



DEPARTMENT OF THE ARMY
IOWA ARMY AMMUNITION PLANT
17571 DMC HIGHWAY 79
MIDDLETOWN, IOWA 52638-5000

CON 12-1-1
Doc # 108370

November 21, 2023

Subject: 2023 Annual Water Quality Report

Iowa Department of Natural Resources
Land Quality Bureau
502 East 9th Street
Des Moines, IA 50319-0034

Dear Mr. Leat,

The 2023 Annual Water Quality Report for the Iowa Army Ammunition Plant CCR Landfill 29-SDP-03-82P is enclosed.

The point of contact is Ms. Amanda Smith, Environmental Coordinator, at email: amanda.j.smith202.civ@army.mil or phone number 319-753-7908.

Sincerely,

SMITH.AMANDA Digitally signed by
.JO.1603356116 SMITH.AMANDA.JO.1603356116
Date: 2023.11.21 08:06:41 -06'00'

Amanda Smith
Environmental Coordinator, U.S. Army

Enclosure

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NOV 27 2023

2023 ANNUAL WATER QUALITY REPORT

IAAAP – CCR Landfill

Permit No. 29-SDP-3-82P

Site Location:

Iowa Army Ammunition Plant
17575 Highway 79
Middletown, IA 52638

November 20, 2023

Prepared for:

AMERICAN ORDNANCE, LLC

17575 Highway 79
Middletown, IA 52638

Prepared by:

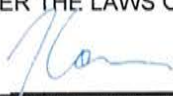
KLINGNER & ASSOCIATES, P.C.

610 North 4th Street, Suite 100
Burlington, IA 52601

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Project No. 02195-84 / 21-2056

	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.
	Jessica Coca 
	MY LICENSE RENEWAL DATE IS DEC. 31, 2024 IOWA REGISTRATION NUMBER: 25623
	PAGES OR SHEETS COVERED BY THIS SEAL: ALL DATE OF ISSUANCE: 11/20/2023

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Acronyms & Abbreviations:

AL	Action Level
CAMP	Corrective Action Monitoring Plan
CL	Control Limit - Mean plus Two Standard Deviations
GWPS	Groundwater Protection Standard
HAL	Health Advisory Level
MCL	EPA Maximum Contaminant Level
N	Normal
NC	No Change
NM	Not Measured
RL	Reporting Limit
SS	IDNR Statewide Standard for a protected groundwater source
SMCL	Secondary Drinking Water Standard
WL	Water Level
IDNR	Iowa Department of Natural Resources

1.0 EXECUTIVE SUMMARY

1.1 Period of Report Coverage

This report contains information on sampling performed in 2023 in general accordance with 567 Iowa Administrative Code (IAC) Section 104.1(4)e, and the provisions identified in the landfill permit. Well maintenance and installation of HydraSleeve™ sampling devices occurred on August 2, 2023. The annual fall sampling event took place September 5, 2023.

1.2 Priority

There is no request for urgent review by IDNR for this submittal.

1.3 Site Status

The CCR Landfill, also known as the Fly Ash Landfill, is in the west-central portion of IAAAP. Figure 1 provides a site base map of the landfill superimposed on an aerial photograph. The approximate location of leachate collection piping is included on Figure 1, together with monitoring points and piezometer locations. Sampling requirements as defined in the Permit were streamlined in 2016 following quarterly assessments of 2015, as previously reported. Most of the well points and piezometers as shown on Figure 1 are not routinely sampled; five are sampled and others are used solely for assessment of the direction and gradient of groundwater flow. [1]

This AWQR was converted to the new IDNR standard AWQR report format for non-municipal solid waste landfills for the monitoring year 2021. Data from 2016 to present was incorporated into the new report. Data prior to 2016 allowed for field filtering metals however Permit Amendments No. 7 & No. 8 required reporting the total concentration of metals. No data from analysis of field filtered samples is included in this report. Permit Amendment No. 9 discontinued sampling for antimony, lithium, molybdenum, nickel, and thallium. Permit Amendment No. 10 discontinued sampling for cadmium and strontium.

2.0 SITE BACKGROUND

2.1 Site History

The CCR Landfill, operating under IDNR Permit No. 29-SDP-03-82P, has a current capacity of approximately 105,517 cubic yards (CY), although deposition into the landfill is currently limited by administrative policies of the Army. Deposition events are to be limited to events where fly ash cannot be recycled, reused, or transported off site. The CCR Landfill comprises 7.5 acres of fill area with an underground leachate collection system, and a treatment basin (south of the Main Heating Plant). Compacted native clay soils were used to construct the landfill's base, which is consistent with disposal of fly ash previously characterized as non-hazardous. No hazardous wastes have been disposed in the landfill. The former fly ash disposal area used in the 1940s and 1950s, approximately five acres in size, is located immediately west of the CCR landfill. [1]

The CCR landfill has historically received coal combustion residue (fly ash) from the operation of the coal-fired Main Heating Plant at Building No. 500-139 and sludge generated by the operation of the coal pile run-off water treatment facility. In attempts to reduce/reuse and recycle the material, alternative uses for fly ash and sludge from the coal pile run-off water treatment facility have been identified. The off-site recycling of fly ash was initiated in 2004 and the off-site recycling of sludge was initiated in 2013. From 2015 to present, fly ash generated by the coal-fired heating plant has been disposed off-site in a permitted landfill in lieu of disposal in the CCR landfill. [1]

At present, the Contract between AO and the Army allows fly ash and sludge to be placed in the CCR landfill only on an emergency basis. For instance, deposition would be allowed when transportation off-site is not practical due to severe weather, slick roads or an unforeseen breakdown of the transport vehicle. Efforts to minimize deposition in the landfill and a description of excavation events for the historical off-site use of fly ash has been presented in pre-2017 AWQRs. [1]

For each year following recycle activities for fly ash and/or sludge, a Solid By-Product Management Plan report is submitted to the IDNR. IDNR received Solid By-Product Management reports for years 2004 through 2015. No report was required for calendar years 2016 through 2019. A report was submitted for the sludge applied to off-site agricultural land in 2020. [1]

In October 2020, 306,000 gallons of lime sludge was removed from the two concrete sludge basins at the coal pile run-off water treatment facility at the coal fired heating plant and applied as agricultural limestone to off-site farmland in row crop use. The applicator was issued an Iowa Department of Agricultural and Land Stewardship License (LM 00151 003) printed on 14 February 2020 with an expiration date of 1 January 2021.

2.2 Site Hydrology

Regional topography is generally flat in the uplands but dissected by several major drainage ways, with overall topography sloping gently toward the south. Ground surface elevations range from approximately 728 feet above mean sea level (amsl) in the uplands in the north to approximately 531 feet amsl near the southern property boundary at Long Creek, approximately 4 miles south of the CCR landfill. [1]

The CCR landfill is in the Long Creek watershed. Topography in the Long Creek watershed slopes generally to the south toward Long Creek and its tributaries. Long Creek flows generally east-southeast and is fed by three unnamed perennial tributaries from the north and many small intermittent streams. In the eastern portion of this watershed at the confluence of two of the perennial tributaries and Long Creek, Long Creek has been dammed to form George H. Mathes Lake, approximately 6,000 feet south of the landfill. After discharging from Mathes Lake, Long Creek flows south and discharges into the Skunk River approximately 0.5 mile outside of the facility. The ground surface surrounding the CCR landfill slopes gently toward the south, consistent with the regional topography. The elevation of the landfill base is approximately 712 feet amsl at the north end and 710 feet amsl at the south end. The landfill is surrounded by engineered earthen berms, the top of which are at an elevation of 720 feet amsl. Surface drainage within the landfill is controlled within the berms and flows due south where it is intercepted by the leachate collection system. Surface drainage around the landfill flows into ditches surrounding the landfill and is channeled by east-west trending railroad tracks to the south. Surface water around the landfill ultimately flows into a south-flowing intermittent tributary of Long Creek west of the landfill or is culverted beneath the railroad tracks into a south-flowing intermittent tributary of Long Creek. [1]

Wells installed at the CCR landfill have been used to evaluate the hydrogeology and hydraulic conductivity of the site. The wells on site include the FLseries wells installed in 1982 (FL-1 through FL-6) and 1984 (FL-7 through FL-10), the Pseries piezometers installed as part of the 1990 hydrogeologic investigation (groups P1 through P4), and CCR landfill permit wells installed in 1991 and 2013 (MW series). A summary of well construction data is provided in Table 1. Depth to the water table in the shallow wells is generally less than 10 feet bgs, which indicates an upward gradient from the till layer into the loess. The surficial loess and Layer 1 of the till are hydraulically connected; however, localized variations in hydraulic conductivity may restrict the water table from fluctuating from the till into the loess and vice versa at times of water infiltration. The well points in the till exhibit low hydraulic conductivities and yield only small quantities of groundwater to wells, as exhibited by well sampling events. The direction of shallow groundwater flow at IAAAP has been generally to the southeast, although localized influence from topographical features and drainages is sometimes present. Groundwater flow directions have been routinely estimated from the elevation measurements within the monitoring wells. Utilizing the shallow till wells to plot a groundwater surface, shallow groundwater flow directions have varied slightly from year to year. The predominant direction was toward the south through 2011. In 2012, the groundwater flow direction was evaluated with the benefit of piezometer and

well construction diagrams. Subsequently, two piezometers were removed from the monitoring plan because siltation and lack of adequate screens provided unreliable water levels. Retired piezometers include NWP-C and SEP-C. It was determined by IDNR that these piezometers need not be replaced. Since 2013, and again as measured in 2021, the direction of shallow groundwater flow has been toward the south-southeast. Figure 2 shows the most recent groundwater potentiometric surface map for the shallow aquifer. Previously noted in past AWQRs was the anomaly in water level contours near piezometer FL-7. Evaluation of contours indicated siltation may have prohibited water in FL-7 to equalize with the fluctuation in groundwater levels on the western edge of the monitoring area. As per correspondence with Michael Leat of IDNR on February 18, 2020, piezometer FL- 7 has been dropped from groundwater level monitoring to generate a more representative groundwater surface map. Water level contours have historically been utilized to characterize upgradient areas from downgradient areas. MW-1 continues to serve as the Upgradient well. [1]

2.3 Site Geology

Surface soils near the landfill consist of loess, typically silt with some clay-sized material approximately 7 to 8 feet thick (to approximately 708 feet amsl). The upper four feet of the loess consists of high plasticity clay, which was utilized to engineer the bottom of the disposal area. The deeper loess has been classified as low plasticity silty clay. Vertical permeability in the (uncompacted) loess tends to be low but greater than its horizontal permeability. The Iowa Geological Survey (IGS) has determined the average vertical permeability of the loess in southeastern Iowa to be 7.3×10^{-6} centimeters per second (cm/sec) (Geotechnics, 1990). This "low" permeability is consistent with slug test results subsequently collected from till layers by Preston Engineering during preventative maintenance activities, further discussed below. [1]

Underlying the loess is glacial till assigned to the Kellersville Till, consisting primarily of silty clay and clayey silt, with thin sand lenses and a particle size distribution of 66 percent clay and 34 percent sand. The till extends to depths greater than 100 feet below ground surface (bgs) (approximately 612 feet amsl) and contains at least four distinct layers at the site (with Layer 1 being the uppermost layer). The lithologic descriptions of the till layers have been documented as follows:

Layer 1 (approximately 8 feet to 41 feet bgs or 708 feet to 675 feet amsl) consists of medium stiff to stiff clay (of varying plasticity) containing a trace to some sand and small pebbles. Sand layers (ranging from 2 inches to 3 feet thick) were encountered near the bottom 5 feet. Vertical permeability (laboratory tested) ranges from 1.7×10^{-7} to 7.2×10^{-9} cm/sec. Bail down tests at the same locations indicate horizontal permeabilities averaging 1.85×10^{-5} , with 1.90×10^{-4} cm/sec being recorded in a piezometer screened in sand layers. In 2006, slug tests performed by Preston Engineering on wells in this layer determined hydraulic conductivities from 1.72×10^{-6} to 3.96×10^{-4} cm/sec. (Preston Engineering, 2006). In 2011, slug tests performed by Preston Engineering on the same wells in this layer determined hydraulic conductivities from 2.49×10^{-10} to 5.08×10^{-8} cm/sec. (Preston Engineering, 2011). The apparent difference in hydraulic

conductivities from 2006 to 2011 may be related to the methodology used, instrument operator interpretation, or silt over slotted piping down-hole. Groundwater monitoring is limited to this layer.

Layer 2 (approximately 41 feet to 70 feet bgs or 675 feet to 646 feet amsl) consists of clay similar to Layer 1, but of a denser consistency. Vertical permeability (laboratory tested) ranges from 13.0×10^{-8} to 5.3×10^{-9} cm/sec. Bail down tests at the same locations indicated horizontal permeabilities averaging 6.45×10^{-6} cm/sec. Hydraulic conductivity results from the 2006 slug tests show a range of 5.00×10^{-8} to 2.82×10^{-5} cm/sec from wells screened in this layer. Hydraulic conductivity results from the 2011 slug tests show 5.08×10^{-8} cm/sec from wells screened in this layer. Three piezometers measure groundwater in this layer: SWP-C, NWP-S, and NEP-W. Groundwater sampling is not being conducted in this layer.

Layer 3 (approximately 70 feet to 98 feet bgs or 646 feet to 618 feet amsl) consists of very stiff to hard sandy, silty clay. The vertical permeability (laboratory tested) is 5.3×10^{-9} cm/sec. This layer could be considered a confining layer, assuming it has negative pore pressure. There are no monitoring points within this layer.

Layer 4 (approximately 98 feet bgs or 618 feet amsl to the top of bedrock) consists of very compacted clayey silt. The vertical permeability (laboratory tested) is 3.9×10^{-8} cm/sec. Bail down tests at the same location indicates horizontal permeability of 2×10^{-7} cm/sec (Geotechnics, 1990). Hydraulic conductivity results from the 2006 slug tests show 1.2×10^{-6} and 4.87×10^{-6} cm/sec from wells screened in this layer. Hydraulic conductivity results from the 2011 slug tests show 5.08×10^{-8} cm/sec from wells screened in this layer. Former monitoring points in this layer include SWP-S, and MW4-91. The difference between vertical and horizontal permeabilities is less pronounced in the denser tills, which serve as confining layers with conductivities below 1×10^{-9} cm/sec. Monitoring is not conducted in this layer. The uppermost bedrock at the IAAAP occurs at 580 feet amsl (135 feet bgs) at the north end of the landfill, and 565 feet amsl (150 feet bgs) at the south end of the landfill (Geotechnics, 1992). The bedrock unit in the area is the Warsaw Shale, calcareous shale that grades into a dolomitic and shaly portion (upper 40 feet) of the Keokuk Limestone, a cherty limestone approximately 70 feet thick. The base of the Keokuk Limestone is identified by the Montrose Chert, which is a 30-foot layer of cherty limestone. The Burlington Limestone underlies the Keokuk Limestone and is estimated to be 70 feet thick within the IAAAP facility. There are no monitoring points within this layer. [1]

2.4 Permit History

A brief history of permit amendments and correspondence is summarized below.

Date	Permit Action	Summary / Notes
1/13/2010	Modified Permit Issued	Permit No. 29-SDP-03-82P, Exp. 1/6/2020
6/18/2010	PA No. 1	Approved the amended closure plan which identified new borrow area, approved alternative method of recording fly ash placed in the landfill, amended the OP by allowing exhumation of 90,000 CY fly ash from the landfill
11/7/2011	PA No. 2	Implement corrective action to repair blockage in leachate collection system
1/10/2012	PA No. 3	Omit requirement to submit sampling forms within 45 days of sampling, require submittal of AWQR, incorporate Certificate of Repair for the subdrain system
7/26/2012	PA No. 4	Designated MW1-91 as upgradient well and FL-9 as downgradient well
11/26/2012	IDNR Letter	IDNR requested a GW Assessment Plan (GAP) be submitted addressing iron, manganese, and sulfate concentrations exceeding SMCLs
3/7/2013	IDNR Letter	Approved the submitted GAP (1/28/2013), requested additional analytical parameters be expanded
2014	Expanded parameters sampled for and results submitted to IDNR	
2014-2015	Correspondence with IDNR regarding HydraSleeve™ sampling	
5/18/2015	PA No. 6	Modified site HMSP requirements
5/26/2016	PA No. 7	Altered sampling parameters
9/27/2016	PA No. 8	Modified provisions for sampling at newly installed wells and implemented a process for discontinuation of supplemental parameters
11/15/2018	PA No. 9	Sampling for antimony, lithium, molybdenum, nickel, and thallium was discontinued
8/28/2019	Permit Renewal	No substantial changes to monitoring or reporting. Permit expires 8/28/2029
12/14/2021	PA No. 10	Sampling for cadmium and strontium was discontinued

3.0 SAMPLING PROTOCOL

The 2023 fall sampling event began on August 2, 2023 with well maintenance performed at each of the 5 wells where groundwater samples are collected. Each of the wells were surged with a PVC slug and groundwater was purged using a peristaltic pump until the water was clear or significantly clearer than the beginning of surging activities. Volumes of groundwater purged and additional information on maintenance performed at each well is included on the field sampling forms located in Appendix B. HydraSleeve™ sampling devices were set in each well at least 1 hour after well maintenance activities were completed.

HydraSleeve™ sampling devices were pulled on September 5, 2023 and sample water collected in the HydraSleeves™ was transferred to laboratory provided samples bottles. Samples were immediately packed on ice and then shipped to Eurofins Test America in Cedar Falls, Iowa for analysis. A duplicate sample was collected for MW5-91 for metals and general chemistry. Specific conductance, pH, and temperature were measured in the field using an Oakton PCTS Tester 50.

4.0 DATA SUMMARY

4.1 Table 1: Monitoring Program Summary Table

Table 1 provides a summary of the wells in the hydrological monitoring system. There are currently five (5) monitoring wells that are sampled in the system and an additional eleven (11) monitoring wells used for gathering groundwater level data. An additional thirteen (13) monitoring wells are present on the site but are not regularly sampled.

The number of samples in each monitoring program begins with the 2016 samples collected.

4.2 Table 2: Monitoring Program Implementation Schedule

Table 2 tracks compliance with permitted sampling frequencies and required parameters to aid in scheduling. It is anticipated that sampling will continue in the fall of 2024 for permit required parameters (included in comments of Table 2).

4.3 Table 3: Monitoring Well Maintenance & Performance Revaluation Schedule

Table 3 tracks compliance with applicable regulations. Annual sampling and groundwater elevation monitoring is required by the permit.

4.4 Table 4: Monitoring Well Maintenance & Performance Summary

Table 4 provides a summary of the well depths, screen elevation, and most recent groundwater level measurements. FL-9 had a submerged screen during the 2023 sampling event.

4.5 Table 5: Background Summary Table

Table 5 summarizes the background levels detected for each constituent. The only well considered as background is MW1-91. Background levels were determined using the mean of GW data collected MW1-91 plus two (2) standard deviations. An upper and lower background limit was determined for alkalinity and pH.

4.6 Table 6: Summary of Well & Detected Constituent Pairs

Table 6 provides a summary of background levels compared to detections during the most recent sampling event for constituent pairs that had not been previously identified as having a control limit exceedance.

4.7 Table 7: Summary of Ongoing & Newly Identified CL Exceedances

Table 7 compares the most recent results to the control limit and the groundwater protection standard. The only exceedance of groundwater protection standards (MCL / SS) was in the upgradient well, MW1-91 (control limit), for manganese and cobalt.

4.8 Table 8: Analytical Data Summary

Table 8 provides a summary of all of the analytical data for each well. Data going back to 2016 is backfilled into the table.

4.9 Table 9: Historic CL & AL Exceedances

Table 9 provides a summary of control limits and action levels from 2016 to the present for each well and constituent pair.

4.10 Table 10: GW Quality Assessment Plan Trend Analysis

Table 10 provides a summary of the trends of current action level exceedances. No trend analysis was provided since the exceedance is in the upgradient well.

5.0 LEACHATE

Leachate, when generated at the landfill, is collected by a system of parallel 4-inch perforated tiles located beneath the landfill, as depicted on Figures 1 and 1a. From a collection sump, leachate is routed to a holding pond south of the coal storage yard. The holding pond also receives runoff from the adjacent coal storage yard and boiler blowdown effluent from the heating plant. Water from the holding pond is pumped to the treatment basin south of the Main Heating Plant to further adjust the pH and reduce total suspended solids per National Pollutant Discharge Elimination System (NPDES) permit IA2900900. [1] After treatment, water from the treatment basin is discharged to the sanitary sewer and ends at the main facility sewage plant.

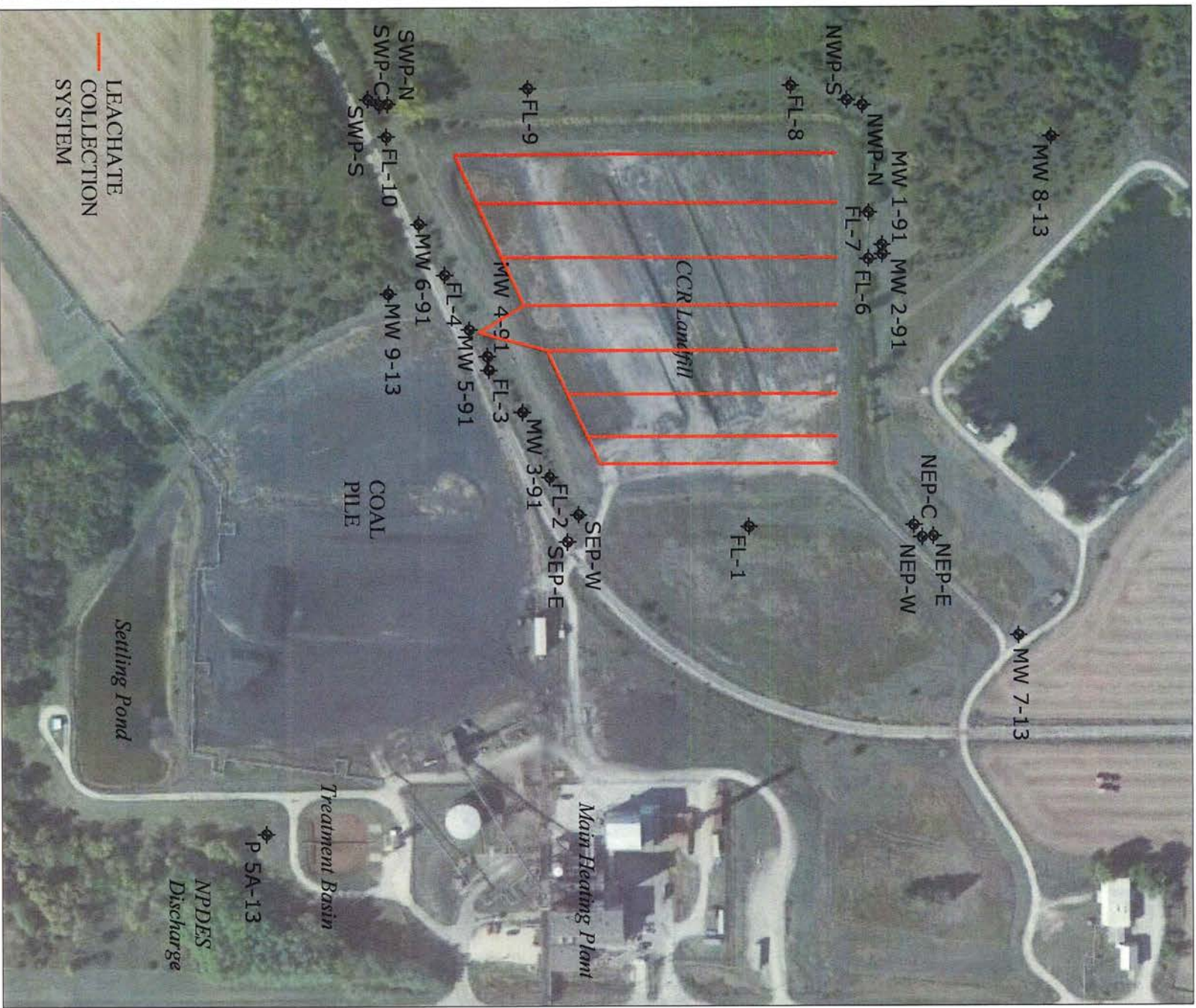
6.0 RECOMMENDATIONS

Special Provision (5)(d) of the permit allows for the discontinuation of supplemental parameters after three consecutive test results show concentrations below the lowest action level if approved by IDNR. No changes to the current permit required parameters is recommended at this time.

7.0 REFERENCES

[1] 2020 AWQR (11/18/2020) prepared by EnviroNet for American Ordnance, LLC

- Portions of text copied from 2020 AWQR prepared by EnviroNet including site history, location information, geological and hydrological information, and leachate information.



EnviroNET Inc.

Site Base Map Including Historical Monitoring Locations

SHEET:
FIGURE 1

American Ordinance CCR Landfill
Middletown, IA

JOB NUMBER:
200005

2020 Annual Water Quality Report

DATE:
Oct. 2020

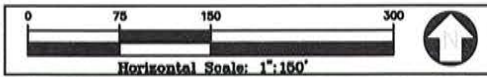
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CHECKED: JRK





EnviroNET Inc.

DESIGNED: JRK
DRAWN: JRF
CHECKED: JRK



Site Base Map with Current Monitoring Locations

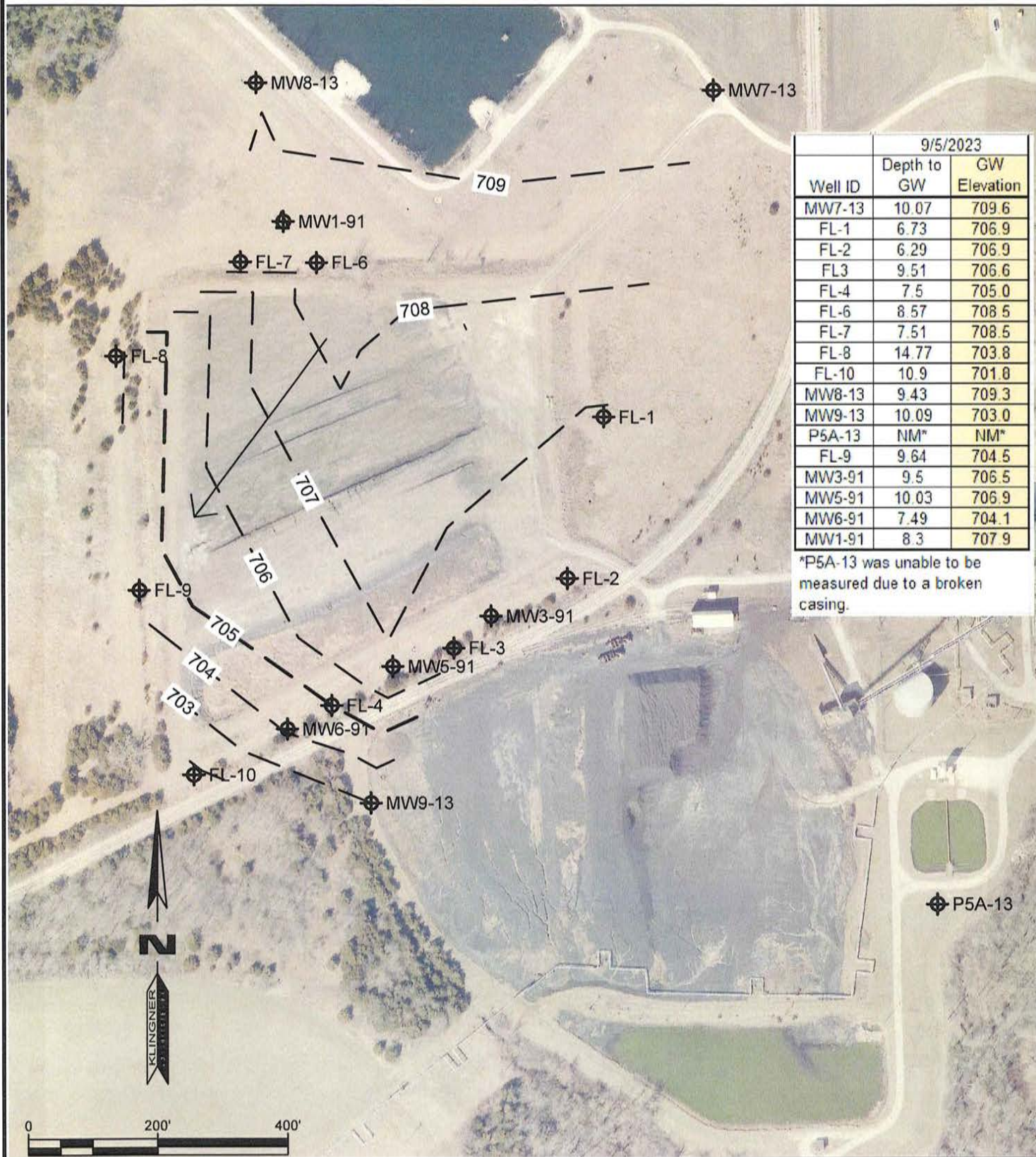
American Ordinance CCR Landfill
Middletown, IA

2020 Annual Water Quality Report

SHEET:
FIGURE 1A

JOB NUMBER:
200005

DATE:
Oct. 2020



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P:\BURLINGTON\02185_1A\AP084_212056 AMERICAN ORDANCE - CCR LANDFILL ANNUAL SAMPLING\19.ENV\RO\LANDFILL\2023\FIGURE 2 2023 CCR LANDFILL GW ELEVATIONS.DWG

CCR LANDFILL ANNUAL SAMPLING

AMERICAN ORDANCE, LLC
 IOWA ARMY AMMUNITION PLANT
 17575 DMC HIGHWAY 79
 MIDDLETOWN, IOWA 52638

Non-Reduced Sheet Size 8.5" x 11"		SHEET TITLE GROUNDWATER POTENTIOMETRIC SURFACE MAP SHALLOW AQUAFER
DESIGNED	DRAWN	
JAC	STT	
FIELD	FIELD BOOK	
-	-	
CHECKED	CHECK DATE	SHEET
DRAWING ISSUED DATE:		
11/20/2023		
PROJECT NO.		FIGURE 2
2185-84 / 21-2056		

Table 1
Monitoring Program Summary
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SOP-03-82P

Monitoring Well	Formation	Current Monitoring Program	Change for next sampling event	Control Limit Exceedances	Total # of Samples in each monitoring program since 2016		
					Routine	Supplemental	Remedial Action
FL-9	Weathered Till	Routine/Supplemental	0	Calcium, Magnesium, Sulfate, pH	112	64	0
MW1-91	Weathered Till	Background	0	N/A	-	-	0
MW3-91	Weathered Till	Routine/Supplemental	0	Boron, Sulfate, pH	112	64	0
MW5-91	Weathered Till	Routine/Supplemental	0	Sulfate	112	64	0
MW6-91	Weathered Till	Routine/Supplemental	0	Boron, Calcium, Magnesium, Sodium, Sulfate	112	64	0

Other Monitoring Points		
Monitoring Well	Formation	Current Monitoring Program
FL-1	Weathered Till	Water Level
FL-2	Weathered Till	Water Level
FL-3	Weathered Till	Water Level
FL-4	Weathered Till	Water Level
FL-5	Weathered Till	None
FL-6	Weathered Till	Water Level
FL-7	Weathered Till	None
FL-8	Weathered Till	Water Level
FL-10	Weathered Till	Water Level
P1A-90 (SWP-N)	Weathered Till	None
P1B-90 (SWP-C)	Weathered Till	None
P1C-90 (SWP-S)	Weathered Till	None
P2A-90 (NWP-N)	Weathered Till	Water Level
P2B-90 (NWP-C)	Weathered Till	ABANDONED
P2C-90 (NWP-S)	Weathered Till	None
P3A-90 (NEP-E)	Weathered Till	None
P3B-90 (NEP-C)*	Weathered Till	ABANDONED
P3C-90 (NEP-W)	Weathered Till	None
P4A-90 (SEP-E)	Weathered Till	None
P4B-90 (SEP-C)*	Weathered Till	ABANDONED
P4C-90 (SEP-W)	N/A	None
P5A-13	Weathered Till	Water Level
MW 2-91	Weathered Till	None
MW 4-91	Weathered Till	None
MW 7-13	Weathered Till	None
MW 8-13	Weathered Till	Water Level
MW 9-13	Weathered Till	Water Level

Comments:

1. Duplicate samples are not counted toward the number of samples in each monitoring program

This worksheet;

- 1) Provides a summary of the monitoring points and in which phase of monitoring they are in,
- 2) Verifies conformance with the approved HMSP network,
- 3) Gives a summary of the monitored aquifer,
- 4) Provides the size of the dataset,
- 5) Provides a summary of current contaminants above background and whether they exceed a Control Limit
- 6) States the phase for the next sampling event,
- 7) Mentions additional site sampling that may be occurring on a temporary basis to achieve a delineation or remedial action goal, and
- 8) Provides any deviations to current HMSP.

Table 2
Monitoring Program Implementation Schedule
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Monitoring Well	Recent Sampling Dates and Constituents				Upcoming Sampling Dates and Constituents		
	9/15/2020	9/7/2021	9/6/2022	9/5/2023	Fall 2024	Fall 2025	Fall 2026
FL-9	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List
MW1-91	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List
MW3-91	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List
MW5-91	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List
MW6-91	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List	Permit Required List
FL-1	WL	WL	WL	WL	WL	WL	WL
FL-2	WL	WL	WL	WL	WL	WL	WL
FL-3	WL	WL	WL	WL	WL	WL	WL
FL-4	WL	WL	WL	WL	WL	WL	WL
FL-6	WL	WL	WL	WL	WL	WL	WL
FL-8	WL	WL	WL	WL	WL	WL	WL
FL-10	WL	WL	WL	WL	WL	WL	WL
P2A-90 (NWP-N)	WL	WL	WL	WL	WL	WL	WL
P5A-13	WL	WL	WL	WL	WL	WL	WL
MW 8-13	WL	WL	WL	WL	WL	WL	WL
MW 9-13	WL	WL	WL	WL	WL	WL	WL

Permit required list:	
bicarbonate alkalinity	total cobalt
chloride	total copper
pH	total iron
sulfate	total lead
total aluminum	total manganese
total arsenic	total magnesium
total barium	total potassium
total beryllium	total selenium
total boron	total sodium
total calcium	total zinc

Comments:

1. WL = Water Level Only

*This worksheet;
1) Tracks compliance with permitted sampling frequencies and required parameters and to aid in scheduling.*

Table 3
Monitoring Well Maintenance and Performance Revaluation Schedule
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Compliance with:	Monitoring Calendar Years							
	2019	2020	2021	2022	2023	2024	2025	2026
567 IAC 103.1(4)(d) Annual Sampling	Completed	Completed	Completed	Completed	Completed	Scheduled	Scheduled	Scheduled
HMSP / Permit Issued 8/28/2019, Special Provision X - WL Elevation Readings during Sampling Events	Completed	Completed	Completed	Scheduled	Completed	Scheduled	Scheduled	Scheduled

Comments:

This worksheet;
1) Summarizes compliance, and
2) Aids in scheduling future tasks.

Table 4
Monitoring Well Maintenance and Performance Summary
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Well	Top of Casing	Top of Screen	Total Depth		Date of Measurements		Maximum Depth Discrepancy (ft)	Baseline Permeability (cm/s/date)	Current Permeability	
					9/6/2022	9/5/2023			-	% Change
FL-9	714.11	700.81	23.6	Groundwater Level (ft)	10.15	9.64	-2.28	(a) (b) 2006 / 2011	-	
				Groundwater Elevation (ft MSL)	703.96	704.47				
				Measured Well Depth (ft)	25.88	25.88				
				Submerged screen	Yes	Yes				
MW1-91	716.15	709.55	15.5	Groundwater Level (ft)	7.05	8.3	-1.15	(a) (b) 2006 / 2011	-	
				Groundwater Elevation (ft MSL)	709.1	707.85				
				Measured Well Depth (ft)	16.65	16.65				
				Submerged screen	No	No				
MW3-91	716.04	709.53	14.7	Groundwater Level (ft)	9.80	9.50	-2	(a) (b) 2006 / 2011	-	
				Groundwater Elevation (ft MSL)	706.24	706.54				
				Measured Well Depth (ft)	16.7	16.7				
				Submerged screen	No	No				
MW5-91	716.89	709.25	15	Groundwater Level (ft)	10.47	10.03	-2	(a) (b) 2006 / 2011	-	
				Groundwater Elevation (ft MSL)	706.42	706.86				
				Measured Well Depth (ft)	17.04	17.04				
				Submerged screen	No	No				
MW6-91	711.55	704.88	15	Groundwater Level (ft)	8.71	7.49	-1.75	(a) (b) 2006 / 2011	-	
				Groundwater Elevation (ft MSL)	702.84	704.06				
				Measured Well Depth (ft)	16.75	16.75				
				Submerged screen	No	No				

Comments:

1. (a) Preston Engineering performed slug tests in 2006 and determined that hydraulic conductivities ranged 1.72 x 10E-6 to 3.96 x 10E-4 cm/sec.
2. (b) Preston Engineering performed slug tests in 2011 and determined that hydraulic conductivities ranged from 2.49 x 10E-10 to 5.08 x 10E-8 cm/sec

This worksheet;

- 1) Summarizes data used to evaluate Monitoring Well Maintenance and Performance, and
- 2) Identifies monitoring wells that have submerged screens.

Table 5
Background Summary
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Upgradient / Background (MW1-91)							
Constituent	Units	Samples	Detections	Background level	Statistical Test	Action Level	Source
Inorganics							
Aluminum	µg/l	9	9	984.5	M+2SD		
Arsenic	µg/l	9	7	5.5	M+2SD	10	MCL
Barium	µg/l	9	9	282.8	M+2SD	2000	MCL
Beryllium	µg/l	9	0	0.5	M+2SD	4	MCL
Boron	µg/l	9	1	123.2	M+2SD	6000	SS
Calcium	µg/l	9	9	85237	M+2SD		
Cobalt	µg/l	9	6	30.9	M+2SD	2.8	SS
Copper	µg/l	9	3	13.4	M+2SD	1300	MCL
Iron	µg/l	9	9	7927	M+2SD		
Lead (Pb)	µg/l	9	8	4.5	M+2SD	15	MCL
Magnesium	µg/l	9	9	34763	M+2SD		
Manganese	µg/l	9	9	2037	M+2SD	300	MCL
Potassium	µg/l	9	7	3923	M+2SD		
Selenium	µg/l	9	0	6.4	M+2SD	50	MCL
Sodium	µg/l	9	9	23679	M+2SD		
Zinc	µg/l	9	1	200.7	M+2SD	2000	MCL
General Chemistry							
Chloride	µg/l	9	9	24331	M+2SD		
Sulfate	µg/l	9	9	41025	M+2SD		
Alkalinity	µg/l	9	9	70043 to 354756	M+/-2SD		
pH	µg/l	9	9	6.71 to 7.29	M+/-2SD		

Comments:

1. Data since Fall 2016
2. Data below RL calculated as 1/2 of RL
3. RED indicates background exceeds Action Level

This worksheet;

- 1) Summarizes the size and quality of the data record of the background data,
- 2) Summarizes the current statistical method,
- 3) Examines how background levels were determined,
- 4) Examines whether background levels are reasonable,
- 5) Identifies background water quality that is impacted.

Table 6
Summary of Well/Detected Constituent Pairs With No Immediately Preceding Control Limit Exceedances
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Well	Constituent	Units	Most recent result	Control Limit
FL-9				
MW3-91	Calcium	µg/l	187000	85237
	Magnesium	µg/l	57300	34763
	Sodium	µg/l	53300	23679
	Chloride	µg/l	68500	24331
MW5-91	Sodium	µg/l	24100	23679
	Boron	µg/l	160	123.2
MW6-91				

Comments:

This worksheet;

1) Presents a summary of background comparisons for well constituents pairs that are in the routine monitoring program. If exceedances are confirmed an investigation of a new release is necessary.

Table 7
Summary of Ongoing and Newly Identified Control Limit Exceedances
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Well	Constituent	Units	Most recent result	Control Limit	Action Level/ Statewide Standard
MW1-91 (Background)	Manganese	µg/l	233	2037	300
	Cobalt	µg/l	2.13	30.9	2.8
FL-9	Calcium	µg/l	154000	86237	--
	Magnesium	µg/l	53600	34763	--
	Sulfate	µg/l	386000	41025	--
	pH	SU	7.51	6.17 to 7.29	--
MW3-91	Boron	µg/l	148	123.2	6000
	Sulfate	µg/l	713000	41025	--
	pH	SU	6.6	6.17 to 7.29	--
MW5-91	Sulfate	µg/l	154000	41025	--
MW6-91	Boron	µg/l	166	123.2	6000
	Calcium	µg/l	102000	85237	--
	Magnesium	µg/l	57300	34763	--
	Sodium	µg/l	14900	23679	--
	Sulfate	µg/l	244000	41025	--

Comments:

1. RED indicates background exceeds Action Level

Table 8
Analytical Data Summary
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Constituent (CAS #)	Sample Date	Units	MW1-91 Bkgrnd	FL-9 DwnGrad	MW3-91 DwnGrad	MW5-91 DwnGrad	MW6-91 DwnGrad
Aluminum SMCL = 200 <i>Supplemental</i>	9/8/2016	µg/l	154	<50	248	<50	158
	(D) 9/8/2016	µg/l	141	NM	NM	NM	NM
	9/13/2017	µg/l	526	<50	<50	<50	262
	(D) 9/13/2017	µg/l	NM	<50	NM	NM	NM
	9/5/2018	µg/l	413	185	277	<50	2090
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	2350
	9/17/2019	µg/l	1080	175	257	<75	233
	(D) 9/17/2019	µg/l	NM	NM	199	NM	NM
	9/15/2020	µg/l	158	468	117	69.4	73.8
	(D) 9/15/2020	µg/l	NM	NM	NM	111	NM
	9/7/2021	µg/l	372	49.2	311	24	154
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	239
	9/6/2022	µg/l	583	67.3	760	31.6	54.3
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	132
	9/5/2023	µg/l	93.7	317	56.2	27.5	34.6
	(D) 9/5/2023	µg/l	NM	NM	NM	25.3	NM
Arsenic (Total) (7440-38-2) MCL = 10	9/8/2016	µg/l	2.6	<2	<2	<2	<2
	(D) 9/8/2016	µg/l	2.6	NM	NM	NM	NM
	9/13/2017	µg/l	5	<2	<2	<2	<2
	(D) 9/13/2017	µg/l	NM	<2	NM	NM	NM
	9/5/2018	µg/l	<2	<2	<2	<2	<2
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<2
	9/17/2019	µg/l	<10	<10	<10	<10	<10
	(D) 9/17/2019	µg/l	NM	NM	<10	NM	NM
	9/15/2020	µg/l	2.17	<0.88	<0.88	<0.88	<0.88
	(D) 9/15/2020	µg/l	NM	NM	NM	<0.88	NM
	9/7/2021	µg/l	3.1	<0.75	<0.75	<0.75	<0.075
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	<0.075
	9/6/2022	µg/l	3.46	<0.75	1.18	<0.27	<0.75
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	<0.75
	9/5/2023	µg/l	1.72	<0.53	<0.53	<0.53	<0.53
	(D) 9/5/2023	µg/l	NM	NM	NM	<0.53	NM
Barium (Total) (7440-39-3) MCL = 2000	9/8/2016	µg/l	100	63.4	66.9	97.3	66.7
	(D) 9/8/2016	µg/l	99.4	NM	NM	NM	NM
	9/13/2017	µg/l	260	53.6	66.6	105	143
	(D) 9/13/2017	µg/l	NM	55	NM	NM	NM
	9/5/2018	µg/l	111	61.2	135	132	104
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	111
	9/17/2019	µg/l	260	628	108	128	166
	(D) 9/17/2019	µg/l	NM	NM	105	NM	NM
	9/15/2020	µg/l	171	58.7	55.2	129	47.6
	(D) 9/15/2020	µg/l	NM	NM	NM	123	NM
	9/7/2021	µg/l	149	54.4	79.7	83.6	92.6
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	92.8
	9/6/2022	µg/l	183	58.8	90.6	102	91.1
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	90.4
	9/5/2023	µg/l	171	60.5	123	80.1	58.7
	(D) 9/5/2023	µg/l	NM	NM	NM	77	NM
Beryllium (Total) (7440-41-7) MCL = 4	9/8/2016	µg/l	<1	<1	<1	<1	<1
	(D) 9/8/2016	µg/l	<1	NM	NM	NM	NM

Constituent (CAS #)	Sample Date	Units	MW1-91	FL-9	MW3-91	MW5-91	MW6-91
	9/13/2017	µg/l	<1	<1	<1	<1	<1
	(D) 9/13/2017	µg/l	NM	<1	NM	NM	NM
	9/5/2018	µg/l	<1	<1	<1	<1	<1
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<1
	9/17/2019	µg/l	<1	<1	<1	<1	<1
	(D) 9/17/2019	µg/l	NM	NM	<1	NM	NM
	9/15/2020	µg/l	<0.27	<0.27	<0.27	<0.27	<0.27
	(D) 9/15/2020	µg/l	NM	NM	NM	<0.27	NM
	9/7/2021	µg/l	<0.27	<0.27	<0.27	<0.27	<0.27
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	<0.27
	9/6/2022	µg/l	<0.27	<0.27	<0.27	<0.27	<0.27
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	<0.27
	9/5/2023	µg/l	<0.33	<0.33	<0.33	<0.33	<0.33
	(D) 9/5/2023	µg/l	NM	NM	NM	<0.33	NM
Boron SS = 6000 HAL = 6000	9/8/2016	µg/l	<200	<200	<200	<200	<200
	(D) 9/8/2016	µg/l	<200	NM	NM	NM	NM
	9/13/2017	µg/l	<200	<200	<200	<200	<200
	(D) 9/13/2017	µg/l	NM	<200	NM	NM	NM
	9/5/2018	µg/l	<200	<200	<200	<200	<200
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<200
	9/17/2019	µg/l	<100	<100	222	145	108
	(D) 9/17/2019	µg/l	NM	NM	220	NM	NM
	9/15/2020	µg/l	<80	<80	152	105	97.6
	(D) 9/15/2020	µg/l	NM	NM	NM	106	NM
	9/7/2021	µg/l	<58	<58	222	227	353
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	359
	9/6/2022	µg/l	<58	<58	220	132	394
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	394
	9/5/2023	µg/l	82.7	<76	148	160	166
	(D) 9/5/2023	µg/l	NM	NM	NM	150	NM
Cadmium (Total) (7440-43-9) MCL = 5 HAL = 5 <i>Supplemental</i>	9/8/2016	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5
	(D) 9/8/2016	µg/l	<0.5	NM	NM	NM	NM
	9/13/2017	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5
	(D) 9/13/2017	µg/l	NM	<0.5	NM	NM	NM
	9/5/2018	µg/l	<0.5	<0.5	<0.5	<0.5	<0.5
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<0.5
	9/17/2019	µg/l	<5	<5	<5	<5	<5
	(D) 9/17/2019	µg/l	NM	<5	<5	NM	NM
	9/15/2020	µg/l	0.133	0.3	0.231	0.13	0.077
	(D) 9/15/2020	µg/l	NM	NM	NM	0.12	NM
	9/7/2021	µg/l	0.125	0.161	0.102	0.62	0.214
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	0.17
	9/6/2022	µg/l	0.07	0.121	0.237	1.19	0.213
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	0.143
	9/5/2023	µg/l	<0.1	0.314	0.22	0.242	<0.1
	(D) 9/5/2023	µg/l	NM	NM	NM	0.244	NM
Calcium <i>Supplemental</i>	9/8/2016	µg/l	25800	142000	30800	52000	45200
	(D) 9/8/2016	µg/l	26900	NM	NM	NM	NM
	9/13/2017	µg/l	59700	140000	47300	71100	181000
	(D) 9/13/2017	µg/l	NM	140000	NM	NM	NM
	9/5/2018	µg/l	60400	151000	106000	89300	106000
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	106000
	9/17/2019	µg/l	68100	148000	54000	68000	160000
	(D) 9/17/2019	µg/l	NM	NM	53800	NM	NM
	9/15/2020	µg/l	60200	141000	32700	75000	59000
	(D) 9/15/2020	µg/l	NM	NM	NM	70300	NM

Constituent (CAS #)	Sample Date	Units	MW1-91	FL-9	MW3-91	MW5-91	MW6-91
	9/7/2021	µg/l	56200	131000	36700	45000	149000
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	147000
	9/6/2022	µg/l	69300	153000	40300	62500	167000
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	165000
	9/5/2023	µg/l	62400	154000	187000	61900	102000
	(D) 9/5/2023	µg/l	NM	NM	NM	60200	NM
Cobalt (Total) (7440-48-4) SS = 2.8	9/8/2016	µg/l	<7	<7	<7	<7	<7
	(D) 9/8/2016	µg/l	<7	NM	NM	NM	NM
	9/13/2017	µg/l	39	<7	<7	<7	<7
	(D) 9/13/2017	µg/l	NM	<7	NM	NM	NM
	9/5/2018	µg/l	<2.8	<2.8	<2.8	<2.8	<2.8
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<2.8
	9/17/2019	µg/l	11.8	<5	<5	<5	<5
	(D) 9/17/2019	µg/l	NM	NM	<5	NM	NM
	9/15/2020	µg/l	7.07	0.5	0.847	1.71	0.28
	(D) 9/15/2020	µg/l	NM	NM	NM	2.04	NM
	9/7/2021	µg/l	4.24	0.337	1.59	0.294	1.08
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	1.57
	9/6/2022	µg/l	6.14	0.36	4.53	0.536	2.2
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	2.77
	9/5/2023	µg/l	2.13	1.79	1.78	0.551	0.179
	(D) 9/5/2023	µg/l	NM	NM	NM	0.559	NM
Copper (Total) (7440-50-8) MCL = 1300 SMCL = 1000	9/8/2016	µg/l	<20	<20	<20	<20	<20
	(D) 9/8/2016	µg/l	<20	NM	NM	NM	NM
	9/13/2017	µg/l	<20	<20	<20	<20	<20
	(D) 9/13/2017	µg/l	NM	<20	NM	NM	NM
	9/5/2018	µg/l	<20	<20	<20	<20	<20
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<20
	9/17/2019	µg/l	<10	<10	<10	<10	<10
	(D) 9/17/2019	µg/l	NM	NM	<10	NM	NM
	9/15/2020	µg/l	1.79	2.5	6.06	2.1	4.42
	(D) 9/15/2020	µg/l	NM	NM	NM	2.6	NM
	9/7/2021	µg/l	1.8	<1.4	3.17	1.49	<1.4
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	1.93
	9/6/2022	µg/l	<1.8	1.8	3.41	2.72	<1.8
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	<1.8
	9/5/2023	µg/l	2.69	6.01	<1.8	<1.8	2.49
	(D) 9/5/2023	µg/l	NM	NM	NM	<1.8	NM
Iron SMCL = 300	9/8/2016	µg/l	1780	<100	381	<100	161
	(D) 9/8/2016	µg/l	1880	NM	NM	NM	NM
	9/13/2017	µg/l	1140	<100	110	<100	265
	(D) 9/13/2017	µg/l	NM	<100	NM	NM	NM
	9/5/2018	µg/l	1100	354	553	<100	2150
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	2530
	9/17/2019	µg/l	7380	264	348	<50	220
	(D) 9/17/2019	µg/l	NM	NM	289	NM	NM
	9/15/2020	µg/l	3600	148	149	179	78.3
	(D) 9/15/2020	µg/l	NM	NM	NM	256	NM
	9/7/2021	µg/l	3890	129	370	<36	160
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	255
	9/6/2022	µg/l	7110	138	1600	59.1	72.6
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	157
	9/5/2023	µg/l	1320	750	116	50.8	<36
	(D) 9/5/2023	µg/l	NM	NM	NM	48.9	NM
Lead (Total) (7439-92-1) MCL = 15	9/8/2016	µg/l	0.8	<0.5	<0.5	<0.5	<0.5
	(D) 9/8/2016	µg/l	0.5	NM	NM	NM	NM

Constituent (CAS #)	Sample Date	Units	MW1-91	FL-9	MW3-91	MW5-91	MW6-91
	9/13/2017	µg/l	3	<0.5	<0.5	<0.5	1.2
	(D) 9/13/2017	µg/l	NM	<0.5	NM	NM	NM
	9/5/2018	µg/l	0.785	<0.5	<0.5	<0.5	2.08
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	2.47
	9/17/2019	µg/l	<10	<10	<10	<10	<10
	(D) 9/17/2019	µg/l	NM	NM	<10	NM	NM
	9/15/2020	µg/l	1.19	0.6	0.449	0.64	0.22
	(D) 9/15/2020	µg/l	NM	NM	NM	0.75	NM
	9/7/2021	µg/l	1.89	0.535	0.682	<0.21	0.512
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	0.781
	9/6/2022	µg/l	1.95	0.652	1.35	<0.24	<0.24
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	<0.24
	9/5/2023	µg/l	0.739	3.34	0.62	0.48	0.365
	(D) 9/5/2023	µg/l	NM	NM	NM	0.451	NM
Magnesium	9/8/2016	µg/l	10500	59500	10200	22300	17400
	(D) 9/8/2016	µg/l	11400	NM	NM	NM	NM
	9/13/2017	µg/l	26300	53600	17000	25100	70900
	(D) 9/13/2017	µg/l	NM	53600	NM	NM	NM
	9/5/2018	µg/l	30700	63600	39700	36800	42100
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	42500
	9/17/2019	µg/l	26200	58600	16100	29500	62400
	(D) 9/17/2019	µg/l	NM	NM	16100	NM	NM
	9/15/2020	µg/l	25000	51200	11100	29900	20400
	(D) 9/15/2020	µg/l	NM	NM	NM	28600	NM
	9/7/2021	µg/l	15900	52400	11700	19600	63000
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	62300
	9/6/2022	µg/l	25500	56900	14300	27200	65300
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	65700
Manganese MCL = 300	9/8/2016	µg/l	395	<10	<10	<10	<10
	(D) 9/8/2016	µg/l	431	NM	NM	NM	NM
	9/13/2017	µg/l	2300	14.6	43.7	33.5	456
	(D) 9/13/2017	µg/l	NM	12.6	NM	NM	NM
	9/5/2018	µg/l	299	23.1	177	11.6	312
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	387
	9/17/2019	µg/l	1240	184	61	<5	17
	(D) 9/17/2019	µg/l	NM	NM	53.9	NM	NM
	9/15/2020	µg/l	389	36.6	22.6	80.5	7
	(D) 9/15/2020	µg/l	NM	NM	NM	101	NM
	9/7/2021	µg/l	309	12.5	64.4	10.6	49.6
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	62.2
	9/6/2022	µg/l	1080	18.2	264	33.1	237
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	281
Potassium Supplemental	9/5/2023	µg/l	233	91	71	26.9	5.44
	(D) 9/5/2023	µg/l	NM	NM	NM	26.7	NM
	9/8/2016	µg/l	1530	<1000	1870	<1000	1220
	(D) 9/8/2016	µg/l	1330	NM	NM	NM	NM
	9/13/2017	µg/l	<1000	<1000	1740	<1000	<1000
	(D) 9/13/2017	µg/l	NM	<1000	NM	NM	NM
	9/5/2018	µg/l	<1000	<1000	2200	<1000	1490
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	1610
	9/17/2019	µg/l	2820	562	1890	<500	1280
	(D) 9/17/2019	µg/l	NM	NM	1830	NM	NM
	9/15/2020	µg/l	1150	455	722	344	774
	(D) 9/15/2020	µg/l	NM	NM	NM	331	NM

Constituent (CAS #)	Sample Date	Units	MW1-91	FL-9	MW3-91	MW5-91	MW6-91
	9/7/2021	µg/l	3750	407	1120	281	667
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	659
	9/6/2022	µg/l	2430	447	963	488	595
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	611
	9/5/2023	µg/l	2500	332	1780	212	557
	(D) 9/5/2023	µg/l	NM	NM	NM	209	NM
Selenium (Total) (7782-49-2) MCL = 50	9/8/2016	µg/l	<5	7.2	<5	<5	<5
	(D) 9/8/2016	µg/l	<5	NM	NM	NM	NM
	9/13/2017	µg/l	<5	7.2	<5	<5	<5
	(D) 9/13/2017	µg/l	NM	7.4	NM	NM	NM
	9/5/2018	µg/l	<5	7.26	<5	<5	<5
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<5
	9/17/2019	µg/l	<15	<15	<15	<15	<15
	(D) 9/17/2019	µg/l	NM	NM	<15	NM	NM
	9/15/2020	µg/l	<1	4.5	1.51	<1	<1
	(D) 9/15/2020	µg/l	NM	NM	NM	<1	NM
	9/7/2021	µg/l	<0.96	5.75	<0.96	<0.96	<0.96
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	<0.96
	9/6/2022	µg/l	<0.96	6.08	<0.96	<0.96	<0.96
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	<0.96
	9/5/2023	µg/l	<1.4	5.58	<1.4	<1.4	<1.4
	(D) 9/5/2023	µg/l	NM	NM	NM	<1.4	NM
Sodium HAL = 20000 Supplemental	9/8/2016	µg/l	4390	15400	4780	21600	4080
	(D) 9/8/2016	µg/l	5110	NM	NM	NM	NM
	9/13/2017	µg/l	19200	17600	14000	24800	23800
	(D) 9/13/2017	µg/l	NM	17600	NM	NM	NM
	9/5/2018	µg/l	17800	16600	23300	1000	12100
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	12100
	9/17/2019	µg/l	17700	18000	9360	25900	21800
	(D) 9/17/2019	µg/l	NM	NM	9490	NM	NM
	9/15/2020	µg/l	15800	14800	9140	22800	7950
	(D) 9/15/2020	µg/l	NM	NM	NM	22400	NM
	9/7/2021	µg/l	10100	15700	9180	21900	36900
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	36500
	9/6/2022	µg/l	16600	17600	10600	23400	37500
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	37600
	9/5/2023	µg/l	9900	17500	53300	24100	14900
	(D) 9/5/2023	µg/l	NM	NM	NM	23400	NM
Strontium HAL = 4000 Supplemental	9/8/2016	µg/l	<100	239	<1000	169	<1000
	(D) 9/8/2016	µg/l	<100	NM	NM	NM	NM
	9/13/2017	µg/l	175	280	174	247	338
	(D) 9/13/2017	µg/l	NM	280	NM	NM	NM
	9/5/2018	µg/l	178	260	298	100	169
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	161
	9/17/2019	µg/l	205	287	199	237	318
	(D) 9/17/2019	µg/l	NM	NM	199	NM	NM
	9/15/2020	µg/l	180	233	124	262	112
	(D) 9/15/2020	µg/l	NM	NM	NM	233	NM
	9/7/2021	µg/l	155	255	133	172	267
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	262
	9/6/2022	µg/l	200	290	156	220	276
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	274
	9/5/2023	µg/l	170	304	593	189	167
	(D) 9/5/2023	µg/l	NM	NM	NM	181	NM
Zinc (Total) (7440-66-6) HAL = 2000	9/8/2016	µg/l	<20	<20	<20	<20	<20
	(D) 9/8/2016	µg/l	<20	NM	NM	NM	NM

Constituent (CAS #) SMCL = 5000	Sample Date	Units	MW1-91	FL-9	MW3-91	MW5-91	MW6-91
	9/13/2017	µg/l	267	<20	<20	<20	<20
	(D) 9/13/2017	µg/l	NM	<20	NM	NM	NM
	9/5/2018	µg/l	<20	<20	22.5	<20	<20
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	<20
	9/17/2019	µg/l	<50	<50	<50	<50	<50
	(D) 9/17/2019	µg/l	NM	NM	<50	NM	NM
	9/15/2020	µg/l	<10	128	<10	<10	<10
	(D) 9/15/2020	µg/l	NM	NM	NM	<10	NM
	9/7/2021	µg/l	<10	11.2	<10	<10	<10
	(D) 9/7/2021	µg/l	NM	NM	NM	NM	<10
	9/6/2022	µg/l	<10	14.2	12.6	<10	<10
	(D) 9/6/2022	µg/l	NM	NM	NM	NM	<10
	9/5/2023	µg/l	<6.4	32.3	8.19	<6.4	<6.4
	(D) 9/5/2023	µg/l	NM	NM	NM	<6.4	NM
Chloride SMCL = 250000	9/8/2016	µg/l	10300	<5000	<5000	12500	5290
	(D) 9/8/2016	µg/l	12100	NM	NM	NM	NM
	9/13/2017	µg/l	21700	<5000	10200	15800	39700
	(D) 9/13/2017	µg/l	NM	<5000	NM	NM	NM
	9/5/2018	µg/l	23300	<5000	47500	26300	12000
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	14300
	9/17/2019	µg/l	17500	3300	4200	15400	28900
	(D) 9/17/2019	µg/l	NM	NM	3500	NM	NM
	9/15/2020	µg/l	10200	4500	5540	16700	9790
	(D) 9/15/2020	µg/l	NM	NM	NM	14500	NM
	9/7/2021	µg/l	8800	4550	2380	2690	21600
	(D) 9/7/2021	µg/l	NM	4020	NM	NM	NM
	9/6/2022	µg/l	11900	358	<2.25	4250	19400
	(D) 9/6/2022	µg/l	NM	3610	NM	NM	NM
	9/5/2023	µg/l	14300	3130	68500	7700	13600
	(D) 9/5/2023	µg/l	NM	NM	NM	6370	NM
Sulfate SMCL = 250000	9/8/2016	µg/l	8750	352000	17400	69800	40900
	(D) 9/8/2016	µg/l	8560	NM	NM	NM	NM
	9/13/2017	µg/l	25900	340000	92000	64900	441000
	(D) 9/13/2017	µg/l	NM	337000	NM	NM	NM
	9/5/2018	µg/l	24600	351000	224000	79500	90600
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	119000
	9/17/2019	µg/l	29600	363000	49100	120000	349000
	(D) 9/17/2019	µg/l	NM	NM	49000	NM	NM
	9/15/2020	µg/l	39600	327000	26800	106000	102000
	(D) 9/15/2020	µg/l	NM	NM	NM	120000	NM
	9/7/2021	µg/l	15100	354000	42500	53400	435000
	(D) 9/7/2021	µg/l	NM	355000	NM	NM	NM
	9/6/2022	µg/l	18800	327000	47500	72800	416000
	(D) 9/6/2022	µg/l	NM	319000	NM	NM	NM
	9/5/2023	µg/l	26300	386000	713000	154000	244000
	(D) 9/5/2023	µg/l	NM	NM	NM	137000	NM
Alkalinity Supplemental	9/8/2016	µg/l	88800	247000	98700	173000	128000
	(D) 9/8/2016	µg/l	88800	NM	NM	NM	NM
	9/13/2017	µg/l	252000	257000	123000	227000	296000
	(D) 9/13/2017	µg/l	NM	257000	NM	NM	NM
	9/5/2018	µg/l	294000	265000	10700	241000	246000
	(D) 9/5/2018	µg/l	NM	NM	NM	NM	243000
	9/17/2019	µg/l	271000	286000	180000	238000	279000
	(D) 9/17/2019	µg/l	NM	NM	178000	NM	NM
	9/15/2020	µg/l	211000	227000	64800	227000	151000
	(D) 9/15/2020	µg/l	NM	NM	NM	227000	NM

Constituent (CAS #)	Sample Date	Units	MW1-91	FL-9	MW3-91	MW5-91	MW6-91
	9/7/2021	µg/l	206000	283000	124000	180000	263000
	(D) 9/7/2021	µg/l	NM	283000	NM	NM	NM
	9/6/2022	µg/l	266000	285000	114000	209000	285000
	(D) 9/6/2022	µg/l	NM	266000	NM	NM	NM
	9/5/2023	µg/l	234000	244000	119000	173000	220000
	(D) 9/5/2023	µg/l	NM	NM	NM	173000	NM
ph (field) SMCL = 6.5 to 8.5 <i>Supplemental</i>	9/8/2016	SU	6.67	7.07	6.58	6.68	6.88
	(D) 9/8/2016	SU	6.67	NM	NM	NM	NM
	9/13/2017	SU	6.86	7.22	6.44	6.76	6.62
	(D) 9/13/2017	SU	NM	7.22	NM	NM	NM
	9/5/2018	SU	6.84	7.22	6.44	6.76	6.62
	(D) 9/5/2018	SU	NM	NM	NM	NM	6.62
	9/17/2019	SU	6.86	7.97	7.22	7.49	7.45
	(D) 9/17/2019	SU	NM	NM	7.22	NM	NM
	9/15/2020	SU	6.71	7.02	6.88	6.5	6.59
	(D) 9/15/2020	SU	NM	NM	NM	6.5	NM
	9/7/2021	SU	8.5	8.2	8	8.1	8
	(D) 9/7/2021	SU	NM	NM	NM	NM	NM
	9/6/2022	SU	7.35	7.49	6.77	7.03	7.14
	(D) 9/6/2022	SU	NM	7.49	NM	NM	NM
	9/5/2023	SU	7.27	7.58	6.9	6.94	7.02
	(D) 9/5/2023	SU	NM	NM	NM	6.94	NM
ph (lab) SMCL = 6.5 to 8.5 <i>Supplemental</i>	9/8/2016	SU	6.82	7.29	6.75	6.82	7.09
	(D) 9/8/2016	SU	6.87	NM	NM	NM	NM
	9/13/2017	SU	7.06	7.44	6.69	6.96	6.82
	(D) 9/13/2017	SU	NM	7.44	NM	NM	NM
	9/5/2018	SU	6.84	7.26	6.73	7.01	6.98
	(D) 9/5/2018	SU	NM	NM	NM	NM	6.98
	9/17/2019	SU	7.3	7.3	7	7	6.9
	(D) 9/17/2019	SU	NM	NM	7	NM	NM
	9/15/2020	SU	7.03	6.96	6.7	6.96	7.21
	(D) 9/15/2020	SU	NM	NM	NM	6.96	NM
	9/7/2021	SU	7.01	7.29	6.5	6.73	6.71
	(D) 9/7/2021	SU	NM	7.41	NM	NM	NM
	9/6/2022	SU	6.99	7.38	6.59	6.78	6.77
	(D) 9/6/2022	SU	NM	7.41	NM	NM	NM
	9/5/2023	SU	7.14	7.51	6.6	7.12	7.14
	(D) 9/5/2023	SU	NM	NM	NM	7.03	NM

Comments:

1. MCL = USEPA Maximum Contaminant Level
2. HAL = Health Advisory Level
3. SMCL = USEPA Secondary MCL
4. SS = Iowa Statewide Standards
5. (D) = Duplicate Sample

This worksheet;

- 1) Looks for gaps in data record and if an explanation for those gaps was prepared.
- 2) Examines if RLs are reasonable and if they have changed over the course of the project.

Table 9
Historic Control Limit & Action Level Exceedances
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Monitoring Well	Constituent	F a l l	F a l l	F a l l	F a l l	F a l l	F a l l	F a l l	F a l l
		2016	2017	2018	2019	2020	2021	2022	2023
MW1-91	Cobalt								
	Manganese								
	Aluminum								
	Iron								
FL-9	Barium								
	Calcium								
	Magnesium								
	Selenium								
	Sulfate								
	pH								
	Aluminum								
	Iron								
MW3-91	Boron								
	Calcium								
	Cobalt								
	Magnesium								
	Chloride								
	Sulfate								
	pH								
	Aluminum								
	Iron								
	Sodium								
MW5-91	Boron								
	Calcium								
	Magnesium								
	Chloride								
	Sulfate								
	Sodium								
MW6-91	Aluminum								
	Boron								
	Calcium								
	Magnesium								
	Sodium								
	Chloride								
	Sulfate								
	Iron								
	Manganese								

Comments:

1. Gray = Control Limit (CL)
2. Black = Action Level (AL)
3. CL from 2021 used for 2016 through 2021

This worksheet;

- 1) Summarizes the historical extent of groundwater impact,
- 2) Tracks GWQAP effectiveness, and
- 3) Potentially highlights sequential degradation of contaminants of concern.

Table 10
Groundwater Quality Assessment Plan Trend Analysis
2023 Annual Water Quality Report
IAAAP - CCR Landfill
Permit No. 29-SDP-03-82P

Well	Current AL Exceedance	Trend
-	-	-

Comments:

1. No Wells in "Corrective Action"

This worksheet;

- 1) Summarizes progress to ending groundwater quality assessment.*

Appendix A

Laboratory Analytical Reports

ANALYTICAL REPORT

PREPARED FOR

Attn: Jessica A Coca (Cary), P.E.
Klingner & Associates PC
610 N 4th St
Suite #100
Burlington, Iowa 52601

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JOB DESCRIPTION

American Ordnance CCR Landfill

JOB NUMBER

310-264355-1

Eurofins Cedar Falls

Job Notes

This report may not be reproduced except in full, and with written approval from the laboratory. The results relate only to the samples tested. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

The test results in this report relate only to the samples as received by the laboratory and will meet all requirements of the methodology, with any exceptions noted. This report shall not be reproduced except in full, without the express written approval of the laboratory. All questions should be directed to the Eurofins Environment Testing North Central, LLC Project Manager.

Authorization



Authorized for release by
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Case Narrative

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Job ID: 310-264355-1

Laboratory: Eurofins Cedar Falls

Narrative

Job Narrative 310-264355-1

Analytical test results meet all requirements of the associated regulatory program listed on the Accreditation/Certification Summary Page unless otherwise noted under the individual analysis. Data qualifiers are applied to indicate exceptions. Noncompliant quality control (QC) is further explained in narrative comments.

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD may be performed, unless otherwise specified in the method. Surrogate and/or isotope dilution analyte recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in the narrative.

Regulated compliance samples (e.g. SDWA, NPDES) must comply with the associated agency requirements/permits.

Receipt

The samples were received on 9/8/2023 9:25 AM. Unless otherwise noted below, the samples arrived in good condition, and, where required, properly preserved and on ice. The temperature of the cooler at receipt time was 2.1°C

HPLC/IC

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Metals

Method 6020B: The continuing calibration verification (CCV) associated with batch 310-399677 recovered above the upper control limit for Potassium and Manganese. The samples associated with this CCV were non-detects for the affected analytes; therefore, the data have been reported. The associated sample is impacted: Field Blank (310-264355-7).

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

General Chemistry

No additional analytical or quality issues were noted, other than those described above or in the Definitions/ Glossary page.

Sample Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
310-264355-1	FL-9	Ground Water	09/05/23 00:00	09/08/23 09:25
310-264355-2	MW-3-91	Ground Water	09/05/23 00:00	09/08/23 09:25
310-264355-3	MW-5-91	Ground Water	09/05/23 00:00	09/08/23 09:25
310-264355-4	MW-6-91	Ground Water	09/05/23 00:00	09/08/23 09:25
310-264355-5	MW-1-91	Ground Water	09/05/23 00:00	09/08/23 09:25
310-264355-6	Duplicate	Ground Water	09/05/23 00:00	09/08/23 09:25
310-264355-7	Field Blank	Ground Water	09/05/23 00:00	09/08/23 09:25

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Detection Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: FL-9

Lab Sample ID: 310-264355-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	3.13	J	5.00	2.25	mg/L	5		9056A	Total/NA
Sulfate	386		5.00	2.10	mg/L	5		9056A	Total/NA
Aluminum	0.317		0.0500	0.0170	mg/L	1		6020B	Total/NA
Barium	0.0605		0.00200	0.000640	mg/L	1		6020B	Total/NA
Cadmium	0.000314		0.000200	0.000100	mg/L	1		6020B	Total/NA
Calcium	154		0.500	0.190	mg/L	1		6020B	Total/NA
Cobalt	0.00179		0.000500	0.000170	mg/L	1		6020B	Total/NA
Copper	0.00601		0.00500	0.00180	mg/L	1		6020B	Total/NA
Iron	0.750		0.100	0.0360	mg/L	1		6020B	Total/NA
Lead	0.00334		0.000500	0.000240	mg/L	1		6020B	Total/NA
Magnesium	53.6		0.500	0.150	mg/L	1		6020B	Total/NA
Manganese	0.0910		0.0100	0.00360	mg/L	1		6020B	Total/NA
Potassium	0.332	J	0.500	0.150	mg/L	1		6020B	Total/NA
Selenium	0.00558		0.00500	0.00140	mg/L	1		6020B	Total/NA
Sodium	17.5		1.00	0.460	mg/L	1		6020B	Total/NA
Strontium	0.304		0.00100	0.000530	mg/L	1		6020B	Total/NA
Zinc	0.0323		0.0200	0.00640	mg/L	1		6020B	Total/NA
pH	7.51	HF	1.00	1.00	SU	1		9040C	Total/NA
Alkalinity as CaCO ₃ to pH 4.5	244		5.00	2.50	mg/L	1		SM 2320B	Total/NA
Bicarbonate Alkalinity as CaCO ₃	244		5.00	2.50	mg/L	1		SM 2320B	Total/NA

Client Sample ID: MW-3-91

Lab Sample ID: 310-264355-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	68.5		5.00	2.25	mg/L	5		9056A	Total/NA
Sulfate	713		50.0	21.0	mg/L	50		9056A	Total/NA
Aluminum	0.0562		0.0500	0.0170	mg/L	1		6020B	Total/NA
Barium	0.123		0.00200	0.000640	mg/L	1		6020B	Total/NA
Boron	0.148		0.100	0.0760	mg/L	1		6020B	Total/NA
Cadmium	0.000220		0.000200	0.000100	mg/L	1		6020B	Total/NA
Calcium	187		0.500	0.190	mg/L	1		6020B	Total/NA
Cobalt	0.00178		0.000500	0.000170	mg/L	1		6020B	Total/NA
Iron	0.116		0.100	0.0360	mg/L	1		6020B	Total/NA
Lead	0.000620		0.000500	0.000240	mg/L	1		6020B	Total/NA
Magnesium	57.3		0.500	0.150	mg/L	1		6020B	Total/NA
Manganese	0.0710		0.0100	0.00360	mg/L	1		6020B	Total/NA
Potassium	1.78		0.500	0.150	mg/L	1		6020B	Total/NA
Sodium	53.3		1.00	0.460	mg/L	1		6020B	Total/NA
Strontium	0.593		0.00100	0.000530	mg/L	1		6020B	Total/NA
Zinc	0.00819	J	0.0200	0.00640	mg/L	1		6020B	Total/NA
pH	6.60	HF	1.00	1.00	SU	1		9040C	Total/NA
Alkalinity as CaCO ₃ to pH 4.5	119		5.00	2.50	mg/L	1		SM 2320B	Total/NA
Bicarbonate Alkalinity as CaCO ₃	119		5.00	2.50	mg/L	1		SM 2320B	Total/NA

Client Sample ID: MW-5-91

Lab Sample ID: 310-264355-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	7.70		5.00	2.25	mg/L	5		9056A	Total/NA
Sulfate	154		5.00	2.10	mg/L	5		9056A	Total/NA
Aluminum	0.0275	J	0.0500	0.0170	mg/L	1		6020B	Total/NA
Barium	0.0801		0.00200	0.000640	mg/L	1		6020B	Total/NA
Boron	0.160		0.100	0.0760	mg/L	1		6020B	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins Cedar Falls

Detection Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: MW-5-91 (Continued)

Lab Sample ID: 310-264355-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.000242		0.000200	0.000100	mg/L	1		6020B	Total/NA
Calcium	61.9		0.500	0.190	mg/L	1		6020B	Total/NA
Cobalt	0.000551		0.000500	0.000170	mg/L	1		6020B	Total/NA
Iron	0.0508	J	0.100	0.0360	mg/L	1		6020B	Total/NA
Lead	0.000480	J	0.000500	0.000240	mg/L	1		6020B	Total/NA
Magnesium	25.1		0.500	0.150	mg/L	1		6020B	Total/NA
Manganese	0.0269		0.0100	0.00360	mg/L	1		6020B	Total/NA
Potassium	0.212	J	0.500	0.150	mg/L	1		6020B	Total/NA
Sodium	24.1		1.00	0.460	mg/L	1		6020B	Total/NA
Strontium	0.189		0.00100	0.000530	mg/L	1		6020B	Total/NA
pH	7.12	HF	1.00	1.00	SU	1		9040C	Total/NA
Alkalinity as CaCO ₃ to pH 4.5	173		5.00	2.50	mg/L	1		SM 2320B	Total/NA
Bicarbonate Alkalinity as CaCO ₃	173		5.00	2.50	mg/L	1		SM 2320B	Total/NA

Client Sample ID: MW-6-91

Lab Sample ID: 310-264355-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	13.6		5.00	2.25	mg/L	5		9056A	Total/NA
Sulfate	244		5.00	2.10	mg/L	5		9056A	Total/NA
Aluminum	0.0346	J	0.0500	0.0170	mg/L	1		6020B	Total/NA
Barium	0.0587		0.00200	0.000640	mg/L	1		6020B	Total/NA
Boron	0.166		0.100	0.0760	mg/L	1		6020B	Total/NA
Calcium	102		0.500	0.190	mg/L	1		6020B	Total/NA
Cobalt	0.000179	J	0.000500	0.000170	mg/L	1		6020B	Total/NA
Copper	0.00249	J	0.00500	0.00180	mg/L	1		6020B	Total/NA
Lead	0.000365	J	0.000500	0.000240	mg/L	1		6020B	Total/NA
Magnesium	33.5		0.500	0.150	mg/L	1		6020B	Total/NA
Manganese	0.00544	J	0.0100	0.00360	mg/L	1		6020B	Total/NA
Potassium	0.557		0.500	0.150	mg/L	1		6020B	Total/NA
Sodium	14.9		1.00	0.460	mg/L	1		6020B	Total/NA
Strontium	0.167		0.00100	0.000530	mg/L	1		6020B	Total/NA
pH	7.14	HF	1.00	1.00	SU	1		9040C	Total/NA
Alkalinity as CaCO ₃ to pH 4.5	220		5.00	2.50	mg/L	1		SM 2320B	Total/NA
Bicarbonate Alkalinity as CaCO ₃	220		5.00	2.50	mg/L	1		SM 2320B	Total/NA

Client Sample ID: MW-1-91

Lab Sample ID: 310-264355-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	14.3		5.00	2.25	mg/L	5		9056A	Total/NA
Sulfate	26.3		5.00	2.10	mg/L	5		9056A	Total/NA
Aluminum	0.0937		0.0500	0.0170	mg/L	1		6020B	Total/NA
Arsenic	0.00172	J	0.00200	0.000530	mg/L	1		6020B	Total/NA
Barium	0.171		0.00200	0.000640	mg/L	1		6020B	Total/NA
Boron	0.0827	J	0.100	0.0760	mg/L	1		6020B	Total/NA
Calcium	62.4		0.500	0.190	mg/L	1		6020B	Total/NA
Cobalt	0.00213		0.000500	0.000170	mg/L	1		6020B	Total/NA
Copper	0.00269	J	0.00500	0.00180	mg/L	1		6020B	Total/NA
Iron	1.32		0.100	0.0360	mg/L	1		6020B	Total/NA
Lead	0.000739		0.000500	0.000240	mg/L	1		6020B	Total/NA
Magnesium	17.3		0.500	0.150	mg/L	1		6020B	Total/NA
Manganese	0.233		0.0100	0.00360	mg/L	1		6020B	Total/NA
Potassium	2.50		0.500	0.150	mg/L	1		6020B	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins Cedar Falls

Detection Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: MW-1-91 (Continued)

Lab Sample ID: 310-264355-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Sodium	9.90		1.00	0.460	mg/L	1		6020B	Total/NA
Strontium	0.170		0.00100	0.000530	mg/L	1		6020B	Total/NA
pH	7.14	HF	1.00	1.00	SU	1		9040C	Total/NA
Alkalinity as CaCO ₃ to pH 4.5	234		5.00	2.50	mg/L	1		SM 2320B	Total/NA
Bicarbonate Alkalinity as CaCO ₃	234		5.00	2.50	mg/L	1		SM 2320B	Total/NA

Client Sample ID: Duplicate

Lab Sample ID: 310-264355-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Chloride	6.37		5.00	2.25	mg/L	5		9056A	Total/NA
Sulfate	137		5.00	2.10	mg/L	5		9056A	Total/NA
Aluminum	0.0253	J	0.0500	0.0170	mg/L	1		6020B	Total/NA
Barium	0.0770		0.00200	0.000640	mg/L	1		6020B	Total/NA
Boron	0.150		0.100	0.0760	mg/L	1		6020B	Total/NA
Cadmium	0.000244		0.000200	0.000100	mg/L	1		6020B	Total/NA
Calcium	60.2		0.500	0.190	mg/L	1		6020B	Total/NA
Cobalt	0.000559		0.000500	0.000170	mg/L	1		6020B	Total/NA
Iron	0.0489	J	0.100	0.0360	mg/L	1		6020B	Total/NA
Lead	0.000451	J	0.000500	0.000240	mg/L	1		6020B	Total/NA
Magnesium	24.2		0.500	0.150	mg/L	1		6020B	Total/NA
Manganese	0.0267		0.0100	0.00360	mg/L	1		6020B	Total/NA
Potassium	0.209	J	0.500	0.150	mg/L	1		6020B	Total/NA
Sodium	23.4		1.00	0.460	mg/L	1		6020B	Total/NA
Strontium	0.181		0.00100	0.000530	mg/L	1		6020B	Total/NA
pH	7.03	HF	1.00	1.00	SU	1		9040C	Total/NA
Alkalinity as CaCO ₃ to pH 4.5	173		5.00	2.50	mg/L	1		SM 2320B	Total/NA
Bicarbonate Alkalinity as CaCO ₃	173		5.00	2.50	mg/L	1		SM 2320B	Total/NA

Client Sample ID: Field Blank

Lab Sample ID: 310-264355-7

Analyte	Result	Qualifier	RL	RL	Unit	Dil Fac	D	Method	Prep Type
pH	6.02	HF	1.00	1.00	SU	1		9040C	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins Cedar Falls

Client Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: FL-9

Lab Sample ID: 310-264355-1

Date Collected: 09/05/23 00:00

Matrix: Ground Water

Date Received: 09/08/23 09:25

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	3.13	J	5.00	2.25	mg/L			09/14/23 15:49	5
Sulfate	386		5.00	2.10	mg/L			09/14/23 15:49	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.317		0.0500	0.0170	mg/L		09/13/23 08:40	09/15/23 00:54	1
Arsenic	<0.000530		0.00200	0.000530	mg/L		09/13/23 08:40	09/15/23 00:54	1
Barium	0.0605		0.00200	0.000640	mg/L		09/13/23 08:40	09/15/23 00:54	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/15/23 00:54	1
Boron	<0.0760		0.100	0.0760	mg/L		09/13/23 08:40	09/15/23 00:54	1
Cadmium	0.000314		0.000200	0.000100	mg/L		09/13/23 08:40	09/15/23 00:54	1
Calcium	154		0.500	0.190	mg/L		09/13/23 08:40	09/15/23 00:54	1
Cobalt	0.00179		0.000500	0.000170	mg/L		09/13/23 08:40	09/15/23 00:54	1
Copper	0.00601		0.00500	0.00180	mg/L		09/13/23 08:40	09/15/23 00:54	1
Iron	0.750		0.100	0.0360	mg/L		09/13/23 08:40	09/15/23 00:54	1
Lead	0.00334		0.000500	0.000240	mg/L		09/13/23 08:40	09/15/23 00:54	1
Magnesium	53.6		0.500	0.150	mg/L		09/13/23 08:40	09/15/23 00:54	1
Manganese	0.0910		0.0100	0.00360	mg/L		09/13/23 08:40	09/21/23 12:04	1
Potassium	0.332	J	0.500	0.150	mg/L		09/13/23 08:40	09/21/23 12:04	1
Selenium	0.00558		0.00500	0.00140	mg/L		09/13/23 08:40	09/15/23 00:54	1
Sodium	17.5		1.00	0.460	mg/L		09/13/23 08:40	09/15/23 00:54	1
Strontium	0.304		0.00100	0.000530	mg/L		09/13/23 08:40	09/15/23 00:54	1
Zinc	0.0323		0.0200	0.00640	mg/L		09/13/23 08:40	09/21/23 12:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO ₃ to pH 4.5 (SM 2320B)	244		5.00	2.50	mg/L			09/15/23 12:36	1
Bicarbonate Alkalinity as CaCO ₃ (SM 2320B)	244		5.00	2.50	mg/L			09/15/23 12:36	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9040C)	7.51	HF	1.00	1.00	SU			09/08/23 16:32	1

Eurofins Cedar Falls

Client Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: MW-3-91

Lab Sample ID: 310-264355-2

Date Collected: 09/05/23 00:00

Matrix: Ground Water

Date Received: 09/08/23 09:25

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	68.5		5.00	2.25	mg/L			09/14/23 16:04	5
Sulfate	713		50.0	21.0	mg/L			09/15/23 17:37	50

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.0562		0.0500	0.0170	mg/L		09/13/23 08:40	09/15/23 00:56	1
Arsenic	<0.000530		0.00200	0.000530	mg/L		09/13/23 08:40	09/15/23 00:56	1
Barium	0.123		0.00200	0.000640	mg/L		09/13/23 08:40	09/15/23 00:56	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/15/23 00:56	1
Boron	0.148		0.100	0.0760	mg/L		09/13/23 08:40	09/15/23 00:56	1
Cadmium	0.000220		0.000200	0.000100	mg/L		09/13/23 08:40	09/15/23 00:56	1
Calcium	187		0.500	0.190	mg/L		09/13/23 08:40	09/15/23 00:56	1
Cobalt	0.00178		0.000500	0.000170	mg/L		09/13/23 08:40	09/15/23 00:56	1
Copper	<0.00180		0.00500	0.00180	mg/L		09/13/23 08:40	09/15/23 00:56	1
Iron	0.116		0.100	0.0360	mg/L		09/13/23 08:40	09/15/23 00:56	1
Lead	0.000620		0.000500	0.000240	mg/L		09/13/23 08:40	09/15/23 00:56	1
Magnesium	57.3		0.500	0.150	mg/L		09/13/23 08:40	09/15/23 00:56	1
Manganese	0.0710		0.0100	0.00360	mg/L		09/13/23 08:40	09/21/23 12:07	1
Potassium	1.78		0.500	0.150	mg/L		09/13/23 08:40	09/21/23 12:07	1
Selenium	<0.00140		0.00500	0.00140	mg/L		09/13/23 08:40	09/15/23 00:56	1
Sodium	53.3		1.00	0.460	mg/L		09/13/23 08:40	09/15/23 00:56	1
Strontium	0.593		0.00100	0.000530	mg/L		09/13/23 08:40	09/15/23 00:56	1
Zinc	0.00819	J	0.0200	0.00640	mg/L		09/13/23 08:40	09/21/23 12:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 to pH 4.5 (SM 2320B)	119		5.00	2.50	mg/L			09/15/23 12:45	1
Bicarbonate Alkalinity as CaCO3 (SM 2320B)	119		5.00	2.50	mg/L			09/15/23 12:45	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9040C)	6.60	HF	1.00	1.00	SU			09/08/23 16:40	1

Eurofins Cedar Falls

Client Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: MW-5-91

Lab Sample ID: 310-264355-3

Date Collected: 09/05/23 00:00

Matrix: Ground Water

Date Received: 09/08/23 09:25

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	7.70		5.00	2.25	mg/L			09/14/23 16:18	5
Sulfate	154		5.00	2.10	mg/L			09/14/23 16:18	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.0275	J	0.0500	0.0170	mg/L		09/13/23 08:40	09/15/23 01:01	1
Arsenic	<0.000530		0.00200	0.000530	mg/L		09/13/23 08:40	09/15/23 01:01	1
Barium	0.0801		0.00200	0.000640	mg/L		09/13/23 08:40	09/15/23 01:01	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/15/23 01:01	1
Boron	0.160		0.100	0.0760	mg/L		09/13/23 08:40	09/15/23 01:01	1
Cadmium	0.000242		0.000200	0.000100	mg/L		09/13/23 08:40	09/15/23 01:01	1
Calcium	61.9		0.500	0.190	mg/L		09/13/23 08:40	09/15/23 01:01	1
Cobalt	0.000551		0.000500	0.000170	mg/L		09/13/23 08:40	09/15/23 01:01	1
Copper	<0.00180		0.00500	0.00180	mg/L		09/13/23 08:40	09/15/23 01:01	1
Iron	0.0508	J	0.100	0.0360	mg/L		09/13/23 08:40	09/15/23 01:01	1
Lead	0.000480	J	0.000500	0.000240	mg/L		09/13/23 08:40	09/15/23 01:01	1
Magnesium	25.1		0.500	0.150	mg/L		09/13/23 08:40	09/15/23 01:01	1
Manganese	0.0269		0.0100	0.00360	mg/L		09/13/23 08:40	09/21/23 12:15	1
Potassium	0.212	J	0.500	0.150	mg/L		09/13/23 08:40	09/21/23 12:15	1
Selenium	<0.00140		0.00500	0.00140	mg/L		09/13/23 08:40	09/15/23 01:01	1
Sodium	24.1		1.00	0.460	mg/L		09/13/23 08:40	09/15/23 01:01	1
Strontium	0.189		0.00100	0.000530	mg/L		09/13/23 08:40	09/15/23 01:01	1
Zinc	<0.00640		0.0200	0.00640	mg/L		09/13/23 08:40	09/21/23 12:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 to pH 4.5 (SM 2320B)	173		5.00	2.50	mg/L			09/15/23 12:52	1
Bicarbonate Alkalinity as CaCO3 (SM 2320B)	173		5.00	2.50	mg/L			09/15/23 12:52	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9040C)	7.12	HF	1.00	1.00	SU			09/08/23 16:34	1

Eurofins Cedar Falls

Client Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: MW-6-91

Lab Sample ID: 310-264355-4

Date Collected: 09/05/23 00:00

Matrix: Ground Water

Date Received: 09/08/23 09:25

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	13.6		5.00	2.25	mg/L			09/14/23 16:32	5
Sulfate	244		5.00	2.10	mg/L			09/14/23 16:32	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.0346	J	0.0500	0.0170	mg/L		09/13/23 08:40	09/15/23 01:03	1
Arsenic	<0.000530		0.00200	0.000530	mg/L		09/13/23 08:40	09/15/23 01:03	1
Barium	0.0587		0.00200	0.000640	mg/L		09/13/23 08:40	09/15/23 01:03	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/15/23 01:03	1
Boron	0.166		0.100	0.0760	mg/L		09/13/23 08:40	09/15/23 01:03	1
Cadmium	<0.000100		0.000200	0.000100	mg/L		09/13/23 08:40	09/15/23 01:03	1
Calcium	102		0.500	0.190	mg/L		09/13/23 08:40	09/15/23 01:03	1
Cobalt	0.000179	J	0.000500	0.000170	mg/L		09/13/23 08:40	09/15/23 01:03	1
Copper	0.00249	J	0.00500	0.00180	mg/L		09/13/23 08:40	09/15/23 01:03	1
Iron	<0.0360		0.100	0.0360	mg/L		09/13/23 08:40	09/15/23 01:03	1
Lead	0.000365	J	0.000500	0.000240	mg/L		09/13/23 08:40	09/15/23 01:03	1
Magnesium	33.5		0.500	0.150	mg/L		09/13/23 08:40	09/15/23 01:03	1
Manganese	0.00544	J	0.0100	0.00360	mg/L		09/13/23 08:40	09/21/23 12:18	1
Potassium	0.557		0.500	0.150	mg/L		09/13/23 08:40	09/21/23 12:18	1
Selenium	<0.00140		0.00500	0.00140	mg/L		09/13/23 08:40	09/15/23 01:03	1
Sodium	14.9		1.00	0.460	mg/L		09/13/23 08:40	09/15/23 01:03	1
Strontium	0.167		0.00100	0.000530	mg/L		09/13/23 08:40	09/15/23 01:03	1
Zinc	<0.00640		0.0200	0.00640	mg/L		09/13/23 08:40	09/21/23 12:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 to pH 4.5 (SM 2320B)	220		5.00	2.50	mg/L			09/15/23 13:01	1
Bicarbonate Alkalinity as CaCO3 (SM 2320B)	220		5.00	2.50	mg/L			09/15/23 13:01	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9040C)	7.14	HF	1.00	1.00	SU			09/08/23 16:39	1

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Client Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: MW-1-91

Lab Sample ID: 310-264355-5

Date Collected: 09/05/23 00:00

Matrix: Ground Water

Date Received: 09/08/23 09:25

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	14.3		5.00	2.25	mg/L			09/14/23 16:46	5
Sulfate	26.3		5.00	2.10	mg/L			09/14/23 16:46	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.0937		0.0500	0.0170	mg/L		09/13/23 08:40	09/15/23 01:06	1
Arsenic	0.00172	J	0.00200	0.000530	mg/L		09/13/23 08:40	09/15/23 01:06	1
Barium	0.171		0.00200	0.000640	mg/L		09/13/23 08:40	09/15/23 01:06	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/15/23 01:06	1
Boron	0.0827	J	0.100	0.0760	mg/L		09/13/23 08:40	09/15/23 01:06	1
Cadmium	<0.000100		0.000200	0.000100	mg/L		09/13/23 08:40	09/15/23 01:06	1
Calcium	62.4		0.500	0.190	mg/L		09/13/23 08:40	09/15/23 01:06	1
Cobalt	0.00213		0.000500	0.000170	mg/L		09/13/23 08:40	09/15/23 01:06	1
Copper	0.00269	J	0.00500	0.00180	mg/L		09/13/23 08:40	09/15/23 01:06	1
Iron	1.32		0.100	0.0360	mg/L		09/13/23 08:40	09/15/23 01:06	1
Lead	0.000739		0.000500	0.000240	mg/L		09/13/23 08:40	09/15/23 01:06	1
Magnesium	17.3		0.500	0.150	mg/L		09/13/23 08:40	09/15/23 01:06	1
Manganese	0.233		0.0100	0.00360	mg/L		09/13/23 08:40	09/21/23 12:22	1
Potassium	2.50		0.500	0.150	mg/L		09/13/23 08:40	09/21/23 12:22	1
Selenium	<0.00140		0.00500	0.00140	mg/L		09/13/23 08:40	09/15/23 01:06	1
Sodium	9.90		1.00	0.460	mg/L		09/13/23 08:40	09/15/23 01:06	1
Strontium	0.170		0.00100	0.000530	mg/L		09/13/23 08:40	09/15/23 01:06	1
Zinc	<0.00640		0.0200	0.00640	mg/L		09/13/23 08:40	09/21/23 12:22	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 to pH 4.5 (SM 2320B)	234		5.00	2.50	mg/L			09/15/23 13:10	1
Bicarbonate Alkalinity as CaCO3 (SM 2320B)	234		5.00	2.50	mg/L			09/15/23 13:10	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9040C)	7.14	HF	1.00	1.00	SU			09/08/23 16:37	1

Eurofins Cedar Falls

Client Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: Duplicate

Lab Sample ID: 310-264355-6

Date Collected: 09/05/23 00:00

Matrix: Ground Water

Date Received: 09/08/23 09:25

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	6.37		5.00	2.25	mg/L			09/14/23 17:00	5
Sulfate	137		5.00	2.10	mg/L			09/14/23 17:00	5

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	0.0253	J	0.0500	0.0170	mg/L		09/13/23 08:40	09/15/23 01:17	1
Arsenic	<0.000530		0.00200	0.000530	mg/L		09/13/23 08:40	09/15/23 01:17	1
Barium	0.0770		0.00200	0.000640	mg/L		09/13/23 08:40	09/15/23 01:17	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/15/23 01:17	1
Boron	0.150		0.100	0.0760	mg/L		09/13/23 08:40	09/15/23 01:17	1
Cadmium	0.000244		0.000200	0.000100	mg/L		09/13/23 08:40	09/15/23 01:17	1
Calcium	60.2		0.500	0.190	mg/L		09/13/23 08:40	09/15/23 01:17	1
Cobalt	0.000559		0.000500	0.000170	mg/L		09/13/23 08:40	09/15/23 01:17	1
Copper	<0.00180		0.00500	0.00180	mg/L		09/13/23 08:40	09/15/23 01:17	1
Iron	0.0489	J	0.100	0.0360	mg/L		09/13/23 08:40	09/15/23 01:17	1
Lead	0.000451	J	0.000500	0.000240	mg/L		09/13/23 08:40	09/15/23 01:17	1
Magnesium	24.2		0.500	0.150	mg/L		09/13/23 08:40	09/15/23 01:17	1
Manganese	0.0267		0.0100	0.00360	mg/L		09/13/23 08:40	09/21/23 12:25	1
Potassium	0.209	J	0.500	0.150	mg/L		09/13/23 08:40	09/21/23 12:25	1
Selenium	<0.00140		0.00500	0.00140	mg/L		09/13/23 08:40	09/15/23 01:17	1
Sodium	23.4		1.00	0.460	mg/L		09/13/23 08:40	09/15/23 01:17	1
Strontium	0.181		0.00100	0.000530	mg/L		09/13/23 08:40	09/15/23 01:17	1
Zinc	<0.00640		0.0200	0.00640	mg/L		09/13/23 08:40	09/15/23 01:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 to pH 4.5 (SM 2320B)	173		5.00	2.50	mg/L			09/15/23 13:19	1
Bicarbonate Alkalinity as CaCO3 (SM 2320B)	173		5.00	2.50	mg/L			09/15/23 13:19	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9040C)	7.03	HF	1.00	1.00	SU			09/08/23 16:41	1

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Client Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: Field Blank

Lab Sample ID: 310-264355-7

Date Collected: 09/05/23 00:00

Matrix: Ground Water

Date Received: 09/08/23 09:25

Method: SW846 9056A - Anions, Ion Chromatography

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.450		1.00	0.450	mg/L			09/14/23 17:14	1
Sulfate	<0.420		1.00	0.420	mg/L			09/14/23 17:14	1

Method: SW846 6020B - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	<0.0170		0.0500	0.0170	mg/L		09/13/23 08:40	09/15/23 01:20	1
Arsenic	<0.000530		0.00200	0.000530	mg/L		09/13/23 08:40	09/15/23 01:20	1
Barium	<0.000640		0.00200	0.000640	mg/L		09/13/23 08:40	09/15/23 01:20	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/15/23 01:20	1
Boron	<0.0760		0.100	0.0760	mg/L		09/13/23 08:40	09/15/23 01:20	1
Cadmium	<0.000100		0.000200	0.000100	mg/L		09/13/23 08:40	09/15/23 01:20	1
Calcium	<0.190		0.500	0.190	mg/L		09/13/23 08:40	09/15/23 01:20	1
Cobalt	<0.000170		0.000500	0.000170	mg/L		09/13/23 08:40	09/15/23 01:20	1
Copper	<0.00180		0.00500	0.00180	mg/L		09/13/23 08:40	09/15/23 01:20	1
Iron	<0.0360		0.100	0.0360	mg/L		09/13/23 08:40	09/15/23 01:20	1
Lead	<0.000240		0.000500	0.000240	mg/L		09/13/23 08:40	09/15/23 01:20	1
Magnesium	<0.150		0.500	0.150	mg/L		09/13/23 08:40	09/15/23 01:20	1
Manganese	<0.00360	^+	0.0100	0.00360	mg/L		09/13/23 08:40	09/15/23 01:20	1
Potassium	<0.150	^+	0.500	0.150	mg/L		09/13/23 08:40	09/15/23 01:20	1
Selenium	<0.00140		0.00500	0.00140	mg/L		09/13/23 08:40	09/15/23 01:20	1
Sodium	<0.460		1.00	0.460	mg/L		09/13/23 08:40	09/15/23 01:20	1
Strontium	<0.000530		0.00100	0.000530	mg/L		09/13/23 08:40	09/15/23 01:20	1
Zinc	<0.00640		0.0200	0.00640	mg/L		09/13/23 08:40	09/15/23 01:20	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Alkalinity as CaCO3 to pH 4.5 (SM 2320B)	<2.50		5.00	2.50	mg/L			09/15/23 13:36	1
Bicarbonate Alkalinity as CaCO3 (SM 2320B)	<2.50		5.00	2.50	mg/L			09/15/23 13:36	1
Analyte	Result	Qualifier	RL	RL	Unit	D	Prepared	Analyzed	Dil Fac
pH (SW846 9040C)	6.02	HF	1.00	1.00	SU			09/08/23 16:46	1

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Definitions/Glossary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Qualifiers

HPLC/IC

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

Metals

Qualifier	Qualifier Description
^+	Continuing Calibration Verification (CCV) is outside acceptance limits, high biased.
F5	Duplicate RPD exceeds limit, and one or both sample results are less than 5 times RL, and the absolute difference between results is < the upper reporting limits for both.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
HF	Parameter with a holding time of 15 minutes. Test performed by laboratory at client's request. Sample was analyzed outside of hold time.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CFU	Colony Forming Unit
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MCL	EPA recommended "Maximum Contaminant Level"
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
MPN	Most Probable Number
MQL	Method Quantitation Limit
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
NEG	Negative / Absent
POS	Positive / Present
PQL	Practical Quantitation Limit
PRES	Presumptive
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)
TNTC	Too Numerous To Count

QC Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Method: 9056A - Anions, Ion Chromatography

Lab Sample ID: MB 310-399845/3

Matrix: Water

Analysis Batch: 399845

Client Sample ID: Method Blank

Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Chloride	<0.450		1.00	0.450	mg/L			09/14/23 13:14	1
Sulfate	<0.420		1.00	0.420	mg/L			09/14/23 13:14	1

Lab Sample ID: LCS 310-399845/4

Matrix: Water

Analysis Batch: 399845

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Chloride	10.0	9.233		mg/L		92	90 - 110
Sulfate	10.0	9.656		mg/L		97	90 - 110

Method: 6020B - Metals (ICP/MS)

Lab Sample ID: MB 310-399334/1-A

Matrix: Water

Analysis Batch: 399677

Client Sample ID: Method Blank

Prep Type: Total/NA

Prep Batch: 399334

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Aluminum	<0.0170		0.0500	0.0170	mg/L		09/13/23 08:40	09/14/23 19:05	1
Arsenic	<0.000530		0.00200	0.000530	mg/L		09/13/23 08:40	09/14/23 19:05	1
Barium	<0.000640		0.00200	0.000640	mg/L		09/13/23 08:40	09/14/23 19:05	1
Beryllium	<0.000330		0.00100	0.000330	mg/L		09/13/23 08:40	09/14/23 19:05	1
Boron	<0.0760		0.100	0.0760	mg/L		09/13/23 08:40	09/14/23 19:05	1
Cadmium	<0.000100		0.000200	0.000100	mg/L		09/13/23 08:40	09/14/23 19:05	1
Calcium	<0.190		0.500	0.190	mg/L		09/13/23 08:40	09/14/23 19:05	1
Cobalt	<0.000170		0.000500	0.000170	mg/L		09/13/23 08:40	09/14/23 19:05	1
Copper	<0.00180		0.00500	0.00180	mg/L		09/13/23 08:40	09/14/23 19:05	1
Iron	<0.0360		0.100	0.0360	mg/L		09/13/23 08:40	09/14/23 19:05	1
Lead	<0.000240		0.000500	0.000240	mg/L		09/13/23 08:40	09/14/23 19:05	1
Magnesium	<0.150		0.500	0.150	mg/L		09/13/23 08:40	09/14/23 19:05	1
Manganese	<0.00360		0.0100	0.00360	mg/L		09/13/23 08:40	09/14/23 19:05	1
Potassium	<0.150		0.500	0.150	mg/L		09/13/23 08:40	09/14/23 19:05	1
Selenium	<0.00140		0.00500	0.00140	mg/L		09/13/23 08:40	09/14/23 19:05	1
Sodium	<0.460		1.00	0.460	mg/L		09/13/23 08:40	09/14/23 19:05	1
Strontium	<0.000530		0.00100	0.000530	mg/L		09/13/23 08:40	09/14/23 19:05	1
Zinc	<0.00640		0.0200	0.00640	mg/L		09/13/23 08:40	09/14/23 19:05	1

Lab Sample ID: LCS 310-399334/2-A

Matrix: Water

Analysis Batch: 399677

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 399334

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Aluminum	0.200	0.2073		mg/L		104	80 - 120
Arsenic	0.200	0.2087		mg/L		104	80 - 120
Barium	0.100	0.1028		mg/L		103	80 - 120
Beryllium	0.100	0.1078		mg/L		108	80 - 120
Boron	0.200	0.2054		mg/L		103	80 - 120
Cadmium	0.100	0.1051		mg/L		105	80 - 120
Calcium	2.00	2.054		mg/L		103	80 - 120

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QC Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Method: 6020B - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 310-399334/2-A

Matrix: Water

Analysis Batch: 399677

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Prep Batch: 399334

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Cobalt	0.100	0.1039		mg/L		104	80 - 120
Copper	0.200	0.2241		mg/L		112	80 - 120
Iron	0.200	0.2093		mg/L		105	80 - 120
Lead	0.200	0.2120		mg/L		106	80 - 120
Magnesium	2.00	1.851		mg/L		93	80 - 120
Manganese	0.100	0.1004		mg/L		100	80 - 120
Potassium	2.00	2.220		mg/L		111	80 - 120
Selenium	0.400	0.4006		mg/L		100	80 - 120
Sodium	2.00	2.277		mg/L		114	80 - 120
Strontium	0.200	0.2004		mg/L		100	80 - 120
Zinc	0.200	0.2076		mg/L		104	80 - 120

Lab Sample ID: 310-264355-2 DU

Matrix: Ground Water

Analysis Batch: 399677

Client Sample ID: MW-3-91

Prep Type: Total/NA

Prep Batch: 399334

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Aluminum	0.0562		0.06503		mg/L		15	20
Arsenic	<0.000530		<0.000530		mg/L		NC	20
Barium	0.123		0.1227		mg/L		0.1	20
Beryllium	<0.000330		<0.000330		mg/L		NC	20
Boron	0.148		0.1480		mg/L		0.1	20
Cadmium	0.000220		0.0002230		mg/L		1	20
Calcium	187		188.0		mg/L		0.6	20
Cobalt	0.00178		0.001758		mg/L		1	20
Copper	<0.00180		<0.00180		mg/L		NC	20
Iron	0.116		0.1263		mg/L		8	20
Lead	0.000620		0.0006660		mg/L		7	20
Magnesium	57.3		58.11		mg/L		1	20
Selenium	<0.00140		<0.00140		mg/L		NC	20
Sodium	53.3		53.20		mg/L		0.3	20
Strontium	0.593		0.5828		mg/L		2	20

Lab Sample ID: 310-264355-2 DU

Matrix: Ground Water

Analysis Batch: 400278

Client Sample ID: MW-3-91

Prep Type: Total/NA

Prep Batch: 399334

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Manganese	0.0710		0.07246		mg/L		2	20
Potassium	1.78		1.803		mg/L		1	20
Zinc	0.00819	J	0.01019	J F5	mg/L		22	20

Method: 9040C - pH

Lab Sample ID: LCS 310-399053/1

Matrix: Water

Analysis Batch: 399053

Client Sample ID: Lab Control Sample

Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
pH	7.00	7.050		SU		101	98 - 102

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QC Sample Results

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Method: 9040C - pH

Lab Sample ID: 310-264355-1 DU
Matrix: Ground Water
Analysis Batch: 399053

Client Sample ID: FL-9
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	7.51	HF	7.620		SU		1	20

Lab Sample ID: 310-264355-7 DU
Matrix: Ground Water
Analysis Batch: 399053

Client Sample ID: Field Blank
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
pH	6.02	HF	5.890		SU		2	20

Method: SM 2320B - Alkalinity

Lab Sample ID: LCS 310-399792/2
Matrix: Water
Analysis Batch: 399792

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec Limits
Alkalinity as CaCO ₃ to pH 4.5	1000	940.8		mg/L		94	90 - 110

QC Association Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

HPLC/IC

Analysis Batch: 399845

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-264355-1	FL-9	Total/NA	Ground Water	9056A	
310-264355-2	MW-3-91	Total/NA	Ground Water	9056A	
310-264355-2	MW-3-91	Total/NA	Ground Water	9056A	
310-264355-3	MW-5-91	Total/NA	Ground Water	9056A	
310-264355-4	MW-6-91	Total/NA	Ground Water	9056A	
310-264355-5	MW-1-91	Total/NA	Ground Water	9056A	
310-264355-6	Duplicate	Total/NA	Ground Water	9056A	
310-264355-7	Field Blank	Total/NA	Ground Water	9056A	
MB 310-399845/3	Method Blank	Total/NA	Water	9056A	
LCS 310-399845/4	Lab Control Sample	Total/NA	Water	9056A	

Metals

Prep Batch: 399334

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-264355-1	FL-9	Total/NA	Ground Water	3005A	
310-264355-2	MW-3-91	Total/NA	Ground Water	3005A	
310-264355-3	MW-5-91	Total/NA	Ground Water	3005A	
310-264355-4	MW-6-91	Total/NA	Ground Water	3005A	
310-264355-5	MW-1-91	Total/NA	Ground Water	3005A	
310-264355-6	Duplicate	Total/NA	Ground Water	3005A	
310-264355-7	Field Blank	Total/NA	Ground Water	3005A	
MB 310-399334/1-A	Method Blank	Total/NA	Water	3005A	
LCS 310-399334/2-A	Lab Control Sample	Total/NA	Water	3005A	
310-264355-2 DU	MW-3-91	Total/NA	Ground Water	3005A	

Analysis Batch: 399677

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-264355-1	FL-9	Total/NA	Ground Water	6020B	399334
310-264355-2	MW-3-91	Total/NA	Ground Water	6020B	399334
310-264355-3	MW-5-91	Total/NA	Ground Water	6020B	399334
310-264355-4	MW-6-91	Total/NA	Ground Water	6020B	399334
310-264355-5	MW-1-91	Total/NA	Ground Water	6020B	399334
310-264355-6	Duplicate	Total/NA	Ground Water	6020B	399334
310-264355-7	Field Blank	Total/NA	Ground Water	6020B	399334
MB 310-399334/1-A	Method Blank	Total/NA	Water	6020B	399334
LCS 310-399334/2-A	Lab Control Sample	Total/NA	Water	6020B	399334
310-264355-2 DU	MW-3-91	Total/NA	Ground Water	6020B	399334

Analysis Batch: 400278

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-264355-1	FL-9	Total/NA	Ground Water	6020B	399334
310-264355-2	MW-3-91	Total/NA	Ground Water	6020B	399334
310-264355-3	MW-5-91	Total/NA	Ground Water	6020B	399334
310-264355-4	MW-6-91	Total/NA	Ground Water	6020B	399334
310-264355-5	MW-1-91	Total/NA	Ground Water	6020B	399334
310-264355-6	Duplicate	Total/NA	Ground Water	6020B	399334
310-264355-2 DU	MW-3-91	Total/NA	Ground Water	6020B	399334

Eurofins Cedar Falls

QC Association Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

General Chemistry

Analysis Batch: 399053

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-264355-1	FL-9	Total/NA	Ground Water	9040C	
310-264355-2	MW-3-91	Total/NA	Ground Water	9040C	
310-264355-3	MW-5-91	Total/NA	Ground Water	9040C	
310-264355-4	MW-6-91	Total/NA	Ground Water	9040C	
310-264355-5	MW-1-91	Total/NA	Ground Water	9040C	
310-264355-6	Duplicate	Total/NA	Ground Water	9040C	
310-264355-7	Field Blank	Total/NA	Ground Water	9040C	
LCS 310-399053/1	Lab Control Sample	Total/NA	Water	9040C	
310-264355-1 DU	FL-9	Total/NA	Ground Water	9040C	
310-264355-7 DU	Field Blank	Total/NA	Ground Water	9040C	

Analysis Batch: 399792

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
310-264355-1	FL-9	Total/NA	Ground Water	SM 2320B	
310-264355-2	MW-3-91	Total/NA	Ground Water	SM 2320B	
310-264355-3	MW-5-91	Total/NA	Ground Water	SM 2320B	
310-264355-4	MW-6-91	Total/NA	Ground Water	SM 2320B	
310-264355-5	MW-1-91	Total/NA	Ground Water	SM 2320B	
310-264355-6	Duplicate	Total/NA	Ground Water	SM 2320B	
310-264355-7	Field Blank	Total/NA	Ground Water	SM 2320B	
LCS 310-399792/2	Lab Control Sample	Total/NA	Water	SM 2320B	

Lab Chronicle

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: FL-9

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-1

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	399845	QTZ5	EET CF	09/14/23 15:49
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	400278	DHM5	EET CF	09/21/23 12:04
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	399677	DHM5	EET CF	09/15/23 00:54
Total/NA	Analysis	9040C		1	399053	A3GU	EET CF	09/08/23 16:32
Total/NA	Analysis	SM 2320B		1	399792	MAQ3	EET CF	09/15/23 12:36

Client Sample ID: MW-3-91

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-2

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	399845	QTZ5	EET CF	09/14/23 16:04
Total/NA	Analysis	9056A		50	399845	QTZ5	EET CF	09/15/23 17:37
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	400278	DHM5	EET CF	09/21/23 12:07
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	399677	DHM5	EET CF	09/15/23 00:56
Total/NA	Analysis	9040C		1	399053	A3GU	EET CF	09/08/23 16:40
Total/NA	Analysis	SM 2320B		1	399792	MAQ3	EET CF	09/15/23 12:45

Client Sample ID: MW-5-91

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-3

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	399845	QTZ5	EET CF	09/14/23 16:18
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	400278	DHM5	EET CF	09/21/23 12:15
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	399677	DHM5	EET CF	09/15/23 01:01
Total/NA	Analysis	9040C		1	399053	A3GU	EET CF	09/08/23 16:34
Total/NA	Analysis	SM 2320B		1	399792	MAQ3	EET CF	09/15/23 12:52

Client Sample ID: MW-6-91

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-4

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	399845	QTZ5	EET CF	09/14/23 16:32
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	400278	DHM5	EET CF	09/21/23 12:18

Eurofins Cedar Falls

Lab Chronicle

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Client Sample ID: MW-6-91

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-4

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	399677	DHM5	EET CF	09/15/23 01:03
Total/NA	Analysis	9040C		1	399053	A3GU	EET CF	09/08/23 16:39
Total/NA	Analysis	SM 2320B		1	399792	MAQ3	EET CF	09/15/23 13:01

Client Sample ID: MW-1-91

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-5

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	399845	QTZ5	EET CF	09/14/23 16:46
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	400278	DHM5	EET CF	09/21/23 12:22
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	399677	DHM5	EET CF	09/15/23 01:06
Total/NA	Analysis	9040C		1	399053	A3GU	EET CF	09/08/23 16:37
Total/NA	Analysis	SM 2320B		1	399792	MAQ3	EET CF	09/15/23 13:10

Client Sample ID: Duplicate

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-6

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		5	399845	QTZ5	EET CF	09/14/23 17:00
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	400278	DHM5	EET CF	09/21/23 12:25
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	399677	DHM5	EET CF	09/15/23 01:17
Total/NA	Analysis	9040C		1	399053	A3GU	EET CF	09/08/23 16:41
Total/NA	Analysis	SM 2320B		1	399792	MAQ3	EET CF	09/15/23 13:19

Client Sample ID: Field Blank

Date Collected: 09/05/23 00:00

Date Received: 09/08/23 09:25

Lab Sample ID: 310-264355-7

Matrix: Ground Water

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Analyst	Lab	Prepared or Analyzed
Total/NA	Analysis	9056A		1	399845	QTZ5	EET CF	09/14/23 17:14
Total/NA	Prep	3005A			399334	KCK5	EET CF	09/13/23 08:40
Total/NA	Analysis	6020B		1	399677	DHM5	EET CF	09/15/23 01:20
Total/NA	Analysis	9040C		1	399053	A3GU	EET CF	09/08/23 16:46
Total/NA	Analysis	SM 2320B		1	399792	MAQ3	EET CF	09/15/23 13:36

Laboratory References:

EET CF = Eurofins Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401

Eurofins Cedar Falls

Accreditation/Certification Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Laboratory: Eurofins Cedar Falls

The accreditations/certifications listed below are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Iowa	State	007	12-01-23

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14

Method Summary

Client: Klingner & Associates PC
Project/Site: American Ordnance CCR Landfill

Job ID: 310-264355-1

Method	Method Description	Protocol	Laboratory
9056A	Anions, Ion Chromatography	SW846	EET CF
6020B	Metals (ICP/MS)	SW846	EET CF
9040C	pH	SW846	EET CF
SM 2320B	Alkalinity	SM	EET CF
3005A	Preparation, Total Metals	SW846	EET CF

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater"

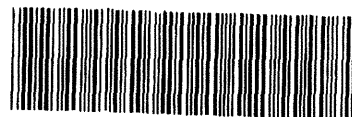
SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

EET CF = Eurofins Cedar Falls, 3019 Venture Way, Cedar Falls, IA 50613, TEL (319)277-2401



Environment Testing
America



310-264355 Chain of Custody

Cooler/Sample Receipt and Temperature Log Form

Client Information			
Client: <u>Klinger + Associates</u>			
City/State:	CITY	STATE <u>IA</u>	Project:
Receipt Information			
Date/Time Received:	DATE <u>9/8/23</u>	TIME <u>0925</u>	Received By: <u>n</u>
Delivery Type: ☐ UPS ☒ FedEx ☐ FedEx Ground ☐ US Mail ☐ Spee-Dee ☐ Lab Courier ☐ Lab Field Services ☐ Client Drop-off ☐ Other: _____			
Condition of Cooler/Containers			
Sample(s) received in Cooler?		☒ Yes ☐ No	If yes: Cooler ID: _____
Multiple Coolers?		☐ Yes ☒ No	If yes: Cooler # _____ of _____
Cooler Custody Seals Present?		☒ Yes ☐ No	If yes: Cooler custody seals intact? ☒ Yes ☐ No
Sample Custody Seals Present?		☐ Yes ☒ No	If yes: Sample custody seals intact? ☐ Yes ☐ No
Trip Blank Present?		☐ Yes ☒ No	If yes: Which VOA samples are in cooler? ↓
Temperature Record			
Coolant: ☒ Wet ice ☐ Blue ice ☐ Dry ice ☐ Other: _____ ☐ NONE			
Thermometer ID: <u>T</u>		Correction Factor (°C): <u>+0.0</u>	
• Temp Blank Temperature – If no temp blank, or temp blank temperature above criteria, proceed to Sample Container Temperature			
Uncorrected Temp (°C):		Corrected Temp (°C):	
• Sample Container Temperature			
Container(s) used:	CONTAINER 1 <u>PL250NHC</u>		CONTAINER 2
Uncorrected Temp (°C):	<u>2.1</u>		
Corrected Temp (°C):	<u>2.1</u>		
Exceptions Noted			
1) If temperature exceeds criteria, was sample(s) received same day of sampling? ☐ Yes ☐ No a) If yes: Is there evidence that the chilling process began? ☐ Yes ☐ No			
2) If temperature is <0°C, are there obvious signs that the integrity of sample containers is compromised? (e.g., bulging septa, broken/cracked bottles, frozen solid?) ☐ Yes ☐ No			
NOTE If yes, contact PM before proceeding If no, proceed with login			
Additional Comments			
<u>2 extra samples Duplicate + Field Blank</u>			

Eurofins TestAmerica, Cedar Falls
 3019 Venture Way
 Cedar Falls IA 50613
 Phone (319) 277-2401 Fax (319) 277-2425

Chain of Custody Record

eurofins

Client Information Company: <u>Skyler Troutman</u> Address: <u>610 N 4th Street, Suite 100</u> City: <u>Burlington</u> State, Zip: <u>IA, 52601</u> Phone: <u>319 752.3603</u> Project Name: <u>Stroutman@Klingner.an</u> American Ordnance CCR Landfill Site:		Sampler: <u>Skyler Troutman</u> Phone: <u>319. 752. 3603</u>	Lab PM: <u>Hayes, Shawn M</u> E-Mail: <u>Shawn.Hayes@Eurofinset.com</u>	Carrier Tracking No(s): COC No:	Page: <u>Page 1 of 1</u> Job #:																																				
		Analysis Requested <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%;">A - HCL</td><td style="width:5%;">M - Hexane</td></tr> <tr> <td>B - NaOH</td><td>N - None</td></tr> <tr> <td>C - Zn Acetate</td><td>O - AsNaO2</td></tr> <tr> <td>D - Nitric Acid</td><td>P - Na2O4S</td></tr> <tr> <td>E - NaHSO4</td><td>Q - Na2SO3</td></tr> <tr> <td>F - MeOH</td><td>R - Na2S2O3</td></tr> <tr> <td>G - Amchlor</td><td>S - H2SO4</td></tr> <tr> <td>H - Ascorbic Acid</td><td>T - TSP Decahydrate</td></tr> <tr> <td>I - Ice</td><td>U - Acetone</td></tr> <tr> <td>J - DI Water</td><td>V - MCAA</td></tr> <tr> <td>K - EDTA</td><td>W - pH 4-5</td></tr> <tr> <td>L - EDA</td><td>Z - other (specify)</td></tr> <tr> <td colspan="2">Other:</td></tr> </table>				A - HCL	M - Hexane	B - NaOH	N - None	C - Zn Acetate	O - AsNaO2	D - Nitric Acid	P - Na2O4S	E - NaHSO4	Q - Na2SO3	F - MeOH	R - Na2S2O3	G - Amchlor	S - H2SO4	H - Ascorbic Acid	T - TSP Decahydrate	I - Ice	U - Acetone	J - DI Water	V - MCAA	K - EDTA	W - pH 4-5	L - EDA	Z - other (specify)	Other:											
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L - EDA	Z - other (specify)																																								
Other:																																									
Due Date Requested: <u>Standard TAT</u> TAT Requested (days): <u>results via email</u> PO #: <u>31013849</u> WO #:		Field Filled Sample (Yes or No) Perform MS/MSD (Yes or No) 2200B Alk, Bicarbonate, 9000C pH, 9006A Chloride and Sulfate 6020A - Select Metals																																							
Sample Identification <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Sample Date</th><th>Sample Time</th><th>Sample Type (C=Comp, G=grab)</th><th>Matrix (W=water, S=solid, O=organic, A=air)</th><th>Preservation Code:</th><th>Total Number of Containers</th></tr> </thead> <tbody> <tr> <td><u>9/5/23</u></td><td></td><td><u>Grab</u></td><td><u>GW</u></td><td><u>N</u></td><td><u>D</u></td></tr> <tr> <td><u>MW-3-91</u></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td><u>MW-5-91</u></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td><u>MW-6-91</u></td><td></td><td></td><td></td><td></td><td></td></tr> <tr> <td><u>MW-1-91</u></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>		Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=organic, A=air)	Preservation Code:	Total Number of Containers	<u>9/5/23</u>		<u>Grab</u>	<u>GW</u>	<u>N</u>	<u>D</u>	<u>MW-3-91</u>						<u>MW-5-91</u>						<u>MW-6-91</u>						<u>MW-1-91</u>						Special Instructions: Metals include: <u>Al, As, Ba, Be, B, Cd, Ca, Co, Cu, Fe, Pb, Mg, Mn, K, Se, Na, Sr, Zn</u>			
Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=organic, A=air)	Preservation Code:	Total Number of Containers																																				
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<u>MW-1-91</u>																																									
Possible Hazard Identification ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown ☐ Radiological		Sample Disposal (A fee may be assessed if samples are retained longer than 1 month) ☐ Return To Client ☒ Disposal By Lab ☒ Archive For <u>1</u> Months																																							
Deliverable Requested I, II III IV Other (specify)		Special Instructions/QC Requirements:																																							
Empty Kit Relinquished by: <u>[Signature]</u>		Date: <u>9/8/23</u> Time:																																							
Relinquished by:		Date/Time:		Company:																																					
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Custody Seals Intact: ☒ Yes ☐ No		Custody Seal No		Cooler Temperature(s) °C and Other Remarks:																																					

Login Sample Receipt Checklist

Client: Klingner & Associates PC

Job Number: 310-264355-1

Login Number: 264355

List Source: Eurofins Cedar Falls

List Number: 1

Creator: Homolar, Dana J

Question	Answer	Comment
Radioactivity wasn't checked or is $\leq$ background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	False	Two extra samples Field Blank and Duplicate not on COC logged at end
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is $<6\text{mm}$ (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	



Appendix B

Field Sampling Forms



Groundwater Sampling Field Sheet

Disposal Site Name: AO CCR Landfill Permit No.: 29-SDP-3-82P
Well/Piezometer: FL-9 Weather: Overcast, 70F
Date: 8/2/2023; 9/5/2023 Sampler Name: Skyler Troutman

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Top of Screen (ft): 13.19
Casing Diameter (in): 4 Casing Material: _____
Top of Casing Elevation (ft. MSL): 714.11 Ground Surface Elevation (ft. MSL): 712.4

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	9.26		9.64
Water Elevation (ft. MSL):			

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☒ Yes ☐ No

	Start	End
Purge Date/Time	8/2/23 - 11:53	8/2/23 - 12:35

Well Conditions Commentary: OK

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler
☐ Bailer ☒ Other (specify): Hydrasleeve

Equipment Name & Description: Purging completed with Geopump Peristaltic Pump; Sampling completed with Hydrasleeve.

Pump Types (check one)

☐ Submersible ☒ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☒ Other (specify): Geopump Peristaltic Pump

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☒ Disposable ☐ Portable

Decontamination Method: Disposal of tubing (for purging) and Hydrasleeve (for sampling)

Field Analysis

							Final Reading
Date/Time	9/5/23						
Depth to Water (ft)	9.64						
Volume Purged ()							
Temp (°F)	68.4						
Sp. Cond (umhos/cm)	918						
pH	7.58						
DO (mg/l)							
ORP (mV)							
Turbidity (NTU)							

Equipment Depth: _____ Flow Rate: _____ Volume Removed: _____ Volume Sampled: ~3.1 Liter

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: 8/2/23 - Well cleaned, agitated, and purged. Hydrasleeve set. 9/5/23 - Retrieved Hydrasleeve, field measurements.



Groundwater Sampling Field Sheet

Disposal Site Name: AO CCR Landfill Permit No.: 29-SDP-3-82P
Well/Piezometer: MW-1-91 Weather: Overcast, 70F
Date: 8/2/2023; 9/5/2023 Sampler Name: Skyler Troutman

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Top of Screen (ft): 6.6
Casing Diameter (in): 4 Casing Material: _____
Top of Casing Elevation (ft. MSL): 716.15 Ground Surface Elevation (ft. MSL): 714.55

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	7.83		8.3
Water Elevation (ft. MSL):			

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ☒ No

	Start	End
Purge Date/Time	8/2/23 - 12:42	8/2/23 - 13:15

Well Conditions Commentary: OK

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler
☐ Bailer ☒ Other (specify): Hydrasleeve

Equipment Name & Description: Purging completed with Geopump Peristaltic Pump; Sampling completed with Hydrasleeve.

Pump Types (check one)

☐ Submersible ☒ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☒ Other (specify): Geopump Peristaltic Pump

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☒ Disposable ☐ Portable

Decontamination Method: Disposal of tubing (for purging) and Hydrasleeve (for sampling)

Field Analysis

Final Reading

Date/Time	9/5/23						
Depth to Water (ft)	8.3						
Volume Purged ()							
Temp (°F)	69.5						
Sp. Cond (umhos/cm)	447						
pH	7.27						
DO (mg/l)							
ORP (mV)							
Turbidity (NTU)							

Equipment Depth: _____ Flow Rate: _____ Volume Removed: _____ Volume Sampled: _____

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: 8/2/23 - Well cleaned, agitated, and purged. Hydrasleeve set. 9/5/23 - Retrieved Hydrasleeve, field measurements.



Groundwater Sampling Field Sheet

Disposal Site Name: AO CCR Landfill Permit No.: 29-SDP-3-82P
Well/Piezometer: MW-3-91 Weather: Overcast, 70F
Date: 8/2/2023; 9/5/2023 Sampler Name: Skyler Troutman

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Top of Screen (ft): 6.51
Casing Diameter (in): 4 Casing Material: _____
Top of Casing Elevation (ft. MSL): 716.04 Ground Surface Elevation (ft. MSL): 714.36

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	9.31		9.50
Water Elevation (ft. MSL):			

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ☒ No

	Start	End
Purge Date/Time	8/2/23 - 09:30	8/2/23 - 10:25

Well Conditions Commentary: OK

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler
☐ Bailer ☒ Other (specify): Hydrasleeve

Equipment Name & Description: Purging completed with Geopump Peristaltic Pump; Sampling completed with Hydrasleeve.

Pump Types (check one)

☐ Submersible ☒ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☒ Other (specify): Geopump Peristaltic Pump

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☒ Disposable ☐ Portable

Decontamination Method: Disposal of tubing (for purging) and Hydrasleeve (for sampling)

Field Analysis

Final Reading

Date/Time	9/5/23						
Depth to Water (ft)	9.50						
Volume Purged ()							
Temp (°F)	66.5						
Sp. Cond (umhos/cm)	1214						
pH	6.90						
DO (mg/l)							
ORP (mV)							
Turbidity (NTU)							

Equipment Depth: _____ Flow Rate: _____ Volume Removed: _____ Volume Sampled: _____

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: 8/2/23 - Well cleaned, agitated, and purged. Hydrasleeve set. 9/5/23 - Retrieved Hydrasleeve, field measurements.



Groundwater Sampling Field Sheet

Disposal Site Name: AO CCR Landfill Permit No.: 29-SDP-3-82P
Well/Piezometer: MW-5-91 Weather: Overcast, 70F
Date: 8/2/2023; 9/5/2023 Sampler Name: Skyler Troutman

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Top of Screen (ft): 7.64
Casing Diameter (in): 4 Casing Material: _____
Top of Casing Elevation (ft. MSL): 714.45 Ground Surface Elevation (ft. MSL): 716.89

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	9.89		10.03
Water Elevation (ft. MSL):			

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ☒ No

	Start	End
Purge Date/Time	8/2/23 - 10:30	8/2/23 - 10:58

Well Conditions Commentary: OK

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler
☐ Bailer ☒ Other (specify): Hydrasleeve

Equipment Name & Description: Purging completed with Geopump Peristaltic Pump; Sampling completed with Hydrasleeve.

Pump Types (check one)

☐ Submersible ☒ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☒ Other (specify): Geopump Peristaltic Pump

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☒ Disposable ☐ Portable

Decontamination Method: Disposal of tubing (for purging) and Hydrasleeve (for sampling)

Field Analysis

Final Reading

Date/Time	9/5/23						
Depth to Water (ft)	10.03						
Volume Purged ()							
Temp (°F)	68.6						
Sp. Cond (umhos/cm)	586						
pH	6.94						
DO (mg/l)							
ORP (mV)							
Turbidity (NTU)							

Equipment Depth: _____ Flow Rate: _____ Volume Removed: _____ Volume Sampled: _____

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: 8/2/23 - Well cleaned, agitated, and purged. Hydrasleeve set. 9/5/23 - Retrieved Hydrasleeve, field measurements.



Groundwater Sampling Field Sheet

Disposal Site Name: AO CCR Landfill Permit No.: 29-SDP-3-82P
Well/Piezometer: MW-6-91 Weather: Overcast, 70F
Date: 8/2/2023; 9/5/2023 Sampler Name: Skyler Troutman

Monitoring Well Details

Construction Data

Borehole Diameter (in): _____ Depth to Top of Screen (ft): 6.67
Casing Diameter (in): 4 Casing Material: _____
Top of Casing Elevation (ft. MSL): 711.55 Ground Surface Elevation (ft. MSL): 710.08

Field Observations

Locked: ☒ Yes ☐ No

	Before Purging	After Purging	Before Sampling
Depth to Water Level (ft.):	7.55		7.49
Water Elevation (ft. MSL):			

Screen Submerged? (Depth to Water Level < Depth to Top of Screen) ☐ Yes ☒ No

	Start	End
Purge Date/Time	8/2/23 - 11:08	8/2/23 - 11:41

Well Conditions Commentary: OK

Sampling Equipment (check one)

☐ Pump ☐ Interval Sampler
☐ Bailer ☒ Other (specify): Hydrasleeve

Equipment Name & Description: Purging completed with Geopump Peristaltic Pump; Sampling completed with Hydrasleeve.

Pump Types (check one)

☐ Submersible ☒ Peristaltic ☐ Bladder ☐ Inertial Lift Pump ☒ Other (specify): Geopump Peristaltic Pump

Method (check one)

☐ Low Flow ☐ No Purge ☐ Purge

Options (check one)

☐ Dedicated ☒ Disposable ☐ Portable

Decontamination Method: Disposal of tubing (for purging) and Hydrasleeve (for sampling)

Field Analysis

							Final Reading
Date/Time	9/5/23						
Depth to Water (ft)	7.49						
Volume Purged ()							
Temp (°F)	65.7						
Sp. Cond (umhos/cm)	617						
pH	7.02						
DO (mg/l)							
ORP (mV)							
Turbidity (NTU)							

Equipment Depth: _____ Flow Rate: _____ Volume Removed: _____ Volume Sampled: _____

Odor? ☐ Yes ☒ No Color? ☐ Yes ☒ No

Comments: 8/2/23 - Well cleaned, agitated, and purged. Hydrasleeve set. 9/5/23 - Retrieved Hydrasleeve, field measurements.

Appendix C

Water Level Data

Well ID	Coordinates		TOC Elevation	9/6/2022		9/5/2023	
	East	North		Depth to GW	GW Elevation	Depth to GW	GW Elevation
MW7-13	2261979.1	301374.2	719.69	11.4	708.3	10.07	709.6
FL-1	2261809.535	300870.993	713.676	7.66	706.0	6.73	706.9
FL-2	2261753.659	300623.155	713.19	7	706.2	6.29	706.9
FL3	2261578.971	300516.272	716.07	9.88	706.2	9.51	706.6
FL-4	2261389.67	300428.189	712.46	7.89	704.6	7.5	705.0
FL-6	2261367.085	301108.863	717.04	9.21	707.8	8.57	708.5
FL-7	-	-	715.97	-	-	7.51	708.5
FL-8	2261058.168	300964.661	718.54	15.12	703.4	14.77	703.8
FL-10	2261176.865	300321.519	712.71	10.9	701.8	10.9	701.8
MW8-13	2261272.8	301385.9	718.77	9.75	709.0	9.43	709.3
MW9-13	2261450.4	300277.8	713.04	9.86	703.2	10.09	703.0
P5A-13	2262323.3	300120.9	709.6	11.8	697.8	NM*	NM*
FL-9	2261093.883	300605.403	714.11	10.15	704.0	9.64	704.5
MW3-91	2261636.497	300565.419	716.04	9.8	706.2	9.5	706.5
MW5-91	2261484.503	300488.133	716.894	10.47	706.4	10.03	706.9
MW6-91	2261321.045	300391.912	711.551	8.71	702.8	7.49	704.1
MW1-91	2261315.461	301172.239	716.15	7.05	709.1	8.3	707.9

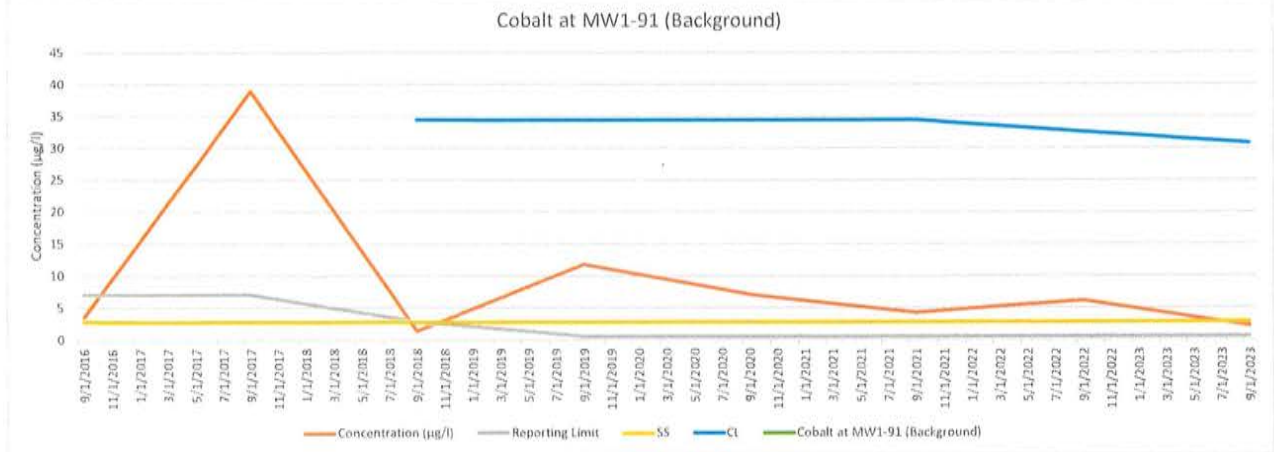
*P5A-13 was unable to be measured due to a broken casing.

Appendix D

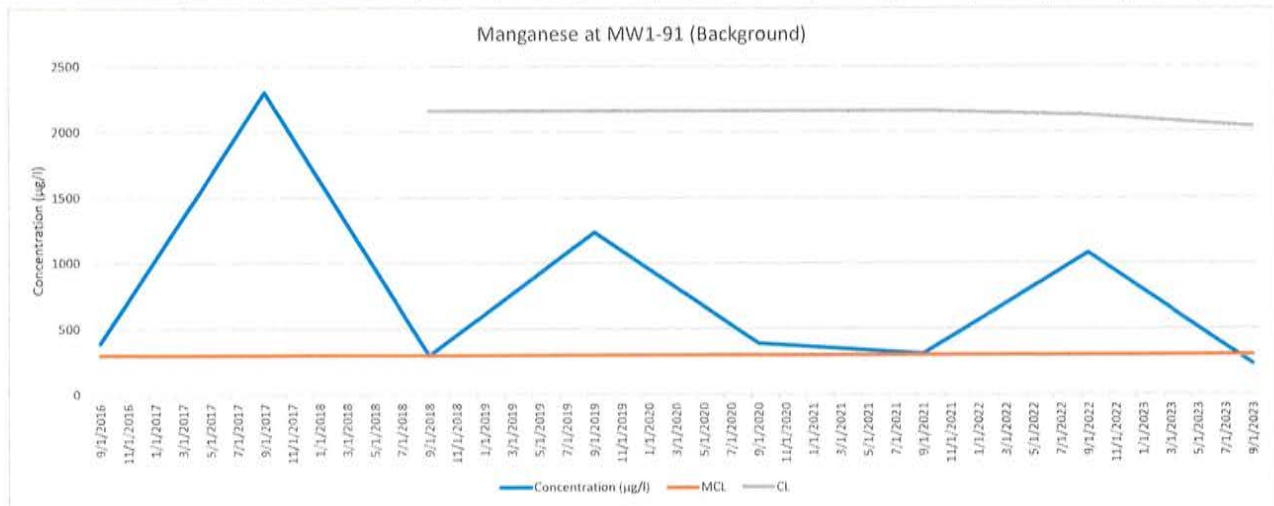
Graphs

Graphs
 *Data below RL plotted as 1/2 of RL

Cobalt at MW1-91 (Background)												
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023				
Concentration (µg/l)	3.5	39	1.4	11.8	7.07	4.24	6.14	2.13				
Reporting Limit	7	7	2.8	0.5	0.5	0.5	0.5	0.5				
SS	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8				
CL			34.5	34.5	34.5	34.5	32.6	30.9				

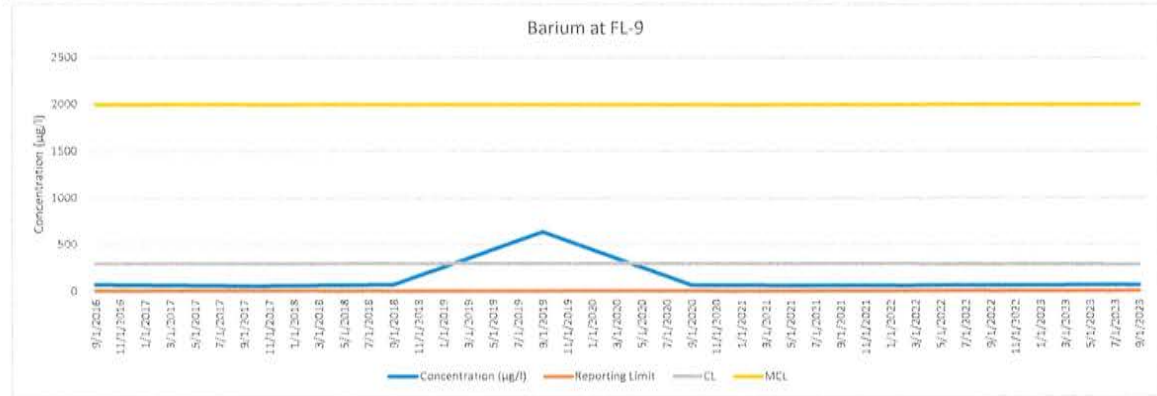


Manganese at MW1-91 (Background)												
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023				
Concentration (µg/l)	395	2300	299	1240	389	309	1080	233				
MCL	300	300	300	300	300	300	300	300				
CL			2159	2159	2159	2159	2125	2037				

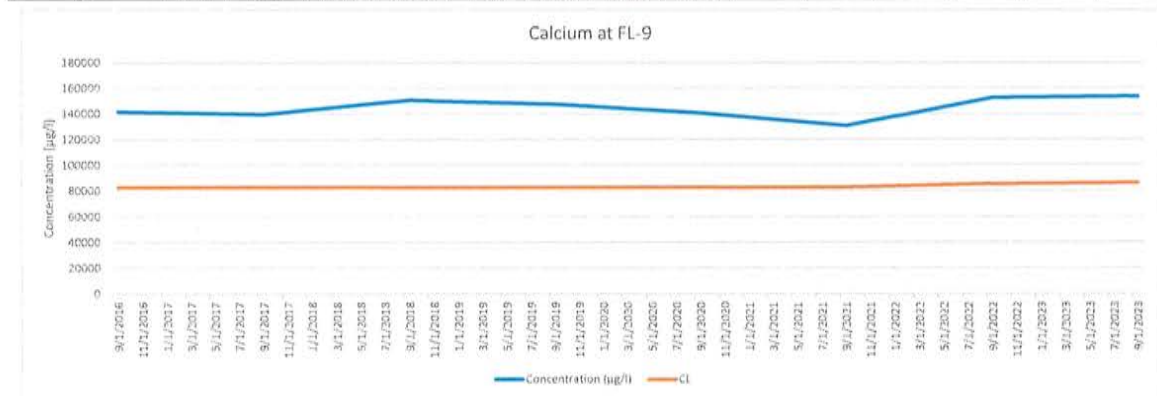


Graphs
 *Data below RL plotted as 1/2 of RL

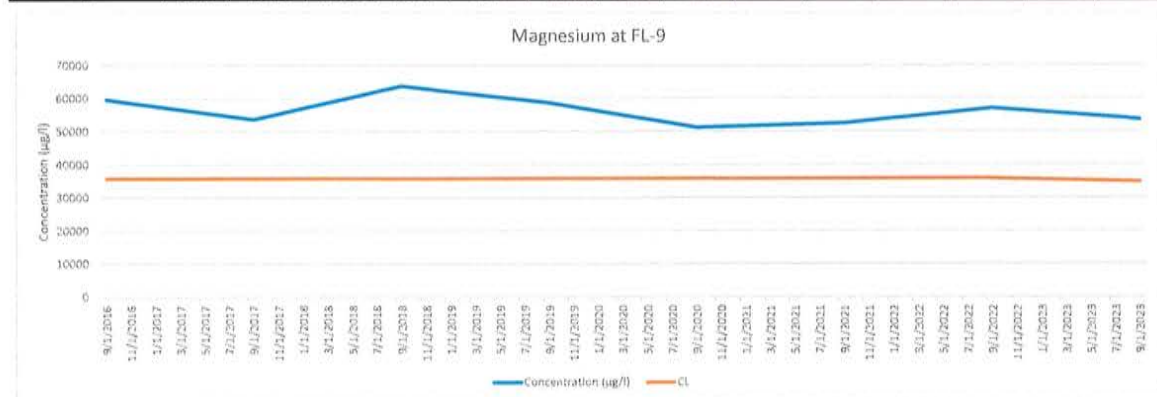
Barium at FL-9										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	63.4	53.6	61.2	628	58.7	54.4	58.8	60.5		
Reporting Limit	7	7	2.8	0.5	0.5	0.5	2	2		
CL	294.8	294.8	294.8	294.8	294.8	294.8	289.3	282.8266		
MCL	2000	2000	2000	2000	2000	2000	2000	2000		



Calcium at FL-9										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	142000	140000	151000	148000	141000	131000	153000	154000		
CL	82971	82971	82971	82971	82971	82971	85540	86237		

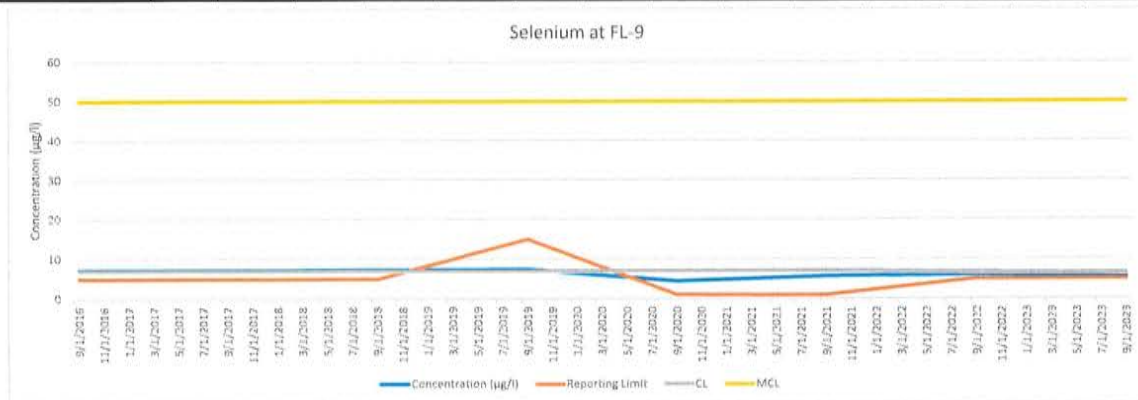


Magnesium at FL-9										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	59500	53600	63600	58600	51200	52400	56900	53600		
CL	35852	35852	35852	35852	35852	35852	35796	34763		

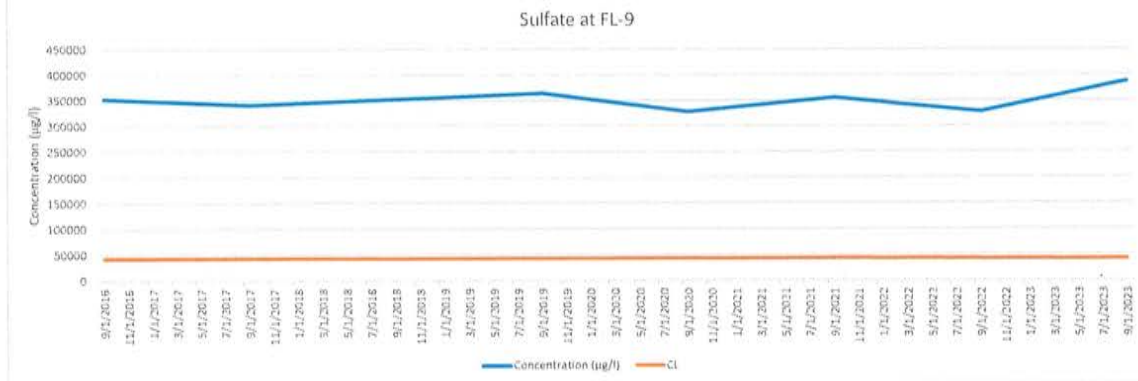


Graphs
 *Data below RL plotted as 1/2 of RL

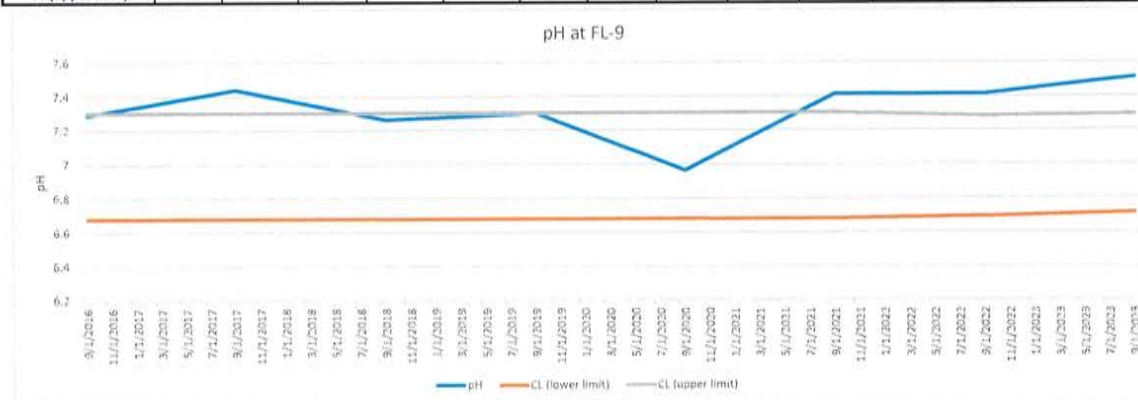
Selenium at FL-9										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	7.2	7.2	7.26	7.5	4.5	5.75	6.08	5.58		
Reporting Limit	5	5	5	15	1	0.96	5	5		
CL	7	7	7	7	7	7	6.7	6.4		
MCL	50	50	50	50	50	50	50	50		



Sulfate at FL-9										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	352000	340000	351000	363000	327000	354000	327000	386000		
CL	43014	43014	43014	43014	43014	43014	41367	41025		

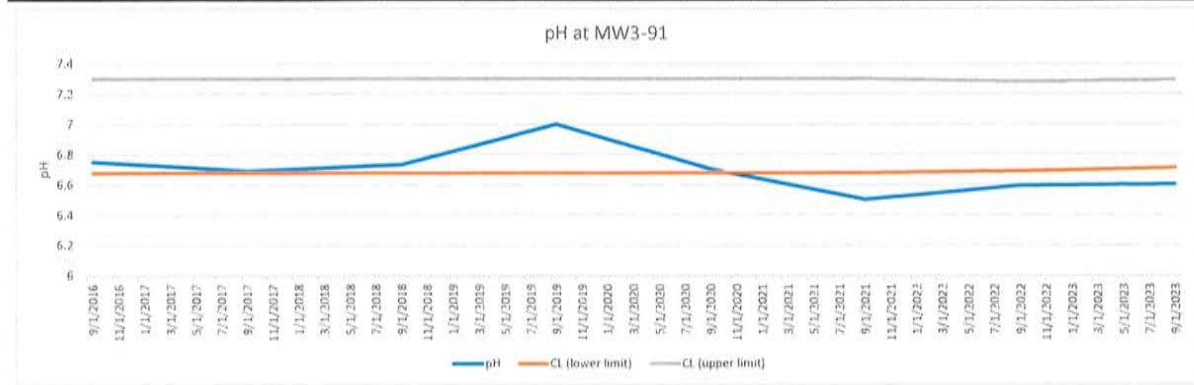


pH at FL-9										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
pH	7.29	7.44	7.26	7.3	6.96	7.41	7.41	7.51		
CL (lower limit)	6.68	6.68	6.68	6.68	6.68	6.68	6.69	6.71		
CL (upper limit)	7.3	7.3	7.3	7.3	7.3	7.3	7.28	7.29		

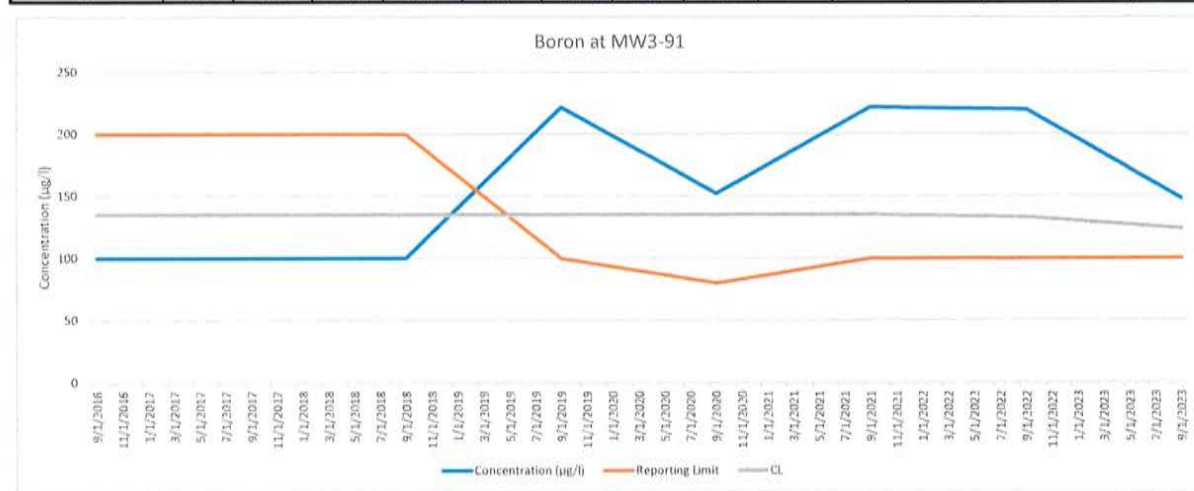


Graphs
 *Data below RL plotted as 1/2 of RL

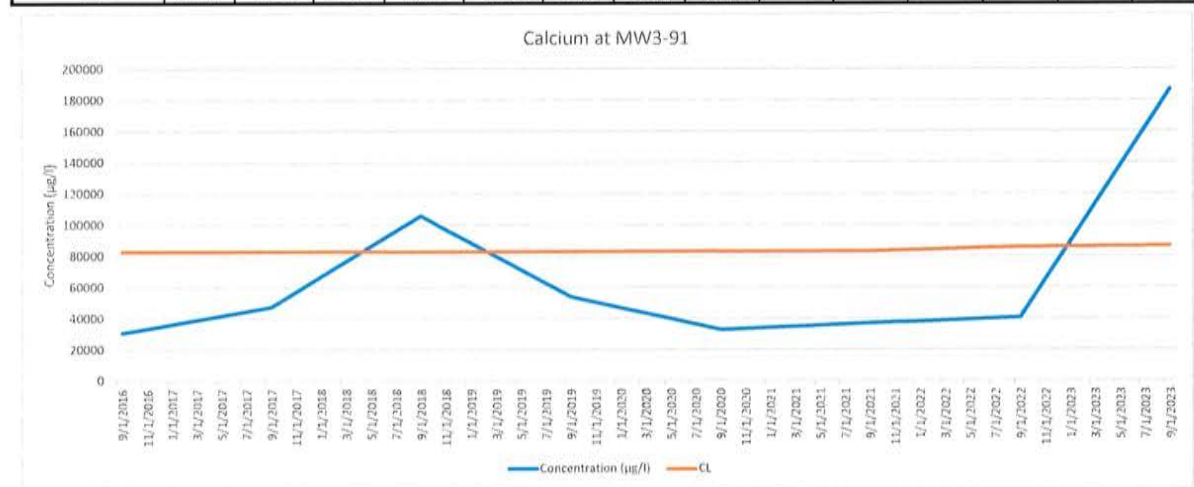
pH at MW3-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
pH	6.75	6.69	6.73	7	6.7	6.5	6.59	6.6		
CL (lower limit)	6.68	6.68	6.68	6.68	6.68	6.68	6.69	6.71		
CL (upper limit)	7.3	7.3	7.3	7.3	7.3	7.3	7.28	7.29		



Boron at MW3-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	100	100	100	222	152	222	220	148		
Reporting Limit	200	200	200	100	80	100	100	100		
CL	134.9	134.9	134.9	134.9	134.9	134.9	132.7	123.2		

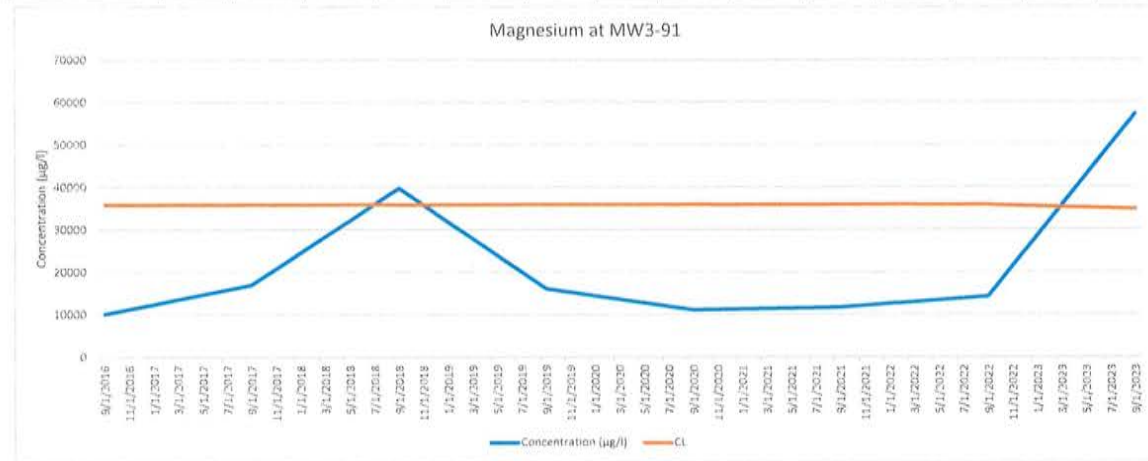


Calcium at MW3-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	30800	47300	106000	54000	32700	36700	40300	187000		
CL	82971	82971	82971	82971	82971	82971	85540	86237		

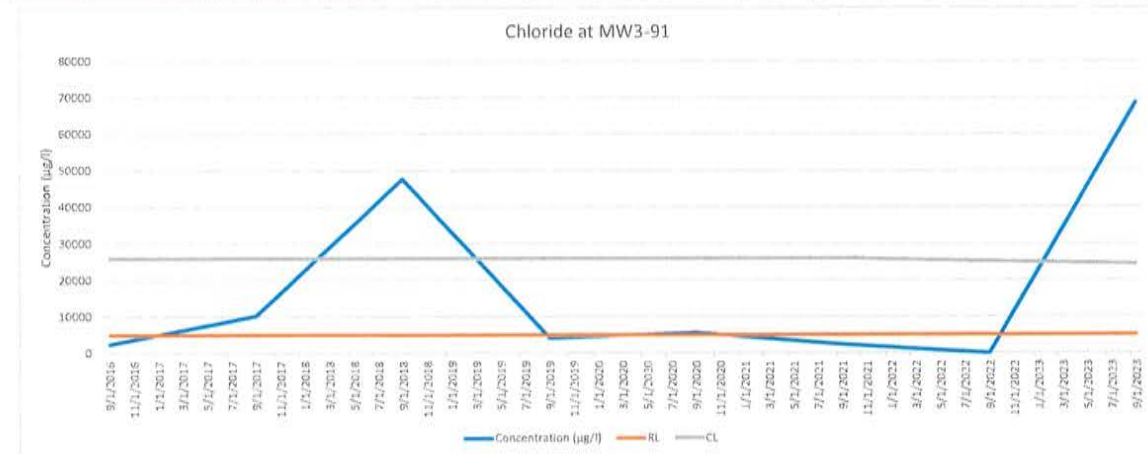


Graphs
 *Data below RL plotted as 1/2 of RL

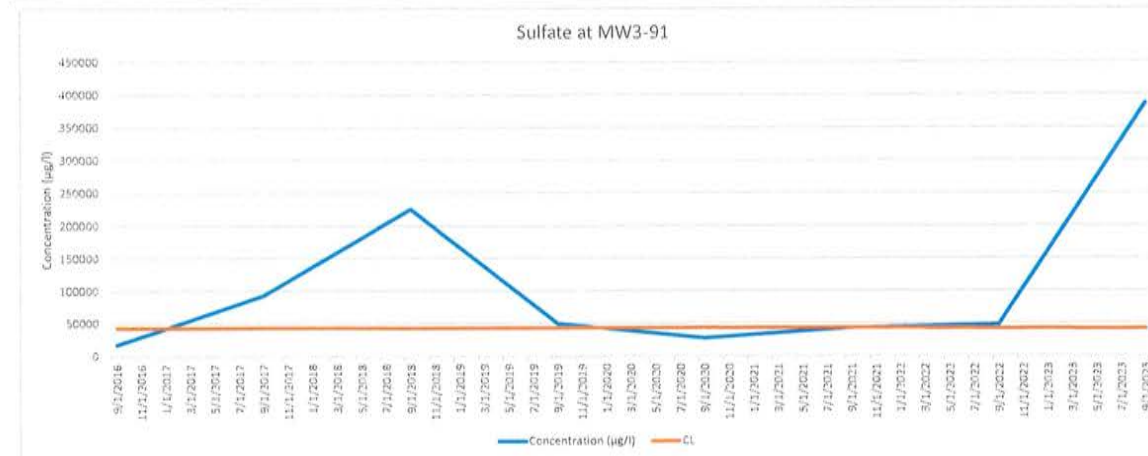
Magnesium at MW3-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	10200	17000	39700	16100	11100	11700	14300	57300		
CL	35852	35852	35852	35852	35852	35852	35796	34763		



Chloride at MW3-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	2500	10200	47500	4200	5540	2380	1,0125	68500		
RL	5000	5000	5000	5000	5000	5000	5000	5000		
CL	25845	25845	25845	25845	25845	25845	24979	24331		

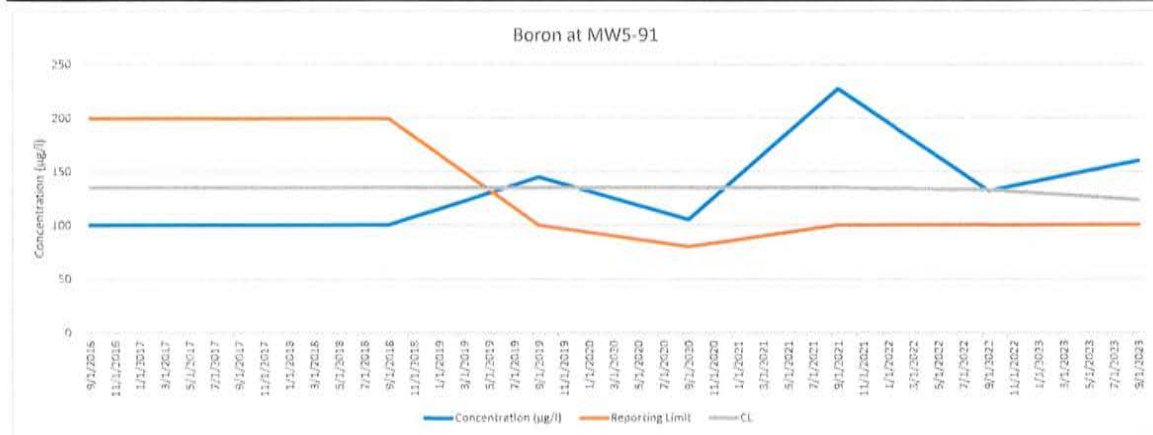


Sulfate at MW3-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	17400	92000	224000	49100	26800	42500	47500	386000		
CL	43014	43014	43014	43014	43014	43014	41367	41025		

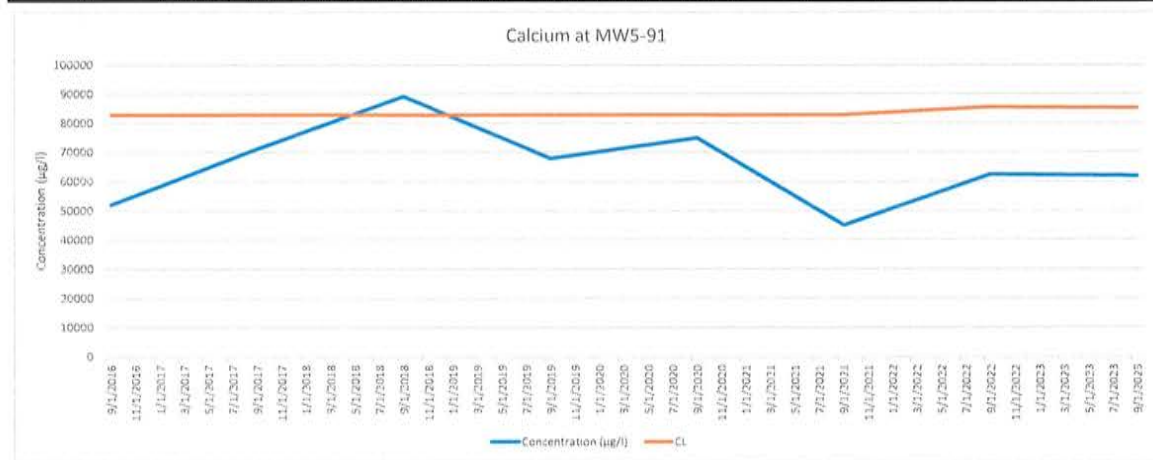


Graphs
 *Data below RL plotted as 1/2 of RL

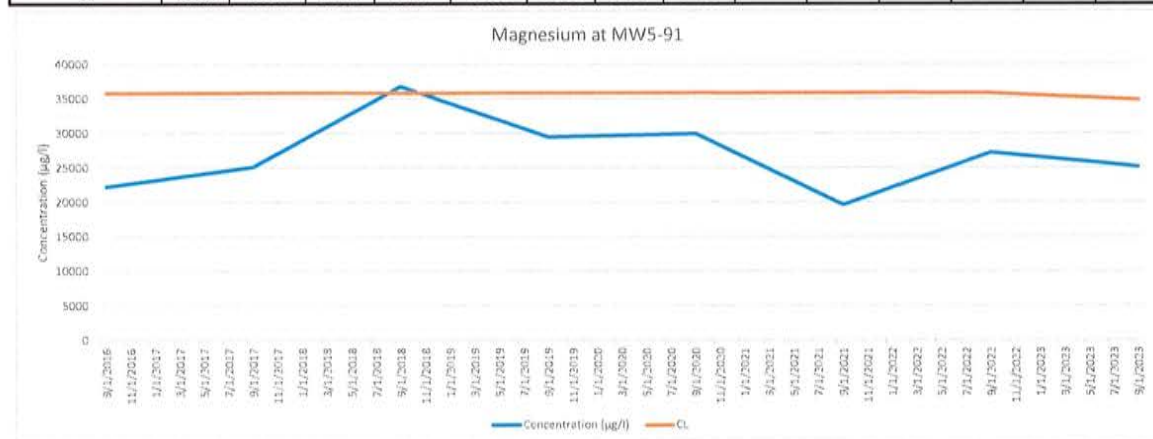
Boron at MW5-91											
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023			
Concentration (µg/l)	100	100	100	145	105	227	132	160			
Reporting Limit	200	200	200	100	80	100	100	100			
CL	134.9	134.9	134.9	134.9	134.9	134.9	132.7	123.2			



Calcium at MW5-91											
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023			
Concentration (µg/l)	52000	71100	89300	68000	75000	45000	62500	61900			
CL	82971	82971	82971	82971	82971	82971	85540	85237			

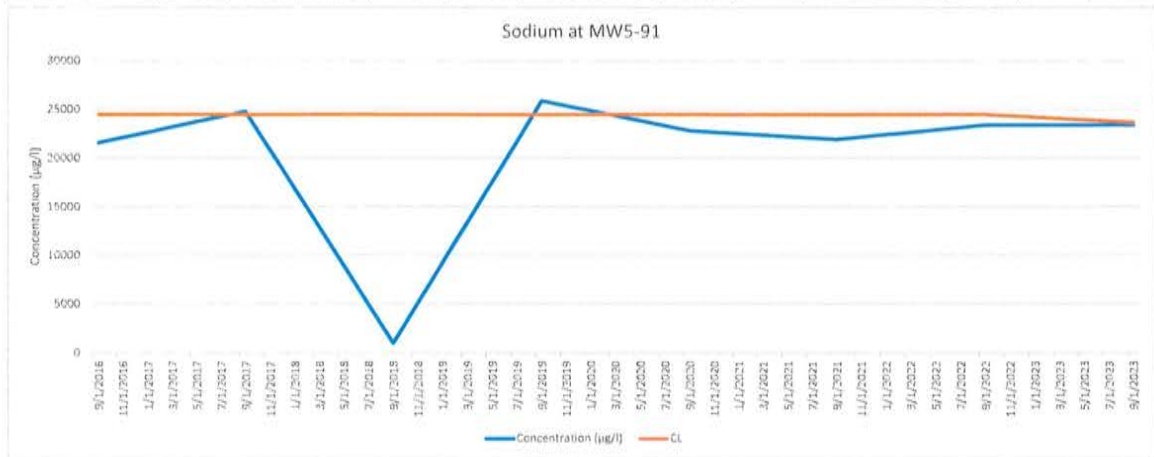


Magnesium at MW5-91											
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023			
Concentration (µg/l)	22300	25100	36800	29500	29900	19600	27200	25100			
CL	35852	35852	35852	35852	35852	35852	35796	34763			

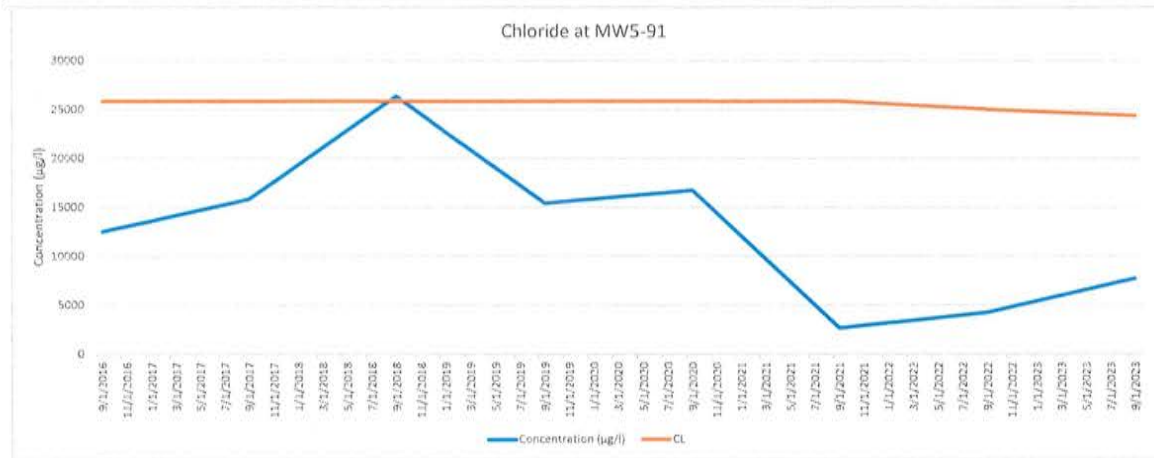


Graphs
*Data below RL plotted as 1/2 of RL

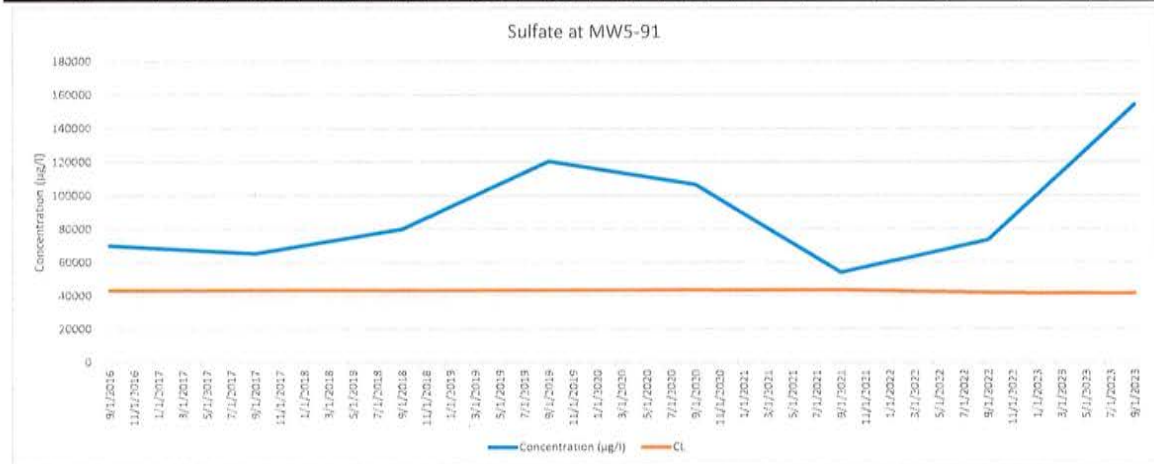
Sodium at MW5-91											
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023			
Concentration (µg/l)	21600	24800	1000	25900	22800	21900	23400	23400			
CL	24486	24486	24486	24486	24486	24486	24479	23679			



Chloride at MW5-91											
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023			
Concentration (µg/l)	12500	15800	26300	15400	16700	2690	4250	7700			
CL	25845	25845	25845	25845	25845	25845	24979	24331			

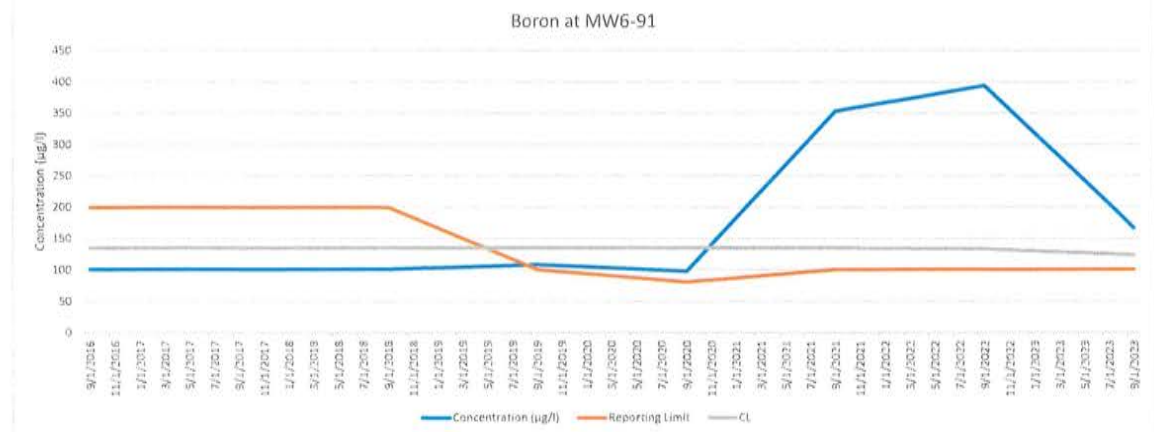


Sulfate at MW5-91											
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023			
Concentration (µg/l)	69800	64900	79500	120000	106000	53400	72800	154000			
CL	43014	43014	43014	43014	43014	43014	41367	41025			

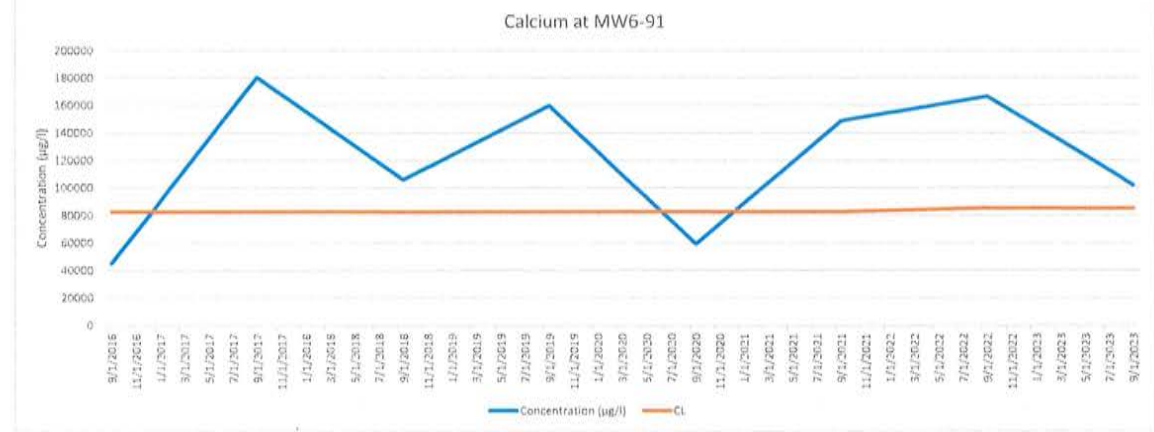


Graphs
 *Data below RL plotted as 1/2 of RL

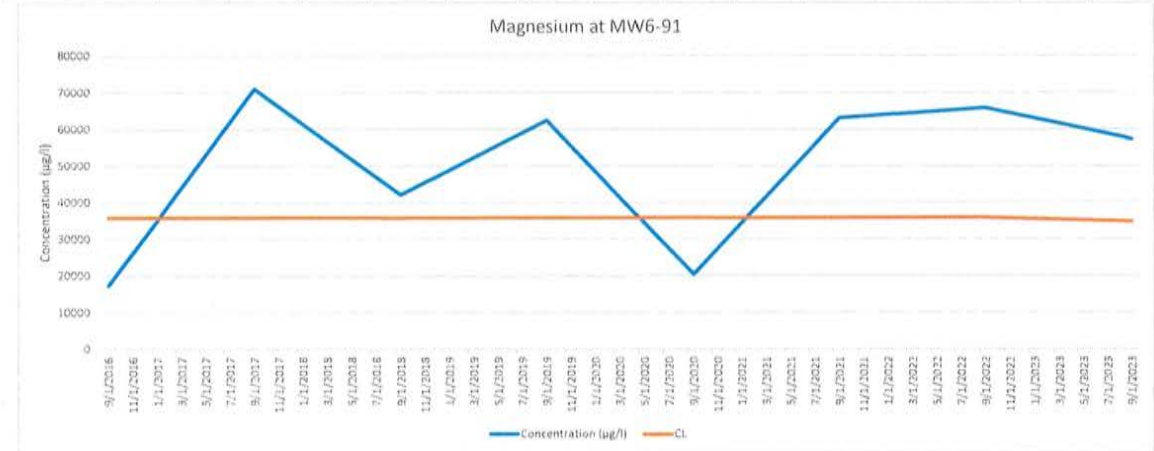
Boron at MW6-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	100	100	100	108	97.6	353	394	166		
Reporting Limit	200	200	200	100	80	100	100	100		
CL	134.9	134.9	134.9	134.9	134.9	134.9	132.7	123.2		



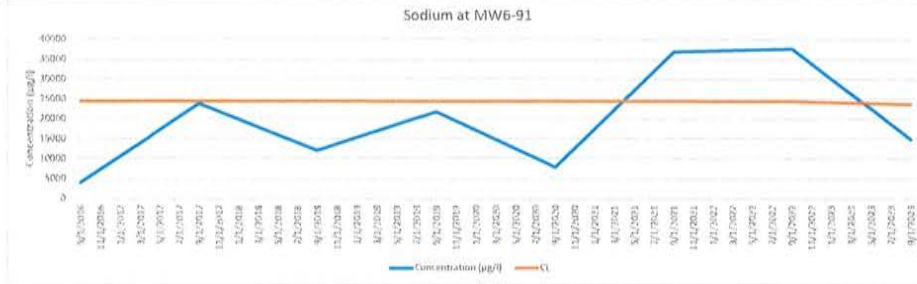
Calcium at MW6-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	45200	181000	106000	160000	59000	149000	167000	102000		
CL	82971	82971	82971	82971	82971	82971	85540	85237		



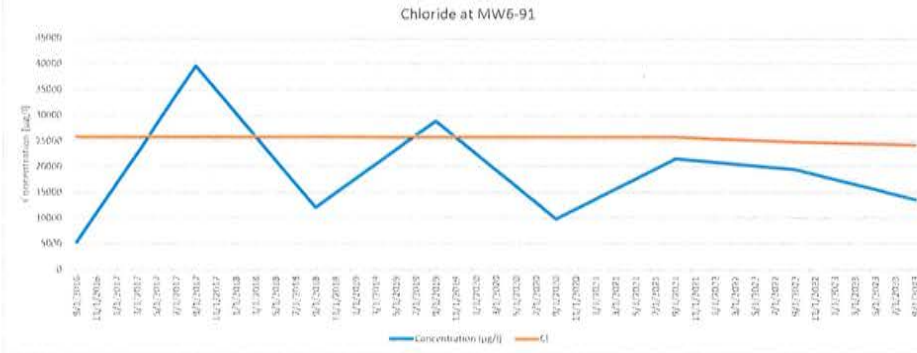
Magnesium at MW6-91										
	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
Concentration (µg/l)	17400	70900	42100	62400	20400	63000	65700	57300		
CL	35852	35852	35852	35852	35852	35852	35796	34763		



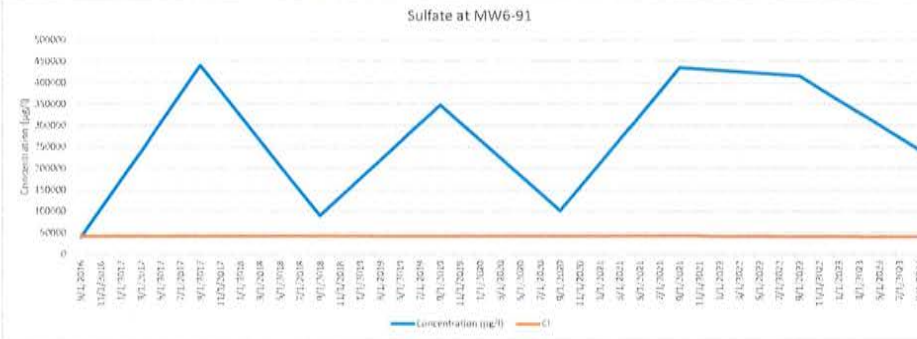
Sodium at MW6-91										
Concentration (µg/l)	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
CL	24486	24486	24486	24486	24486	24486	24479	23679		



Chloride at MW6-91										
Concentration (µg/l)	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
CL	25845	25845	25845	25845	25845	25845	24949	24331		



Sulfate at MW6-91										
Concentration (µg/l)	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
CL	43014	43014	43014	43014	43014	43014	41367	41025		



Aluminum at MW6-91										
Concentration (µg/l)	9/8/2016	9/13/2017	9/5/2018	9/17/2019	9/15/2020	9/7/2021	9/6/2022	9/5/2023		
CL	1023	1023	1023	1023	1023	1023	1018.9	984.5		

