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.205	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	1.27	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	28.3	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	<0.00075	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW4**

Lab Sample ID: AF86696

Sample Collection Date: 4/19/2023 Time: 12:53
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	27.82	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	22.58	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	6.69	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	782	µS	1	EPA 9050	JMH	4/19/2023
Temperature	13.4	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	6	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	0.62	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	64.2	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.0117	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.235	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	3.23	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	25.2	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	0.00829	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW23**

Lab Sample ID: AF86697

Sample Collection Date: 4/19/2023 Time: 12:25
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	33.66	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	21.60	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	6.99	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	1151	µS	1	EPA 9050	JMH	4/19/2023
Temperature	13.5	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	6	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	1.2	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	89.3	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.0181	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.135	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	2.46	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	39.4	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	0.00200	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

I certify under penalty of law that I believe the reported information above is true, accurate, and complete

ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW24**

Lab Sample ID: AF86698

Sample Collection Date: 4/19/2023 Time: 10:25
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	29.68	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	19.45	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	6.91	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	862	µS	1	EPA 9050	JMH	4/19/2023
Temperature	11.8	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	0.76	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	69.2	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	<0.0009	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.218	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	0.622	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	28.8	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	0.00209	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M Lyon

Bruce M. Lyon
Utilities Quality Assurance Officer

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ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW2**

Lab Sample ID: AF86699

Sample Collection Date: 4/19/2023 Time: 14:15
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	25.61	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	19.49	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	6.47	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	859	µS	1	EPA 9050	JMH	4/19/2023
Temperature	11.9	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	<0.31	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	69.5	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.00119	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.187	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	1.10	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	27.9	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	0.00125	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW3R**

Lab Sample ID: AF86700

Sample Collection Date: 4/19/2023 Time: 14:39
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	27.15	ft	0.01	SOLINST	JMH	4/19/2023
Depth to water from TC	20.23	ft	0.01	SOLINST	JMH	4/19/2023
pH-Field	6.59	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	836	µS	1	EPA 9050	JMH	4/19/2023
Temperature	14.2	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	8	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	0.4	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	71.2	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.0612	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.294	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	14.9	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	33.2	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	0.0130	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW22**

Lab Sample ID: AF86701

Sample Collection Date: 4/20/2023 Time: 8:00
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	26.67	ft	0.01	SOLINST	JMH	4/20/2023
Depth to water from TC	18.43	ft	0.01	SOLINST	JMH	4/20/2023
pH-Field	6.71	SU	0.01	EPA 9040	JMH	4/20/2023
Sp. Cond.-Field	988	µS	1	EPA 9050	JMH	4/20/2023
Temperature	13.4	°C	0.1	SM 2550B	JMH	4/20/2023
Chemical Oxygen Demand	100	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	2.6	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	74.8	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.0178	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.900	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	18.3	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	46.0	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	0.0314	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon Field Blank**

Lab Sample ID: AF86702

Sample Collection Date: 4/19/2023 Time: 8:53
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	<0.31	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	0.571	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	<0.00018	mg/L	0.00018	EPA 6020A	MLU	5/9/2023
Barium, Total	<0.00024	mg/L	0.00024	EPA 6020A	MLU	5/9/2023
Iron, Total	<0.01358	mg/L	0.01358	EPA 6020A	MLU	5/9/2023
Magnesium, Total	<0.03553	mg/L	0.03553	EPA 6020A	MLU	5/9/2023
Cobalt, Total	<0.00015	mg/L	0.00015	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 5/18/2023

Report To: Michael Kuntz
Water Pollution Control Fac.
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon Field Duplicate**

Lab Sample ID: AF86703

Sample Collection Date: 4/19/2023 Time: 8:53
Lab Submittal Date: 4/20/2023 Time: 14:31

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
pH-Field	7.34	SU	0.01	EPA 9040	JMH	4/19/2023
Sp. Cond.-Field	697	µS	1	EPA 9050	JMH	4/19/2023
Temperature	12.6	°C	0.1	SM 2550B	JMH	4/19/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	BKY	5/4/2023
Ammonia (as N)	0.61	mg/L	0.104	SM 4500 NH3 F	CNB	4/21/2023
Chloride	6.10	mg/L	0.574	EPA 300.0	ATL	5/1/2023
Metals ICP-MS						
Arsenic, Total	0.00343	mg/L	0.00090	EPA 6020A	MLU	5/9/2023
Barium, Total	0.204	mg/L	0.00120	EPA 6020A	MLU	5/9/2023
Iron, Total	1.32	mg/L	0.06790	EPA 6020A	MLU	5/9/2023
Magnesium, Total	29.5	mg/L	0.17765	EPA 6020A	MLU	5/9/2023
Cobalt, Total	<0.00075	mg/L	0.00075	EPA 6020A	MLU	5/9/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 6/29/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW22**

Lab Sample ID: AF89446

Sample Collection Date: 5/24/2023 Time: 12:43
Lab Submittal Date: 5/24/2023 Time: 14:25

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	26.37	ft	0.01	SOLINST	JMH	5/24/2023
Depth to water from TC	18.48	ft	0.01	SOLINST	JMH	5/24/2023
pH-Field	6.38	SU	0.01	EPA 9040	JMH	5/24/2023
Sp. Cond.-Field	948	µS	1	EPA 9050	JMH	5/24/2023
Temperature	18.7	°C	0.1	SM 2550B	JMH	5/24/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	BKY	6/28/2023
Ammonia (as N)	2.2	mg/L	0.104	SM 4500 NH3 F	JES	5/25/2023
Chloride	76.8876	mg/L	0.574	EPA 300.0	ATL	5/25/2023
Metals ICP-MS						
Arsenic, Total	0.0237	mg/L	0.00090	EPA 6020A	MLU	6/8/2023
Barium, Total	0.327	mg/L	0.00120	EPA 6020A	MLU	6/8/2023
Iron, Total	19.4	mg/L	0.06790	EPA 6020A	MLU	6/8/2023
Magnesium, Total	31.7	mg/L	0.17765	EPA 6020A	MLU	6/8/2023
Cobalt, Total	0.0142	mg/L	0.00075	EPA 6020A	MLU	6/8/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW**

Lab Sample ID: AG00905

Sample Collection Date: 10/18/2023 Time: 10:45
Lab Submittal Date: 10/19/2023 Time: 12:09

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	27.76	ft	0.01	SOLINST	ARC	10/18/2023
Depth to water from TC	25.25	ft	0.01	SOLINST	ARC	10/18/2023
pH-Field	6.8	SU	0.01	EPA 9040	ARC	10/18/2023
Sp. Cond.-Field	869	µS	1	EPA 9050	ARC	10/18/2023
Temperature	13.5	°C	0.1	SM 2550B	ARC	10/18/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	1.6	mg/L	0.104	SM 4500 NH3 F	AEB	10/20/2023
Chloride	76.5	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	0.0174	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.458	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	3.93	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	36.9	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	0.00785	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW2**

Lab Sample ID: AG00906

Sample Collection Date: 10/18/5023 Time: 13:20
Lab Submittal Date: 10/19/2023 Time: 12:09

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	33.64	ft	0.01	SOLINST	ARC	10/18/2023
Depth to water from TC	24.05	ft	0.01	SOLINST	ARC	10/18/2023
pH-Field	6.8	SU	0.01	EPA 9040	ARC	10/18/2023
Sp. Cond.-Field	1118	µS	1	EPA 9050	ARC	10/18/2023
Temperature	12.6	°C	0.1	SM 2550B	ARC	10/18/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	1.2	mg/L	0.104	SM 4500 NH3 F	AEB	10/20/2023
Chloride	83.8	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	0.0109	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.134	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	1.33	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	44.3	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	0.00134	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW2**

Lab Sample ID: AG00907

Sample Collection Date: 10/18/5023 Time: 14:11
Lab Submittal Date: 10/19/2023 Time: 12:09

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	29.63	ft	0.01	SOLINST	ARC	10/18/2023
Depth to water from TC	21.27	ft	0.01	SOLINST	ARC	10/18/2023
pH-Field	7.0	SU	0.01	EPA 9040	ARC	10/18/2023
Sp. Cond.-Field	885	µS	1	EPA 9050	ARC	10/18/2023
Temperature	13.4	°C	0.1	SM 2550B	ARC	10/18/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	0.77	mg/L	0.104	SM 4500 NH3 F	AEB	10/20/2023
Chloride	83.2	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	<0.00145	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.158	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	0.528	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	31.2	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	<0.00065	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

I certify under penalty of law that I believe the reported information above is true, accurate, and complete

ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

CITY OF CEDAR RAPIDS - UTILITIES LABORATORY

CENTRAL LAB - WATER POLLUTION CONTROL FACILITIES
7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW2**

Lab Sample ID: AG00980

Sample Collection Date: 10/20/2023 Time: 10:48
Lab Submittal Date: 10/20/2023 Time: 14:27

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	25.80	ft	0.01	SOLINST	ARC	10/20/2023
Depth to water from TC	23.19	ft	0.01	SOLINST	ARC	10/20/2023
pH-Field	6.4	SU	0.01	EPA 9040	ARC	10/20/2023
Sp. Cond.-Field	461	µS	1	EPA 9050	ARC	10/20/2023
Temperature	13.9	°C	0.1	SM 2550B	ARC	10/20/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	<0.313	mg/L	0.104	SM 4500 NH3 F	BKY	10/23/2023
Chloride	48.1	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	<0.00145	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.123	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	0.610	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	12.5	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	<0.00065	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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IOWA DNR : 096

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7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW**

Lab Sample ID: AG00981

Sample Collection Date: 10/20/2023 Time: 10:04
Lab Submittal Date: 10/20/2023 Time: 14:27

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	34.90	ft	0.01	SOLINST	ARC	10/20/2023
Depth to water from TC	23.93	ft	0.01	SOLINST	ARC	10/20/2023
pH-Field	7.2	SU	0.01	EPA 9040	ARC	10/20/2023
Sp. Cond.-Field	707	µS	1	EPA 9050	ARC	10/20/2023
Temperature	16.0	°C	0.1	SM 2550B	ARC	10/20/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	0.63	mg/L	0.104	SM 4500 NH3 F	BKY	10/23/2023
Chloride	5.61	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	0.00227	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.204	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	0.779	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	31.9	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	<0.00065	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW2**

Lab Sample ID: AG00982

Sample Collection Date: 10/20/2023 Time: 11:37
Lab Submittal Date: 10/20/2023 Time: 14:27

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	25.59	ft	0.01	SOLINST	ARC	10/20/2023
Depth to water from TC	20.80	ft	0.01	SOLINST	ARC	10/20/2023
pH-Field	6.7	SU	0.01	EPA 9040	ARC	10/20/2023
Sp. Cond.-Field	701	µS	1	EPA 9050	ARC	10/20/2023
Temperature	16.2	°C	0.1	SM 2550B	ARC	10/20/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	<0.313	mg/L	0.104	SM 4500 NH3 F	BKY	10/23/2023
Chloride	56.9	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	0.00238	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.197	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	0.757	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	31.4	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	<0.00065	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW R**

Lab Sample ID: AG00983

Sample Collection Date: 10/20/2023 Time: 12:10
Lab Submittal Date: 10/20/2023 Time: 14:27

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	27.21	ft	0.01	SOLINST	ARC	10/20/2023
Depth to water from TC	21.10	ft	0.01	SOLINST	ARC	10/20/2023
pH-Field	6.7	SU	0.01	EPA 9040	ARC	10/20/2023
Sp. Cond.-Field	760	µS	1	EPA 9050	ARC	10/20/2023
Temperature	16.6	°C	0.1	SM 2550B	ARC	10/20/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	0.3	mg/L	0.104	SM 4500 NH3 F	BKY	10/23/2023
Chloride	50.5	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	0.0300	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.219	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	8.35	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	27.1	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	0.0114	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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IOWA DNR : 096

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7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW22**

Lab Sample ID: AG00984

Sample Collection Date: 10/20/2023 Time: 12:39
Lab Submittal Date: 10/20/2023 Time: 14:27

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	26.49	ft	0.01	SOLINST	ARC	10/20/2023
Depth to water from TC	19.41	ft	0.01	SOLINST	ARC	10/20/2023
pH-Field	6.8	SU	0.01	EPA 9040	ARC	10/20/2023
Sp. Cond.-Field	927	µS	1	EPA 9050	ARC	10/20/2023
Temperature	17.4	°C	0.1	SM 2550B	ARC	10/20/2023
Chemical Oxygen Demand	<5.7	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	2.0	mg/L	0.104	SM 4500 NH3 F	BKY	10/23/2023
Chloride	70.7	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	0.0223	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.259	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	6.54	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	33.2	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	0.0101	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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7525 BERTRAM RD SE, CEDAR RAPIDS, IA 52403-7111
(319)-286-5286 FAX (319)-286-5287

ANALYTICAL DATA REPORT

Report Date 11/16/2023

Report To: Michael Kuntz
Utilities Environmental Mgr
7525 Bertram Rd SE
Cedar Rapids IA 52403-7111

Site: Cedar Rapids Water Pollution Control Facility Sludge Ash Landfill

Permit : 57-SDP-7-85P

Sample Point: **East Ash Lagoon MW2**

Lab Sample ID: AG01248

Sample Collection Date: 10/24/2023 Time: 8:17
Lab Submittal Date: 10/24/2023 Time: 10:55

Test Parameter	Result	Units	Reporting Limit	Method	Analyst	Analysis Date
Well Depth from TC	27.41	ft	0.01	SOLINST	ARC	10/24/2023
Depth to water from TC	9.82	ft	0.01	SOLINST	ARC	10/24/2023
pH-Field	6.9	SU	0.01	EPA 9040	ARC	10/24/2023
Sp. Cond.-Field	1350	µS	1	EPA 9050	ARC	10/24/2023
Temperature	14.5	°C	0.1	SM 2550B	ARC	10/24/2023
Chemical Oxygen Demand	6	mg/L	5.7	HACH 8000	MLB	11/9/2023
Ammonia (as N)	<0.313	mg/L	0.104	SM 4500 NH3 F	BKY	10/24/2023
Chloride	174	mg/L	2.25	EPA 300.0	TA-CF	11/14/2023
Metals ICP-MS						
Arsenic, Total	<0.00145	mg/L	0.00145	EPA 6020A	MLU	11/7/2023
Barium, Total	0.301	mg/L	0.00070	EPA 6020A	MLU	11/7/2023
Iron, Total	0.126	mg/L	0.04295	EPA 6020A	MLU	11/7/2023
Magnesium, Total	52.7	mg/L	0.43195	EPA 6020A	MLU	11/7/2023
Cobalt, Total	<0.00065	mg/L	0.00065	EPA 6020A	MLU	11/7/2023

Sample Comments:

Bruce M. Lyon
Utilities Quality Assurance Officer

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ug/L - microgram per liter (ppb) mg/L - milligrams per liter (ppm)
ND - Not detected at or above reporting limit.
SM - Standard Methods SW - Test Methods for Evaluating Solid Waste (SW-846)

ACCREDITATIONS:
IOWA DNR : 096

APPENDIX D

Field Sampling Forms

FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW26** Well Type : Background

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	NONE
Concrete Seal?	NOT VISIBLE	Weather Conditions?:	Clear, Calm

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	725.81	Ground Elevation:	
Depth of Well, from TC	25.72	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	13:14	20.39	705.42
After Purging	04/19/23	13:25	20.39	705.42
Before Sampling	04/19/23	13:26	20.39	705.42

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 2.7

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.57	SU
Specific Conductance:	709	uS/cm
Temperature:	13.3	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	NONE	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Checks (7 or 4): 7.04

Utilities QA Officer 5/18/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW21** Well Type : Downgradient

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	CLEAN
Concrete Seal?	NOT VISIBLE	Weather Conditions?:	Overcast

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	729.93	Ground Elevation:	
Depth of Well, from TC	27.42	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	9:32	6.38	723.55
After Purging	04/19/23	9:59	23.14	706.79
Before Sampling	04/19/23	13:44	6.54	723.39

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 10.5

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.92	SU
Specific Conductance:	1443	uS/cm
Temperature:	12.0	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	SLIGHT	Sample Turbidity:	SLIGHT
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Checks (7 or 4): 7.07

Utilities QA Officer 5/18/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

542-1322

FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW1** Well Type : Downgradient

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	CLEAN
Concrete Seal?	OK	Weather Conditions?:	Overcast, Windy, C

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	730.72	Ground Elevation:	
Depth of Well, from TC	34.91	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	8:33	20.20	710.52
After Purging	04/19/23	8:50	21.59	709.13
Before Sampling	04/19/23	8:53	20.75	709.97

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 7.5

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	7.33	SU
Specific Conductance:	711	uS/cm
Temperature:	12.6	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	HEAVY	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE
QC Samples:	Dupl & Blnk			
pH Meter Checks (7 or 4):	7.03			

Utilities QA Officer 5/18/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

542-1322

FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW4** Well Type : Downgradient

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	Buried in Wood Chips. Lots of Debris
Concrete Seal?	NOT VISIBLE	Weather Conditions?:	Overcast

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	726.78	Ground Elevation:	
Depth of Well, from TC	27.82	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	12:40	22.58	704.20
After Purging	04/19/23	12:50	22.58	704.20
Before Sampling	04/19/23	12:53	22.58	704.20

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 2.6

Number of Well Volumes Purged (based on current water level) : 3.0 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.69	SU
Specific Conductance:	782	uS/cm
Temperature:	13.4	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	HEAVY	Sample Turbidity:	SLIGHT
	Sample Color:	BLACK	Sample Odor:	TRASH

QC Samples:

pH Meter Checks (7 or 4): 7.02

Utilities QA Officer 5/18/2023

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FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW23** Well Type : Downgradient

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	LITTER
Concrete Seal?	NOT VISIBLE	Weather Conditions?:	Overcast, Windy

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	725.41	Ground Elevation:	
Depth of Well, from TC	33.66	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	12:08	21.60	703.81
After Purging	04/19/23	12:24	21.63	703.78
Before Sampling	04/19/23	12:25	21.63	703.78

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 6

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.99	SU
Specific Conductance:	1151	uS/cm
Temperature:	13.5	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	SLIGHT	Sample Turbidity:	SLIGHT
	Sample Color:	YELLOW	Sample Odor:	NONE

QC Samples:

pH Meter Checks (7 or 4): 7.07

Utilities QA Officer 5/18/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW24** Well Type : Downgradient

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	CLEAR
Concrete Seal?	OK	Weather Conditions?:	Overcast

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	720.27	Ground Elevation:	
Depth of Well, from TC	29.68	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	10:11	19.45	700.82
After Purging	04/19/23	10:22	19.46	700.81
Before Sampling	04/19/23	10:25	19.46	700.81

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 5

Number of Well Volumes Purged (based on current water level) : 3.0 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.91	SU
Specific Conductance:	862	uS/cm
Temperature:	11.8	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	NONE	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Checks (7 or 4): 7.07

Utilities QA Officer 5/18/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW2** Well Type : Downgradient

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	CLEAR
Concrete Seal?	OK	Weather Conditions?:	Overcast

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	720.04	Ground Elevation:	
Depth of Well, from TC	25.61	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	14:04	19.49	700.55
After Purging	04/19/23	14:14	19.5	700.54
Before Sampling	04/19/23	14:15	19.5	700.54

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 3

Number of Well Volumes Purged (based on current water level) : 3.0 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.47	SU
Specific Conductance:	859	uS/cm
Temperature:	11.9	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	HEAVY	Sample Turbidity:	SLIGHT
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Checks (7 or 4): 7.09

Utilities QA Officer 5/18/2023

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FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW3R** Well Type : Downgradient

Sample collector(s): JMH/CWG Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	CLEAR
Concrete Seal?	CRACKED	Weather Conditions?:	Overcast

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	719.17	Ground Elevation:	
Depth of Well, from TC	27.15	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/19/23	14:31	20.23	698.94
After Purging	04/19/23	14:38	20.23	698.94
Before Sampling	04/19/23	14:39	20.23	698.94

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 3.5

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Waterra

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.59	SU
Specific Conductance:	836	uS/cm
Temperature:	14.2	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	HEAVY	Sample Turbidity:	HEAVY
	Sample Color:	BRN/YLLW	Sample Odor:	NONE

QC Samples:

pH Meter Checks (7 or 4): 7.09

Utilities QA Officer 5/18/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

542-1322

FORM FOR
GROUNDWATER SAMPLING AND/OR
GROUNDWATER ELEVATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW22** Well Type : Downgradient

Sample collector(s): JMH Laboratory Services, City of Cedar Rapids

A. MONITORING WELL/PIEZOMETER CONDITIONS

Well Locked?	YES	Comments	
Well Capped?	YES	Standing Water or Litter?	CLEAR
Concrete Seal?	OK	Weather Conditions?:	Overcast

B. GROUNDWATER ELEVATION MEASUREMENT (+/- 0.01 foot, MSL)

Elevation, top of inner well casing	718.40	Ground Elevation:	
Depth of Well, from TC	26.67	Inner casing dia. (in.)	2

Groundwater Level (+/- 0.01 foot below top of inner casing, MSL):

	Date	Time	Depth to Water	Water Elevation
Before Purging	04/20/23	7:38	18.43	699.97
After Purging	04/20/23	7:51	18.43	699.97
Before Sampling	04/20/23	8:00	18.43	699.97

Water levels measured with Solinst Electronic Depth Tape

C. WELL PURGING

Quantity of Water Removed from Well (gallons): 4

Number of Well Volumes Purged (based on current water level) : 3.0 Was Well Purged Dry? NO

Equipment Used: (W) = Waterra Inertial Pump, (B) = Disposable Bailer: Hand Pumped

All purging and sampling equipment used is dedicated or disposable.

D. FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.71	SU
Specific Conductance:	988	uS/cm
Temperature:	13.4	deg C

Field measurements made with an Oakton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	HEAVY	Sample Turbidity:	HEAVY
	Sample Color:	BROWN	Sample Odor:	DIRT

QC Samples:

pH Meter Checks (7 or 4): 7.02

Utilities QA Officer 5/18/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW22** Well Type : Downgradient

Sample collector(s): JMH Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	CLEAR
Concrete Seal	OK	Weather Conditions :	Clear, Calm

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	718.40	Ground Elevation:	
Depth of Well, from TC	26.37	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	05/24/23	12:55	18.48	699.92
After Purging	05/24/23	13:06	18.48	699.92
Before Sampling	05/24/23	13:07	18.48	699.92

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 4

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.38	SU
Specific Conductance:	948	uS/cm
Temperature:	18.7	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments: Initial Turbidity: HEAVY Sample Turbidity: None

Sample Color: None Sample Odor: None

QC Samples: Dupl FBl

pH Meter Chec s (7 or 4): 6.96

Bruce M Lyon

Utilities QA Officer 5/31/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

542-1322

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW2** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	NOT VISIBLE	Weather Conditions :	Clear, Calm, Cool

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	729.93	Ground Elevation:	
Depth of Well, from TC	27.41	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/23/23	13:28	9.82	720.11
After Purging	10/23/23	13:54	25.73	704.20
Before Sampling	10/24/23	8:17	9.86	720.07

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 9

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.90	SU
Specific Conductance:	1350	uS/cm
Temperature:	14.5	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	NONE	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Chec s (7 or 4): 7.1

Utilities QA Officer 10/25/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	OK	Weather Conditions :	Clear, Mild

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	730.72	Ground Elevation:	
Depth of Well, from TC	34.90	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/20/23	9:38	23.93	706.79
After Purging	10/20/23	10:07	25.12	705.60
Before Sampling	10/20/23	10:04	24.25	706.47

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 5.5

Number of Well Volumes Purged (based on current water level) : 3.1 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	7.20	SU
Specific Conductance:	707	uS/cm
Temperature:	16.0	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	SLIGHT	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Chec s (7 or 4): 7

Utilities QA Officer 10/25/2023

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542-1322

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	NOT VISIBLE	Weather Conditions :	Overcast, Windy, C

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	726.78	Ground Elevation:	
Depth of Well, from TC	27.76	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/18/23	10:35	25.25	701.53
After Purging	10/18/23	10:42	25.25	701.53
Before Sampling	10/18/23	10:45	25.25	701.53

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 2

Number of Well Volumes Purged (based on current water level) : 4.9 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.80	SU
Specific Conductance:	869	uS/cm
Temperature:	13.5	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	NONE	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Chec s (7 or 4): 7.1

Bruce M Lyon

Utilities QA Officer 10/25/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

542-1322

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW2** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	NOT VISIBLE	Weather Conditions :	Overcast, Windy, C

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	725.41	Ground Elevation:	
Depth of Well, from TC	33.64	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/18/23	13:05	24.05	701.36
After Purging	10/18/23	13:19	24.08	701.33
Before Sampling	10/18/23	13:20	24.08	701.33

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 5

Number of Well Volumes Purged (based on current water level) : 3.2 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.80	SU
Specific Conductance:	1118	uS/cm
Temperature:	12.6	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	SLIGHT/HEAVY	Sample Turbidity:	NONE
	Sample Color:	GREY	Sample Odor:	NONE

QC Samples:

pH Meter Chec s (7 or 4): 7.1

Utilities QA Officer 10/25/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW2** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	OK	Weather Conditions :	Overcast, Windy, C

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	720.27	Ground Elevation:	
Depth of Well, from TC	29.63	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/18/23	13:46	21.27	699.00
After Purging	10/18/23	14:07	21.27	699.00
Before Sampling	10/18/23	14:11	21.27	699.00

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 5

Number of Well Volumes Purged (based on current water level) : 3.7 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	7.00	SU
Specific Conductance:	885	uS/cm
Temperature:	13.4	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments: Initial Turbidity: NONE Sample Turbidity: NONE

Sample Color: NONE Sample Odor: NONE

QC Samples:

pH Meter Chec s (7 or 4): 7.1

Utilities QA Officer 10/25/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW2** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	OK	Weather Conditions :	Clear, Mild

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	720.04	Ground Elevation:	
Depth of Well, from TC	25.59	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/20/23	11:32	20.80	699.24
After Purging	10/20/23	11:35	20.8	699.24
Before Sampling	10/20/23	11:37	20.8	699.24

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 2.5

Number of Well Volumes Purged (based on current water level) : 3.2 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.70	SU
Specific Conductance:	701	uS/cm
Temperature:	16.2	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	NONE	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Chec s (7 or 4): 7.1

Utilities QA Officer 10/25/2023

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FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW R** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	CRACKED	Weather Conditions :	Clear, Mild

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	719.17	Ground Elevation:	
Depth of Well, from TC	27.21	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/20/23	11:49	21.10	698.07
After Purging	10/20/23	12:07	21.11	698.06
Before Sampling	10/20/23	12:10	21.11	698.06

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 4

Number of Well Volumes Purged (based on current water level) : 4.0 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.70	SU
Specific Conductance:	760	uS/cm
Temperature:	16.6	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments: Initial Turbidity: HEAVY Sample Turbidity: SLIGHT

Sample Color: YELLOW Sample Odor: NONE

QC Samples:

pH Meter Chec s (7 or 4): 7.1

Utilities QA Officer 10/25/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW22** Well Type : Downgradient

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	OK	Weather Conditions :	Clear, Mild

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	718.40	Ground Elevation:	
Depth of Well, from TC	26.49	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/20/23	12:21	19.41	698.99
After Purging	10/20/23	12:35	19.41	698.99
Before Sampling	10/20/23	12:39	19.41	698.99

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 4.5

Number of Well Volumes Purged (based on current water level) : 3.9 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.80	SU
Specific Conductance:	927	uS/cm
Temperature:	17.4	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	SLIGHT	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples:

pH Meter Chec s (7 or 4): 7

Utilities QA Officer 10/25/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.

FORM FOR
GROUNDWATER SAMPLING AND OR
GROUNDWATER ELE ATION MEASURMENT

Site Name: Cedar Rapids Water Pollution Control Ash Lagoon Landfill Permit No.: 57-SDP-7-85P

Monitoring Well/Piezometer N **MW2** Well Type : Bac ground

Sample collector(s): ARC Laboratory Services, City of Cedar Rapids

A MONITORING WELL PIE OMETER CONDITIONS

Well Loc ed	YES	Comments	
Well Capped	YES	Standing Water or Litter	NONE
Concrete Seal	NOT VISIBLE	Weather Conditions :	Clear, Mild

B GROUNDWATER ELE ATION MEASUREMENT (/- 0.01 foot, MSL)

Elevation, top of inner well casing	725.81	Ground Elevation:	
Depth of Well, from TC	25.80	Inner casing dia. (in.)	2

Gro nd ater Le el - oot elo to o nner as ng MSL

	Date	Time	Depth to Water	Water Elevation
Before Purging	10/20/23	10:36	23.19	702.62
After Purging	10/20/23	10:47	23.13	702.68
Before Sampling	10/20/23	10:48	23.13	702.68

Water levels measured with Solinst Electronic Depth Tape

C WELL PURGING

Quantity of Water Removed from Well (gallons): 2

Number of Well Volumes Purged (based on current water level) : 4.7 Was Well Purged Dry NO

E uipment Used: (W) Waterra Inertial Pump, (B) Disposable Bailer: Waterra

All purging and sampling e uipment used is dedicated or disposable.

D FIELD MEASUREMENT

Field measurements (at sample time)

pH:	6.40	SU
Specific Conductance:	461	uS/cm
Temperature:	13.9	deg C

Field measurements made with an Oa ton pH/Con 10 meter with a combination pH/ conductivity and temperature probe.

Sampling Comments:	Initial Turbidity:	NONE	Sample Turbidity:	NONE
	Sample Color:	NONE	Sample Odor:	NONE

QC Samples: Dupl Bln

pH Meter Chec s (7 or 4): 7.1

Utilities QA Officer 10/25/2023

I certify under penalty of law that I believe the reported information above is true, accurate, and complete.