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DRC-2022-001864

January 28, 2022

Sent VIA E-MAIL AND OVERNIGHT DELIVERY

Mr. Doug Hansen
Director
Division of Waste Management and Radiation Control
Utah Department of Environmental Quality
195 North 1950 West
Salt Lake City, UT 84114-4880

Re: Transmittal of Source Assessment Report for MW-30 White Mesa Mill Groundwater Discharge Permit UGW370004

Dear Mr. Hansen:

Enclosed are two copies of Energy Fuels Resource (USA) Inc.'s ("EFRI's") Source Assessment Report ("SAR") for MW-30 at the White Mesa Mill. This SAR addresses the constituents that were identified as exceeding the GWCL in the 2nd Quarter 2021 as described in the Division of Waste Management and Radiation Control ("DWMRC")-approved Q2 2021 Plan and Time Schedule. EFRI submitted the Plan and Time Schedule for MW-30 on August 25, 2021. DWMRC approval of the Plan and Time Schedule was received by EFRI on September 29, 2021. DWMRC approved an extension for the SAR on December 7, 2021. Pursuant to the Plan and Time Schedule EFRI has prepared this SAR.

This transmittal also includes two CDs each containing a word searchable electronic copy of the report.

If you should have any questions regarding this report please contact me.

Yours very truly,

Kathy Weinel

ENERGY FUELS RESOURCES (USA) INC.
Kathy Weinel
Quality Assurance Manager

CC: Jordan App
David Frydenlund
Garrin Palmer
Logan Shumway
Scott Bakken
Stewart Smith (HGC)
Angie Persico (Intera)

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White Mesa Uranium Mill

State of Utah Groundwater Discharge Permit No. UGW370004

Source Assessment Report Under Part I.G.4

For Exceedances in MW-30 in the Third Quarter of 2021

Prepared by:

Energy Fuels Resources (USA) Inc.
225 Union Boulevard, Suite 600
Lakewood, CO 80228

January 28, 2022

EXECUTIVE SUMMARY

This Source Assessment Report ("SAR") is an assessment of the sources, extent, and potential dispersion of uranium and selenium in MW-30 at the White Mesa Mill ("the Mill") as required under State of Utah Groundwater Discharge Permit UGW370004 (the "GWDP") Part I.G.4 relating to violations of Part I.G.2 of the GWDP. Uranium and selenium have exhibited exceedances of the applicable Groundwater Compliance Limits ("GWCLs").

MW-30 has been included in multiple recent investigations and reports, including the New Wells Background Report (INTERA, 2008), an isotopic investigation (Hurst and Solomon, 2008), a 2012 SAR (INTERA, 2012a), a pH Report (INTERA, 2012b), and a 2019 SAR (INTERA, 2019). GWCL exceedances of selenium in MW-30 were assessed and included in the 2012 and 2019 SARs. The previous SARs concluded that the increasing trend in selenium was likely due to the significantly decreasing trend in pH caused by site-wide oxidation of pyrite. The previous SAR and revised GWCLs were approved by the State of Utah Division of Waste Management and Radiation Control ("DWMRC")[1] in July of 2019.

In addition, the previous SARs noted that MW-30 was within the margins of the nitrate/chloride plume and that groundwater in this well is being impacted by that plume, which was and remains under remedial action. Although chloride concentrations exhibit an increasing trend due to the location of MW-30 within the toe of the nitrate/chloride plume, sulfate and fluoride concentrations exhibit stable to decreasing trends, which indicate there are no impacts from the TMS.

Selenium concentrations in MW-30 were increasing (not significantly) at the time of the New Wells Background Report. This increase occurred at the time that the isotopic investigation (Hurst and Solomon, 2008) demonstrated no groundwater impacts from the TMS. Continuing increases, now statistically significant, are attributable primarily to: the oxidation of naturally-occurring pyrite that contains selenium as a contaminant; and mobilization of naturally occurring selenium by nitrate as the nitrate plume migrates past MW-30. Increasing uranium concentrations in MW-30 are caused by the same processes: the oxidation of naturally-occurring pyrite that contains uranium as a contaminant; and mobilization of naturally occurring uranium by nitrate as the nitrate plume migrates past MW-30. Changes in pH also impact uranium and selenium concentrations at MW-30. Decreases in pH prior to about 2016 (attributable to natural pyrite oxidation) are expected to have increased the mobilization of pH-sensitive metals and metalloids such as uranium and selenium; and increases in pH since about 2016, accompanied by increases in bicarbonate, have increased the mobility of naturally-occurring uranium. Furthermore, the post-2016 increase in pH is inconsistent with a TMS impact.

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[1] Formerly referred to as the State of Utah Division of Radiation Control.

Although uranium concentrations exhibit a statistically significant increasing trend, uranium concentrations at MW-30 are relatively low for the site. As noted above, although chloride concentrations exhibit an increasing trend due to the location of MW-30 within the toe of the nitrate/chloride plume, sulfate and fluoride concentrations exhibit stable to decreasing trends. The decreasing trends in sulfate and fluoride demonstrate that there are no TMS impacts to MW-30. Furthermore, if the uranium and selenium had a TMS source, relatively conservative fluoride and sulfate would increase long before increases in either uranium or selenium were detected; yet fluoride and sulfate are stable to decreasing. The lack of TMS impact is also demonstrated by the increasing trends in pH and bicarbonate at MW-30 since about 2016; by decreasing iron and manganese concentrations since about 2009; by the results of a mass balance analysis; and by consideration of effective soil-water equilibrium distribution coefficients (Kd) for uranium and selenium.

As the results of this analysis will demonstrate, concentrations of uranium and selenium are within the range of site-wide background; and naturally-occurring uranium and selenium are mobilized by nitrate as the nitrate/chloride plume migrates past MW-30. Revising the GWCL to reflect the variations in uranium and selenium concentrations is proposed. In accordance with the DWMRC-approved Flowsheet (from INTERA [2007a], included as **Appendix E**), increasing trends may necessitate a modified approach for calculation of GWCLs. A modified approach for calculating a revised GWCL for selenium and uranium used the greater of (1) mean + 2 standard deviations, (2) highest historical value, or (3) mean x 1.5 to determine representative and appropriate GWCLs for trending constituents. Regular revisions to GWCLs for constituents in wells with significantly increasing trends over time due to background is consistent with the United States Environmental Protection Agency ("USEPA") Unified Guidance (USEPA, 2009). Such revisions account for variability in larger datasets and minimize unwarranted out-of-compliance status.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

ACRONYM LIST

Background Reports	*collectively refers to relevant background reports for this well and site*: the Existing Wells Background Report (INTERA, 2007a), the Regional Background Report (INTERA, 2007b), and the New Wells Background Report (INTERA, 2008)
CAP	Corrective Action Plan
CFCs	chlorofluorocarbons
CIR	Contaminant Investigation Report
DF	Dilution Factor
Director	Director of the Division of Waste Management and Radiation Control
DWMRC	State of Utah Division of Waste Management and Radiation Control
EFRI	Energy Fuels Resources (USA) Inc.
GWCL	Groundwater Compliance Limit
GWDP	State of Utah Ground Water Discharge Permit UGW370004
GWQS	Groundwater Quality Standard
µg/L	micrograms per liter
mg/L	milligrams per liter
Mill	White Mesa Uranium Mill
OOC	out of compliance
Q1	first quarter
Q2	second quarter
SAR	Source Assessment Report
TDS	Total Dissolved Solids
TMS	Tailings Management System
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

Energy Fuels Resources (USA) Inc. ("EFRI") operates the White Mesa Uranium Mill (the "Mill"), located near Blanding, Utah (Figure 1A). Groundwater is regulated under the State of Utah Groundwater Discharge Permit UGW370004 (the "GWDP"). This is the Source Assessment Report ("SAR") required under Part I.G.4 of the GWDP, relating to Part I.G.2 of the GWDP with respect to uranium and selenium in groundwater compliance monitoring well MW-30.

Part I.G.2 of the GWDP provides that an out-of-compliance status exists when the concentration of a constituent in two consecutive samples from a compliance monitoring point exceeds a groundwater compliance limit ("GWCL") in Table 2 of the GWDP. The GWDP was originally issued in March 2005, at which time GWCLs were set on an interim basis, based on fractions of State of Utah Ground Water Quality Standards ("GWQSs") or the equivalent, without reference to natural background at the Mill. The GWDP also required that EFRI prepare a background groundwater quality report to evaluate all historical data for the purposes of establishing background groundwater quality at the Mill site and developing GWCLs under the GWDP. As required by then Part I.H.3 of the GWDP, EFRI submitted three "Background Groundwater Quality Reports" (INTERA 2007a, 2007b, 2008) (collectively, the "Background Reports") to the Director (the "Director") of the State of Utah Division of Waste Management and Radiation Control ("DWMRC") (the Director was formerly the Executive Secretary of the Utah Radiation Control Board and the Co-Executive Secretary of the Utah Water Quality Board).

Based on a review of the Background Reports and other information and analyses, the Director re-opened the GWDP and modified the GWCLs to be equal to the mean concentration plus two standard deviations ("mean + 2σ") or the equivalent for each constituent in each well, based on an "intra-well" approach. That is, the compliance status for each constituent in a well is determined based on current concentrations of that constituent in that well compared to the historic concentrations for that constituent in that well, rather than compared to the concentrations of the same constituent in other monitoring wells. The modified GWCLs became effective on January 20, 2010. On January 19, 2018, March 19, 2019, and March 8, 2021 revised GWDPs were issued, which set revised GWCLs for certain constituents in certain monitoring wells as approved by the Director through previously approved SARs relating to those constituents in those wells. GWCLs apply to groundwater monitoring wells located in the perched aquifer at the Mill.

Figure 1B is a site map showing perched well and piezometer locations, third quarter ("Q3"), 2021 perched groundwater elevations, and other relevant site features, such as the locations of formerly used (unlined) wildlife ponds, the historical pond, and the boundaries of two shallow groundwater plumes (the nitrate/chloride plume and the chloroform plume) which are under active remediation by pumping. Specifically, Figure 1B shows the commingled nitrate and chloride components of the nitrate/chloride plume.

Figure 1C shows the same features as Figure 1B, except that water levels and plume boundaries are as they existed just prior to cessation of water delivery to the wildlife ponds in the first quarter ("Q1") of 2012. As shown in Figures 1B and 1C, perched groundwater flows generally to the southwest across the site, and the nitrate/chloride plume extends more than 1,000 feet upgradient of the tailings management system ("TMS") indicating an upgradient source. As discussed in HGC (2018), the chloroform plume originated from disposal of laboratory wastes to two former sanitary leach fields that were used prior to Mill construction and operation. Both Figures 1B and 1C show that MW-30 is located within the toe of the nitrate/chloride plume.

Groundwater quality at individual wells is impacted by transient conditions at the site. Currently the perched groundwater system that is monitored at the site does not approach steady state over much of the monitored area. A large part of the site perched water system is in a transient state and affected by long-term changes in water levels due to past and current activities unrelated to the disposal of materials to the TMS. Changes in water levels have historically been related to seepage from the unlined wildlife ponds; however past impacts related to the historical pond, and to a lesser extent formerly used sanitary leach fields, are also expected, as discussed in HGC (2018). Water levels have decreased at some locations due to chloroform and nitrate pumping and reduced recharge from the wildlife ponds.

Figure 2 is a plot of groundwater elevations and nitrate concentrations over time at MW-30 since installation in 2005. Groundwater levels have increased by approximately 4 ½ feet since the well was installed; and nitrate concentrations have increased by approximately 40%. As discussed above, the water level increase is attributable to former wildlife pond recharge. The nitrate increase is attributable to migration of the leading edge of the nitrate/chloride plume past MW-30.

1.1 Source Assessment Report Organization

Analyses of uranium, selenium, and indicator parameters in MW-30 were performed. A description of the approach used for analysis is provided in Section 2.0, and the results of the analysis are presented in Section 3.0. The calculation of GWCLs is discussed in

Section 4.0, and conclusions and recommendations are reviewed in Section 5.0. Section 6.0 provides a list of references cited in this SAR.

The appendices comprise the analyses performed for this SAR and are organized in the following manner: **Appendix A** contains a table showing exceedances. **Appendix B** contains the statistical analysis performed on uranium and selenium in MW-30. **Appendix C** contains the indicator parameter analysis performed on MW-30. **Appendix D** summarizes the mass balance analysis. **Appendix E** contains the Groundwater Data Preparation and Statistical Process Flow for Calculating Groundwater Protection Standards, White Mesa Mill Site, San Juan County, Utah ("Flowsheet") that was developed based on the United States Environmental Protection Agency's ("USEPA") Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (USEPA, 2009), which was approved by DWMRC prior to completion of the Background Reports. **Appendix F** is included on the compact disc that accompanies this SAR and contains the electronic input and output files used for statistical analysis.

Statistical analysis was performed using the software package "R." R is a free statistical package that allows the analyst to perform statistical analysis and format and output graphs more effectively than the Statistica software package used in the past. Input and output files included in **Appendix F** can be imported into either R or Statistica to replicate the results presented in this SAR.

2.0 CATEGORIES AND APPROACHES FOR ANALYSIS

Previously EFRI has categorized wells and constituents in five categories as follows:

- Constituents Potentially Impacted by Decreasing pH Trends Across the Site
- Newly Installed Wells with Interim GWCLs
- Constituents in Wells with Previously Identified Rising Trends
- Pumping Wells
- Other Constituents

This SAR addresses uranium and selenium in MW-30. Uranium and selenium fall within the third category: "constituents in wells with previously identified rising trends." Increasing trends in selenium and uranium concentrations in MW-30 were observed in the 2008 New Wells Background Report (although not statistically significant at the time), the 2012 SAR (INTERA, 2012a), the pH Report (INTERA, 2012b), and the 2019 SAR (INTERA, 2019). These trends were already present at the time of the University of Utah isotopic study (Hurst and Solomon, 2008; described below) that determined there had been no impacts to groundwater from the TMS.

Additional factors that contributed to changes in groundwater conditions at MW-30 such as Site-wide pH changes, wildlife pond seepage, and arrival of the nitrate/chloride plume are discussed in Sections 3.1, 3.2, and 3.3.

2.1 Approach for Analysis

The first step in the analysis is to assess the potential sources for the exceedances to determine whether they are due to background influences or Mill activities. If the exceedances are determined to be within natural variability or site-wide influences, then it is not necessary to perform any further evaluations on the extent and potential dispersion of the contamination or to perform an evaluation of potential remedial actions. Monitoring will continue; and, where appropriate, revised GWCLs are proposed to reflect changes in background conditions.

The analysis performed in this SAR considers all available data to date to evaluate the behavior of the constituents in the well. Analysis will determine if there have been any changes in the behavior of potential TMS seepage indicator parameters (e.g., chloride, sulfate, fluoride, and uranium) since the date of the New Wells Background Report that may suggest a change in the behavior of the groundwater in MW-30.

As discussed in the previous Background Reports (INTERA, 2007a, 2007b, 2008), indicator parameters of potential TMS seepage include chloride, sulfate, fluoride, and uranium. Chloride is the best indicator of potential TMS seepage; however, chloride is problematic as an indicator parameter for groundwater monitoring wells at the Mill site (such as MW-30) impacted by the nitrate/chloride plume which originates upgradient of the TMS (**Figures 1B and 1C**) (HGC, 2018a). Sulfate and fluoride are useful indicator parameters when the geochemical conditions allow these constituents to behave conservatively (i.e., are non-reactive). Although uranium may be the most mobile metal its behavior ranges from conservative to non-conservative, depending on the geochemical conditions (see Section 3.3 for further discussion).

Any potential seepage from the TMS would be expected to exhibit increasing concentrations of chloride, sulfate, fluoride, and uranium. While uranium can be the most mobile of trace metals under certain conditions, it is retarded behind chloride, fluoride, and sulfate due to sorption and precipitation, and would not show increases in groundwater until sometime after chloride, fluoride, and sulfate concentrations had begun to increase (INTERA, 2007a). It is important to note, however, that while the absence of a rising trend in chloride concentration would demonstrate that there has been no impact from the TMS, a rising trend in chloride concentration as well as in other indicator parameters can also be due to natural influences (see Section 12.0 of INTERA, 2007a).

The evaluation of SAR and indicator parameters in MW-30 was supported by a statistical analysis that followed the process outlined in the Flowsheet (INTERA, 2007a), a copy of which is attached as **Appendix E.** The Flowsheet was designed based on USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 2009), and was approved by DWMRC prior to completion of the Background Reports.

2.2 Approach for Setting Revised GWCLs

If the preceding approach resulted in the conclusion that the analysis in the Background Reports has not changed, or that the increasing concentrations of selenium and uranium in MW-30 are due to natural variability in groundwater; geochemical changes caused by the arrival of the nitrate/chloride plume; or site-wide influences such as the oxidation of pyrite; then a new GWCL may be proposed. In proposing revised GWCLs, The DWMRC-approved Flowsheet approach was adopted, including the last decision of the process that directs the analyst to consider a modified approach to determining a GWCL if an increasing trend is present.

Appendix B-1 summarizes the geochemical analysis for SAR parameters in MW-30 and presents the revised GWCLs for selenium and uranium, based on the Flowsheet. A modified approach for selenium is being proposed to address issues with revising GWCLs in constituents with significantly increasing trends and to minimize unwarranted out-of-compliance situations.

2.3 University of Utah Study

At the request of the DWMRC, T. Grant Hurst and D. Kip Solomon of the Department of Geology and Geophysics of the University of Utah performed a groundwater study (the "University of Utah Study") at the Mill site in July 2007 (Hurst and Solomon, 2008). The purpose of this study was to characterize groundwater flow, chemical composition, noble gas composition, and age to evaluate whether the increasing and elevated trace metal concentrations in monitoring wells at the Mill, all of which were identified in the Background Reports, may indicate that potential seepage from the tailings system is occurring.

To evaluate sources of solute concentrations at the Mill, low-flow groundwater sampling was used as a method for collecting groundwater quality samples from 15 monitoring wells, including MW-30. In addition, surface water samples were collected from tailings cells 1, 3, and 4A, and two wildlife ponds. Passive diffusion samplers were also deployed and collected to characterize the dissolved gas composition of groundwater at different depths within the wells. Samples were collected and analyzed for the following constituents: tritium, nitrate, sulfate, deuterium and oxygen-18 of water, sulfur-34 and oxygen-18 of sulfate, trace metals (uranium, manganese, and selenium), and chlorofluorocarbons ("CFCs").

Hurst and Solomon (2008, page iii) concluded generally that,

> *[t]he data show that groundwater at the Mill is largely older than 50 years, based on apparent recharge dates from chlorofluorocarbons and tritium concentrations. Wells exhibiting groundwater that has recharged within the last 50 years appears to be a result of recharge from wildlife ponds near the site. Stable isotope fingerprints do not suggest contamination of groundwater by tailings cell leakage, evidence that is corroborated by trace metal concentrations similar to historically-observed observations.*

Hurst and Solomon (2008) conclude that,

> *[i]n general, the data collected in this study do not provide evidence that tailings cell leakage is leading to contamination of groundwater in the area around the White Mesa Mill. Evidence of old water in the majority of wells, and significantly different isotopic fingerprints between wells with the highest concentrations of trace metals and surface water sites, supports this conclusion. The only evidence linking surface waters to recharging groundwater is seen in MW-27 and MW-19. Measurable*

tritium and CFC concentrations indicate relatively young water, with low concentrations of selenium, manganese, and uranium. Furthermore, stable isotope fingerprints of ðD and $ð^{18}O$ suggest mixing between wildlife pond recharge and older groundwater in MW-19 and MW-27. $D^{34}S\text{-}SO_4$ and $ð^{18}O\text{-}SO_4$ fingerprints closely relate MW-27 to wildlife pond water, while the exceptionally low concentration of sulfate in MW-27, the only groundwater site to exhibit sulfate levels below 100 mg/L, suggest no leachate from the tailings cells has reached the well.

It should be further noted that, subsequent to the University of Utah Study, EFRI submitted a *Contaminant Investigation Report, White Mesa Uranium Mill Site, Blanding Utah*, dated December 30, 2009 (INTERA, 2009) ("CIR"), in connection with the nitrate/chloride plume at the Mill site. The CIR discusses the presence of a historical pond that existed for many years at a location upgradient from MW-27 (Figures 1B and 1C), which was much closer to MW-27 than the wildlife ponds. This historical pond was a contributor of surface water to MW-27.

3.0 RESULTS OF ANALYSIS

This section describes the geochemical influences on groundwater in MW-30 and results of the analyses, summaries of which are provided in **Appendix B-1, Appendix C-1**, and **Appendix D**. A statistical analysis of pH was performed as part of the indicator parameter analyses for MW-30. The pH analysis included box plots to identify and omit extreme outliers, a Shapiro-Wilk test of normality, and trend tests (see **Appendix C**).

3.1 Site-Wide pH Changes

As discussed below, pH in nearly all MW-series monitoring wells, including MW-30, was decreasing prior to about 2016. This has resulted in mobilization of pH-sensitive metals and increases in concentrations of these metals in groundwater. However, since about 2016, the site-wide decreasing pH trend has reversed in nearly all MW-series monitoring wells (including MW-30) and is now exhibiting increasing trends. The increasing trend will mobilize uranium which is relatively immobile at near-neutral pH but has increased mobility as pH changes from near-neutral to either a more acidic or alkaline pH. As will be discussed below, not only is the post-2016 pH increase expected to reduce the effective soil-water equilibrium distribution coefficient (Kd) for uranium, which will increase uranium mobility, but the increase in bicarbonate that accompanies the increase in pH will also mobilize uranium.

USEPA (2007) provides Kd for uranium over a range in pH. The higher the Kd, the less mobile uranium is expected to be; and the lower the Kd, the more mobile uranium is expected to be. As indicated in USEPA (2007), Kd values for uranium are pH-dependent, with the highest Kd associated with near-neutral to slightly acidic pH. The *minimum* Kd values reported for uranium increase from 0.4 mL/g at pH 4; to 100 mL/g at pH 6; drop to 63 mL/g at pH 7; then drop to 0.4 mL/g at pH 8. The actual Kd values for uranium at the site are expected to be higher than these minimum values due to the fine-grained nature of the formations hosting perched groundwater at the site. USEPA (2007) provides maximum Kd for uranium that increase from 5,000 mL/g at pH 4; to 1,000,000 mL/g at pH 6; drop to 630,000 mL/g at pH 7; then drop to 250,000 mg/L at pH 8. The actual uranium Kd values for the Mill are expected to lie within the ranges of minimum and maximum Kd specified in USEPA (2007).

USEPA (2005) provides Kd values for selenium that are generally on the order of <1 to 10 mL/g. At the near-neutral to slightly acidic pH at MW-30, uranium is expected to be substantially less mobile than selenium due to Kd values that are at least one to two orders of magnitude larger and could be more than four orders of magnitude larger. However, as shown in Figure 3, both uranium and selenium are increasing at MW-30; and both show similar increases in rate circa 2016. The nearly simultaneous increases in uranium and selenium at MW-30; and nearly simultaneous changes in rate; are indicative of geochemical changes in the immediate vicinity of the well rather than due to seepage from a relatively remote source such as the TMS.

Similarly, because chloride is increasing with uranium and selenium, and is a conservative species (negligible Kd), a relatively remote source such as the TMS could not cause the nearly simultaneous changes in concentration of all three of these constituents because of their substantially different Kds. Uranium and selenium would be substantially retarded with respect to chloride such that increases in uranium and selenium would be substantially delayed in time with respect to increases in chloride. Likewise, uranium and selenium would be substantially retarded with respect to relatively conservative fluoride and sulfate such that increases in uranium and selenium would be substantially delayed in time with respect to increases in fluoride and sulfate. However, as discussed above, fluoride and sulfate at MW-30 are *stable to decreasing*.

In order to impact groundwater at MW-30, any solution seeping from the TMS would have to penetrate more than 50 feet of vadose materials, then migrate within perched groundwater toward MW-30. Because, as discussed above, the expected Kd for uranium is at least one to two orders of magnitude higher than the expected Kd for selenium; and the Kd for chloride is negligible; the substantial retardation of uranium with respect to selenium; and the substantial retardation of both constituents with respect to chloride that would occur; would prevent the nearly simultaneous increases in all three constituents that have been measured. The only condition that would allow simultaneous increases in constituents with substantially different Kd would be a 'fast pathway' that could conduct TMS solution directly to the immediate vicinity of MW-30 without sorption or any other significant attenuation process. However, if such a 'fast pathway' existed, then nearly simultaneous increases in *all* TMS constituents would occur, rather than just a few; and pH would drop substantially, rather than increase as has happened at MW-30 since 2016. In particular, iron, which typically has the highest measured concentrations in the TMS, would be expected to increase substantially; yet, as will be discussed below, iron at MW-30 has *decreased* in concentration as has not been detected since the second quarter of 2013.

3.1.1 pH Decrease Prior to 2016

As has been documented in INTERA (2012), a decreasing trend in pH was observed in almost every groundwater monitoring well across the site, including upgradient and far downgradient monitoring wells; and decreasing pH is one of the most important contributors to increasing concentrations of many naturally-occurring parameters.

Hydro Geo Chem, Inc. (["HGC"]), 2012a) ("The Pyrite Report") attributed the decline in pH across the Mill site to the site-wide existence and oxidation of pyrite in the perched groundwater monitored at the site. Based on HGC (2012a) pyrite has been noted in approximately $^2/_3$ of the lithologic logs for wells installed at the site since 1999, and verified by laboratory analysis in core and cuttings from at least 25 monitoring wells. Pyrite was not detected by laboratory analysis in MW-30, but was noted in the lithologic boring logs.

Pyrite will oxidize according to the following reaction (Williamson and Rimstidt, 1994):

$$FeS_{2(s)} + 7/2O_{2(g)} + H_2O \rightarrow Fe^{2+}_{(aq)} + 2SO_4^{2-}{}_{(aq)} + 2H^+ \qquad \text{(reaction 1)}$$

Reaction 1 will increase hydrogen ion (acid) concentrations, which results in decreasing pH. Oxidation of pyrite and the resulting decrease in pH enables subsequent pH-dependent reactions to occur, including the mobilization of naturally-occurring metals and metalloids (such as uranium) in the formation (McClean and Bledsoe, 1992). In addition, pyrite typically contains many contaminants including selenium (Deditius, 2011) that are released upon pyrite oxidation. Furthermore, naturally occurring uranium reduced by and sorbed onto pyrite (Descotes et al 2010; Glizaud, 2006) makes it available for release upon oxidation. As discussed in EFRI (2021), bottle-roll tests using 'generic' pyrite resulted in bottle-roll solutions initially consisting of laboratory-grade DI water generating between 25 micrograms per liter ("µg/L") and 3,420 µg/L uranium. Bottle-roll tests using pyrite-bearing core from the formation hosting perched groundwater at the site yielded bottle-roll solutions having as much as 6,700 µg/L uranium.

The causes for site-wide oxidation of pyrite include processes that increase oxygen transport to groundwater. Monitoring well casings themselves provide direct conduits for oxygen to impact groundwater in the immediate vicinities of the wells. Additional factors that increase oxygen transport to groundwater include: (1) infiltration of oxidized water from the wildlife ponds upgradient of the Mill site; (2) changing water levels and incorporation of oxygen in air-filled pore spaces into groundwater; (3) the introduction of oxygen during pumping related treatment of the nitrate/chloride plume; and (4) the introduction of oxygen during increased sampling of monitoring wells (INTERA, 2012). Many of these mechanisms, in particular changing water levels, are impacting MW-30. Water levels at many site wells increased due to former seepage from the northern wildlife ponds located upgradient of the TMS. As shown in Figure 2, as a result of former wildlife pond seepage and expansion of the resulting perched groundwater mound, water levels at MW-30 increased by approximately 4 ½ feet between 2005 and present.

Furthermore, MW-30 is located within the toe of the nitrate/chloride plume at the site (which as discussed above, originates more than 1,000 feet upgradient of the TMS). Pyrite is oxidized by nitrate by the following mechanisms as discussed in HGC (2018) The pathway most commonly applied in geochemical studies (Kolle *et al.*, 1983, 1985; Postma *et al.*, 1991; Korom, 1992; Robertson *et al.*, 1996; Pauwels *et al.*, 1998; Hartog *et al.*, 2001, 2004; Spiteri *et al.*, 2008) is a bacteria-mediated reaction that yields ferrous iron, sulfate, water, and nitrogen gas as follows:

$$5FeS_2 + 14NO_3^- + 4H^+ = 7N_2 + 10SO_4^{2-} + 5Fe^{2+} + 2H_2O \text{ (Reaction 2).}$$

By Reaction 2, five moles of pyrite reduce 14 moles of nitrate, consuming four moles of acid. Reaction 2 is considered applicable when pyrite concentrations exceed nitrate concentrations (van Beek, 1999). Where nitrate concentrations exceed pyrite concentrations, Reaction 3 is a more likely mechanism (Kolle *et al.*, 1987; van Beek, 1999; Schlippers and Jorgensen, 2002):

$$2FeS_2 + 6NO_3^- + 4H_2O = 3N_2 + 4SO_4^{2-} + 2Fe(OH)_3 + 2H^+ \text{(Reaction 3).}$$

By Reaction 3, two moles of pyrite reduce six moles of nitrate, yielding iron hydroxide, sulfate, acid, and nitrogen gas. Therefore, when nitrate concentrations exceed pyrite concentrations (Reaction 3), denitrification by pyrite is more efficient than when pyrite is in excess (Reaction 2). Additionally, Reaction 3 produces acid, while Reaction 2 consumes acid, indicating that the impact of denitrification by pyrite on aquifer geochemistry is controlled by the relative abundance of pyrite and nitrate.

Reaction 3 is an overall reaction that combines Reaction 2 and a second step whereby ferrous iron is oxidized by nitrate. This second step is more likely to occur when excess nitrate is present and available to oxidize ferrous iron (Kolle *et al.*, 1987; Rivett *et al.*, 2008; Zhang 2012).

Because MW-30 is located within the nitrate/chloride plume, groundwater at MW-30 is impacted by mixing and geochemical reactions that occur within the nitrate/chloride plume as the waters travel through the pyrite-bearing formation upgradient of, and in the immediate vicinity of, MW-30. Nitrate at MW-30 increased until approximately 2012 and, although 'noisy', has been relatively stable since. Stabilized nitrate concentrations in MW-30 have been attributed to natural degradation via pyrite oxidation in addition to active pumping associated with the CAP and natural recharge from the former wildlife ponds (HGC, 2018).

3.1.2 pH Increase Post-2016

As shown in Figure 4, pH at MW-30 generally decreased until about 2016, then began to increase. As shown in Figures 5 and 6, the decrease was associated with a decrease in bicarbonate and calcium, and the subsequent increase with an increase in bicarbonate and calcium. As discussed above, the pH increase is associated with reduced Kd which is expected to mobilize uranium. Furthermore, the increase in bicarbonate and calcium will increase uranium mobility. Increased mobility and elevated concentrations of uranium are frequently associated with increased calcium and carbonate species concentrations (Drage and Kennedy, 2013). In fact, sodium bicarbonate solutions have been used as a lixiviant to mobilize subsurface uranium as part of the In-Situ Recovery ("ISR") mining process.

Both the post-2016 increases in pH and bicarbonate are inconsistent with a TMS source; TMS solutions have a low pH and undetectable bicarbonate concentrations.

3.2 Changes in Groundwater in MW-30

At the time of the Background Reports, MW-30 had a limited data set composed of 8 data points per GWDP parameter. At the time of this SAR, more than 140 data points are available, providing a more robust understanding of the water quality and behavior of MW-30. Other factors that also contribute to the behavior of constituents in this well are discussed below.

As discussed in Section 1, Figure 1B shows water levels and chloroform, nitrate and chloride plume boundaries for Q3 of 2021. Figure 1C shows the same features as Figure 1B, except that water levels and plume boundaries are as they existed just prior to cessation of water delivery to the wildlife ponds. A comparison between Figure 1B and Figure 1C shows the substantial changes in water levels that have occurred in less than 10 years due to pumping and cessation of water delivery to the wildlife ponds. Currently, although water levels have declined substantially in the center of the perched groundwater mound associated with the northern wildlife ponds, water levels have not returned to pre-pond seepage conditions, and consequently the groundwater mound is still expanding.

The transient status of a large portion of the perched water system, manifested in long-term changes in saturated thicknesses and rates of groundwater flow, results in trends in pH and in the concentrations of many dissolved constituents that are unrelated to site operations. Changes in saturated thicknesses and rates of groundwater flow can result in changes in concentrations of dissolved constituents (or pH) for many reasons. For example, as discussed in HGC (2012), groundwater rising into a vadose zone having a different chemistry than the saturated zone will result in changes in pH and groundwater constituent concentrations. If the rise in groundwater represents a long-term trend, long-term changes in groundwater constituent concentrations (or pH) result.

3.3 Nitrate/Chloride Plume and Mobilities of Uranium and Selenium

As discussed above, MW-30 is located within the toe of the nitrate/chloride plume. Geochemical changes at MW-30 result from the migration of the plume past MW-30.

For example, groundwater at MW-30 is becoming increasingly oxidizing, not only because of oxygen introduced via the well casing, but due to migration of the nitrate/chloride plume. The plume likely originated via seepage from a surface pond (historical pond) that presumably was saturated with oxygen; and within any oxygen-deficient areas, the nitrate supplied by the plume can also act as an oxidizing agent. Figure 7 shows that both iron and manganese at MW-30 have been decreasing since about 2009, consistent with increasingly oxidizing conditions and inconsistent with a TMS impact, since both iron and manganese exist at high concentrations in TMS solutions. The change to more oxidizing conditions will mobilize naturally-occurring constituents such as uranium. In addition, both uranium and selenium are expected to be mobilized by nitrate.

Asta et al (2020); Senko et al (2002); and Senko et al (2005) show that uranium is mobilized by nitrate; and Bailey et al (2009); Mast (2014); and Wright (1999) show that selenium is mobilized by nitrate. Therefore, increased nitrate availability caused by arrival of the nitrate/chloride plume at MW-30 will mobilize naturally-occurring uranium and selenium in the formations hosting perched groundwater at the site, and yield increasing uranium and selenium concentration trends.

As discussed above, Figure 2 is a plot of nitrate and water levels at MW-30. Figure 2 shows that both water levels and nitrate concentrations increased until about 2012, then began to level off. The stabilization of nitrate concentrations in MW-30 is caused by natural degradation via pyrite oxidation. In addition, as discussed in Section 3.1, oxidation of pyrite by nitrate can occur by two reaction pathways; one producing acid and the other consuming acid. Therefore, pyrite oxidation by nitrate can be accompanied by either a decrease or increase in pH depending on the reaction pathway.

Because pyrite is a source of both uranium and selenium (Deditius, 2011; Descotes et al 2010; Glizaud, 2006) both are released upon pyrite oxidation; and nitrate and/or oxygen oxidizes pyrite at MW-30. That uranium and selenium can be released from pyrite and from pyrite-bearing core collected at the Mill is discussed in EFRI (2021).

Bottle-roll tests using 'generic' pyrite resulted in bottle-roll solutions initially consisting of laboratory-grade DI water generating between 25 micrograms per liter ("µg/L") and 3,420 µg/L uranium; and between 31 µg/L and 65 µg/L selenium. Bottle-roll tests using pyrite-bearing core from the formation hosting perched groundwater at the site (at well MW-24A) yielded bottle-roll solutions having as much as 6,700 µg/L uranium; and 303 µg/L selenium.

Furthermore, the mobilities of uranium and selenium, based on Kd reported in USEPA (2007) and USEPA (2005), show that these constituents are expected to have substantially different mobilities at the near-neutral pH measured at MW-30. Uranium is expected to have a *minimum* Kd of approximately 60 to 100 mL/g; and a potential maximum Kd of approximately 630,000 to 1,000,000 mL/g; while selenium is expected to have a Kd on the order of <1 to 10 mL/g. In addition, chloride is conservative and has a negligible Kd. As discussed in Section 3.1, the nearly simultaneous increases in chloride, uranium and selenium at MW-30 demonstrate that geochemical changes in the immediate vicinity of the well are causing the rising trends rather than seepage from a relatively remote source such as the TMS.

3.4 Indicator Parameter Analysis

As discussed in the Background Reports (INTERA, 2007a, 2007b, 2008), indicator parameters of potential TMS seepage include chloride, sulfate, fluoride, and uranium. Chloride is the best indicator of potential TMS seepage; however, chloride is problematic as an indicator parameter for those groundwater monitoring wells such as MW-30 impacted by the chloride component of the nitrate/chloride plume (EFRI, 2020b). Sulfate and fluoride are useful indicator parameters under geochemical conditions allowing conservative (i.e., non-reactive) behavior. Uranium behavior may range from conservative to non-conservative depending on the geochemical conditions.

Groundwater impacted by any potential seepage from the TMS is expected to exhibit increasing concentrations of all of the indicator parameters chloride, sulfate, fluoride, and uranium, among other constituents. While uranium can be the most mobile of trace metals under certain conditions, it is retarded behind chloride, fluoride, and sulfate due to sorption and precipitation and would not show increasing concentrations in groundwater until sometime after chloride, fluoride, and sulfate concentrations had begun to increase (INTERA, 2007a). Based on data provided in USEPA (2007) uranium will sorb and have comparatively poor mobility at the near-neutral to slightly acidic pH conditions encountered at MW-30. However, as discussed above, increases in pH at MW-30 since 2016, accompanied by increases in bicarbonate and calcium, are increasing uranium mobility. Regardless, although the absence of a rising trend in constituent concentrations would indicate that there has been no impact from the TMS, a rising trend in concentrations could also result from natural influences (INTERA, 2007a, Section 12.0).

A summary of statistical analysis of indicator parameters is included in **Appendix C-1**. **Appendix C-2** presents a descriptive statistics comparison for indicator parameters from the New Wells Background Report, the 2012 SAR, the 2019 SAR, and this SAR. Data used in the analysis and data removed prior to analysis are presented in **Appendices C-3** and **C-4**, respectively. The distribution and identification of outliers and extreme outliers in indicator parameter concentration datasets are demonstrated in the box plots included in **Appendix C-5.** Histograms and time series plots included in Appendices **C-6** to **C-8** can be used to further visualize the distribution and behavior of indicator parameters over time.

Chloride concentrations in MW-30 exhibit a statistically significant increasing trend. MW-30 is located within the nitrate/chloride plume (Figure 1B), which is actively being remediated according to the Corrective Action Plan (HGC, 2012b). Groundwater in this well is being impacted by that plume; therefore, chloride is not an appropriate indicator parameter for potential tailings seepage in MW-30. Sulfate and fluoride concentrations exhibit stable to decreasing trends (Figure 8), and uranium concentrations, although relatively low for the Mill site (**Appendix B-8**), exhibit a statistically significant increasing trend.

As discussed above, because MW-30 is within the nitrate/chloride plume, chloride is not an appropriate indicator parameter. Decreasing trends in sulfate and fluoride demonstrate that there are no TMS impacts in MW-30. In addition, as discussed above, increases in pH and bicarbonate at MW-30 increase uranium mobility and do not indicate a TMS impact.

Furthermore, prior to about 2016, uranium was relatively stable while bicarbonate was generally decreasing and nitrate was generally increasing. Because both nitrate and bicarbonate are expected to mobilize uranium, the competing impacts of decreasing bicarbonate and increasing nitrate likely 'canceled out', resulting in the relative stability of dissolved uranium.

3.5 Mass Balance Analyses

Since installation in 2005, water levels at MW-30 have risen by approximately 4½ feet, and the saturated thickness has increased by about 17%. TMS solutions contain chloride, a conservative solute, at an average concentration exceeding 28,000 mg/L. If the water level changes at MW-30 were due to potential TMS seepage, and resulted in a mixture containing 17 % TMS solution, chloride concentrations at MW-30 would exceed 4,800 mg/L, rather than the latest measured value of approximately 180 mg/L. Similarly, based on the average concentrations (since 2003) in TMS solutions, the fluoride concentration would exceed 570 mg/L (rather than the latest measured 0.32 mg/L); the sulfate concentration would exceed 31,000 mg/L (rather than the latest measured 754 mg/L); the uranium concentration would exceed 68,000 ug/L (rather than the latest measured 9.7 ug/); and the selenium concentration would exceed 1,600 mg/L (rather than the latest measured 60 ug/L).These calculations demonstrate that the observed increases in water levels at MW-30 do not result from potential TMS seepage.

In addition, as discussed above, fluoride and sulfate concentrations at MW-30 are stable to decreasing (Figure 7 and Appendix C). Because fluoride and sulfate are relatively mobile anions, and, after chloride, are the next most useful indicator parameters, their stable to decreasing trends demonstrate that MW-30 cannot be impacted by potential TMS seepage.

Overall, the mass balance analyses and geochemical considerations demonstrate that potential TMS seepage is not a contributor to the groundwater chemistry at MW-30.

3.6 Summary of Results

As discussed above and in the Background Reports (INTERA, 2007a, 2007b, 2008), indicator parameters of potential TMS seepage include chloride, sulfate, fluoride, and uranium. Sulfate and fluoride are the best indicators of potential TMS seepage for wells such as MW-30 that are inside the nitrate/chloride plume that originates upgradient of the TMS.

As discussed in Section 3.3, chloride and uranium at MW-30 are significantly increasing; and fluoride and sulfate at MW-30 are stable to decreasing. The behavior of fluoride and sulfate demonstrate that there are no impacts from the TMS. Increasing uranium and selenium are caused by mobilization of naturally occurring uranium and selenium from the formations hosting perched groundwater due to conditions that are increasingly favorable to uranium and selenium mobility at MW-30.

3.6.1 Water Levels and Nitrate at MW-30

Figure 2 is a plot of nitrate and water levels at MW-30. Figure 2 shows that both water levels and nitrate concentrations increased until about 2012, then began to level off. As discussed above, stabilized nitrate concentrations in MW-30 have been attributed to natural degradation via pyrite oxidation.

3.6.2 Uranium and Selenium at MW-30

Uranium and selenium at MW-30 are both increasing as shown in Figure 3. Asta et al (2020); Senko et al (2002); and Senko et al (2005) show that uranium is mobilized by nitrate; and Bailey et al (2009); Mast (2014); and Wright (1999) show that selenium is mobilized by nitrate. Therefore, increased nitrate availability caused by arrival of the nitrate/chloride plume at MW-30 will mobilize naturally-occurring uranium and selenium in the formations hosting perched groundwater at the site, and yield increasing concentration trends.

Figure 3 also shows that the rates of increase in both uranium and selenium appear to accelerate circa 2016. As discussed above and as shown in Figure 9, the change in the rate of uranium increase correlates with the reversal in pH trend from generally decreasing to generally increasing. This change is consistent with increased uranium mobility based on the expected reduction in uranium Kd with increasing pH (USEPA, 2007); and with the increased bicarbonate and calcium in MW-30 since 2016 (Figures 5 and 6) via the mechanisms detailed in Drage and Kennedy (2013).

However, pyrite is a source of both uranium and selenium (Deditius, 2011; Descotes et al 2010; Glizaud, 2006) that are expected to be released upon pyrite oxidation; and pyrite oxidation via both oxygen and nitrate is occurring at MW-30. Pyrite oxidation by nitrate can occur by two pathways, one that consumes and one that releases acid. Therefore, depending on the pathway, nitrate oxidation of pyrite may be accompanied by either a decrease or an increase in pH.

That both uranium and selenium are released from pyrite and from pyrite-bearing core at the Mill is discussed in EFRI (2021). Bottle-roll tests using 'generic' pyrite resulted in bottle-roll solutions initially consisting of laboratory-grade DI water generating between 25 micrograms per liter ("µg/L") and 3,420 µg/L uranium; and between 31 µg/L and 65 µg/L selenium. Bottle-roll tests using Mill-specific pyrite-bearing core from the formation hosting perched groundwater at the site (at well MW-24A) yielded bottle-roll solutions having as much as 6,700 µg/L uranium; and 303 µg/L selenium.

Furthermore, the mobilities of uranium and selenium, based on Kd reported in USEPA (2007) and USEPA (2005), indicate that these constituents are expected to have substantially different mobilities at the near-neutral pH measured at MW-30. Uranium is expected to have a *minimum* Kd of approximately 60 to 100 mL/g; and a potential maximum Kd of 630,000 to 1,000,000 mL/g; while selenium is expected to have a Kd on the order of <1 to 10 mL/g. In addition, chloride is conservative and has a negligible Kd. Because chloride is increasing with uranium and selenium, and is a conservative species (negligible Kd), a relatively remote source such as the TMS could not cause the nearly simultaneous changes in concentration of all three of these constituents because of their substantially different Kds. Uranium and selenium would be substantially retarded with respect to chloride such that increases in uranium and selenium would be substantially delayed in time with respect to increases in chloride. Likewise, uranium and selenium would be substantially retarded with respect to relatively conservative fluoride and sulfate such that increases in uranium and selenium would be substantially delayed in time with respect to increases in fluoride and sulfate. However, fluoride and sulfate at MW-30 are *stable to decreasing*. As discussed in Section 3.1, the nearly simultaneous increases in chloride, uranium and selenium at MW-30 demonstrate that geochemical changes in the immediate vicinity of the well are the cause of the rising trends rather than seepage from a relatively remote source such as the TMS.

In order to impact groundwater at MW-30, any solution seeping from the TMS would have to penetrate more than 50 feet of vadose materials, then migrate within perched groundwater toward MW-30. Because, as discussed above, the expected Kd for uranium is at least one to two orders of magnitude higher than the expected Kd for selenium; and could be more than four orders of magnitude larger; the substantial retardation of uranium with respect to selenium that would occur would prevent the nearly simultaneous increases in both constituents that have been measured. Similarly, because chloride is increasing with uranium and selenium, and is a conservative species (negligible Kd), a relatively remote source such as the TMS could not cause the nearly simultaneous changes in concentration of all three of these constituents because of their substantially different Kds. The only condition that would allow simultaneous increases in constituents with substantially different Kd would be a 'fast pathway' that could conduct TMS solution directly to the immediate vicinity of MW-30 without sorption or any other significant attenuation process. However, if such a 'fast pathway' existed, then nearly simultaneous increases in *all* TMS constituents would occur, rather than just a few; and pH would drop substantially, rather than increase as has happened at MW-30 since 2016. In particular, iron, which typically has the highest measured concentrations in the TMS, would be expected to increase substantially; yet, as discussed above (Figure 7), iron at MW-30 has decreased in concentration as has not been detected since the second quarter of 2013.

3.6.3 Summary of Factors Demonstrating no Impact to MW-30 From the TMS

Factors that demonstrate groundwater at MW-30 has not been impacted by the TMS include, but are not limited to, the following:

1. Indicator parameters fluoride and sulfate are decreasing;
2. Bicarbonate is increasing (since 2016);

3. pH is increasing (since 2016);
4. Iron and Manganese are decreasing (since 2009);
5. Chloride, uranium and selenium could not be increasing simultaneously due to substantially different Kd expected at the measured pH conditions (uranium increase should be substantially delayed relative to chloride and selenium; and selenium increase should be substantially delayed relative to chloride); and
6. If the water level increase resulted from potential TMS seepage, then chloride, fluoride, sulfate, uranium and selenium concentrations would be orders of magnitude higher than measured.

3.6.4 Revised GWCLs

Because increasing concentrations of uranium and selenium are not the result of potential TMS seepage, revised GWCLs for uranium and selenium are proposed. Section 4 presents the methods used to calculate GWCLs using a modified approach for trending constituents, in accordance with the Flowsheet.

4.0 CALCULATIONS OF GROUNDWATER COMPLIANCE LIMITS

The findings of analyses discussed above support the conclusions that (1) increasing concentrations of selenium and uranium result from natural causes that include mobilization by nitrate supplied by the nitrate/chloride plume, as well as oxidation of pyrite by nitrate; (2) with the exception of chloride, concentrations of indicator parameters in MW-30 have not changed significantly since the time of the New Wells Background Report; and (3) MW-30 is not being impacted by potential TMS seepage. Therefore, revised GWCLs for selenium and uranium in MW-30 are proposed.

4.1 Modified Approach to Calculation of GWCLs for Trending Constituents

According to the DWMRC-approved Flowsheet, if an increasing trend is present, a modified approach should be considered for determining GWCLs.

Uranium and selenium both exhibit significantly increasing trends that can be attributed to mobilization by nitrate and to pyrite oxidation by nitrate. The modified approach for revised uranium and selenium GWCLs includes multiplying 1.5 times the background concentration as defined in UAC R317-6-4.6-B.3 using a subset of data to determine representative and appropriate GWCLs for trending constituents. This modified approach has been used for previous SARs and has been approved by DWMRC.

The UAC R317-6-4.3 recognizes that "contaminants" may be present as part of naturally occurring background conditions. In this rule, background concentration is defined as the "concentration of a pollutant in ground water upgradient or lateral hydraulically equivalent point from a facility, practice or activity which has not been affected by that facility, practice or activity." Background at the Mill has been determined on an intra-well basis, as defined in the Background Reports. Therefore, to be conservative, the mean concentration of the 2016 data subset is used as background for the purposes of this calculation.

pH trends in MW-30 were decreasing prior to 2016 and are increasing after 2016. This point of inflection, January 1, 2016, identified in the pH data informed the data sets used to calculate revised GWCLs using a modified approach.

Multiplying the mean concentration by 1.5 produces a GWCL that is greater than a GWCL determined using mean plus two standard deviations or the highest historical value. A greater GWCL decreases the likelihood of false positives (exceedances) associated with increasing trends related to natural background conditions including oxidation of pyrite. This method maintains the intra-well approach that has been established for compliance at the Mill, combining elements from the Flowsheet and from previously approved GWCLs calculated using a modified approach. The flowsheet calculations along with the proposed GWCLs using the modified approach, are presented in **Appendix B-1** and **Table 1**.

4.2 Proposed Revised GWCLs

GWCLs determined according to the Flowsheet are presented in **Table 1.**

Table 1
Proposed Revised GWCLs for MW-30

Parameter	Current GWCL	Flowsheet Revised GWCL	Rationale	Modified Approach Proposed GWCL	Rationale
Selenium (ug/L)	53.60	60.40	Highest historical value	**72.52**	Post January 1, 2016 Mean x 1.5
Uranium (ug/L)	9.82	10.27	Mean + 2σ	**13.11**	Post January 1, 2016 Mean x 1.5

5.0 CONCLUSIONS AND RECOMMENDATIONS

The Mill site was recently thoroughly studied in the Background Reports (INTERA, 2007a, 2007b, 2008), in various SARs, and in the University of Utah Study (Hurst and Solomon, 2008). The Background Reports and the University of Utah Study concluded that groundwater at the Mill site has not been impacted by Mill operations. Both of those studies also acknowledged that there are natural influences at play at the Mill site that have given rise to increasing trends and general variability of background groundwater at the Mill site.

The focus of this SAR was therefore to identify any changes in the circumstances identified in those studies. Although uranium and selenium at MW-30 are increasing, stable to decreasing fluoride and sulfate preclude any potential impacts from the TMS, consistent with previous findings.

Since the pH Report (INTERA, 2012b) pH at MW-30 decreased until about 2016, then began to increase. The post-2016 increase in pH is also inconsistent with a potential TMS impact.

Selenium concentrations continue to exhibit a statistically significant increasing trend, due to the mobilization of naturally-occurring selenium by nitrate; and by oxidation of pyrite by nitrate that releases selenium present as a contaminant in pyrite. Increasing uranium concentrations are also caused by mobilization of naturally-occurring uranium by nitrate; by oxidation of pyrite by nitrate; and by increasing bicarbonate concentrations that correlate to the post-2016 change in pH from decreasing to increasing. In addition, decreases in Kd for uranium that occur as pH changes from near-neutral to either more acidic or alkaline pH will increase the mobility of uranium. Exceedances in selenium and uranium are therefore unrelated to any potential impacts by the TMS.

EFRI recommends adopting the revised GWCLs for MW-30 in accordance with the Flowsheet. Regular revisions to GWCLs are consistent with the USEPA Unified Guidance (USEPA, 2009). Such revisions account for variability in larger datasets and minimize unwarranted out-of-compliance status.

6.0 SIGNATURE AND CERTIFICATION

This document was prepared by Energy Fuels Resources (USA) Inc.

Energy Fuels Resources (USA) Inc.

By:

______________________________ 6/28/22
Scott A. Bakken Date
Vice President, Regulatory Affairs

Certification:

I certify, under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Scott A. Bakken
Vice President, Regulatory Affairs
Energy Fuels Resources (USA) Inc.

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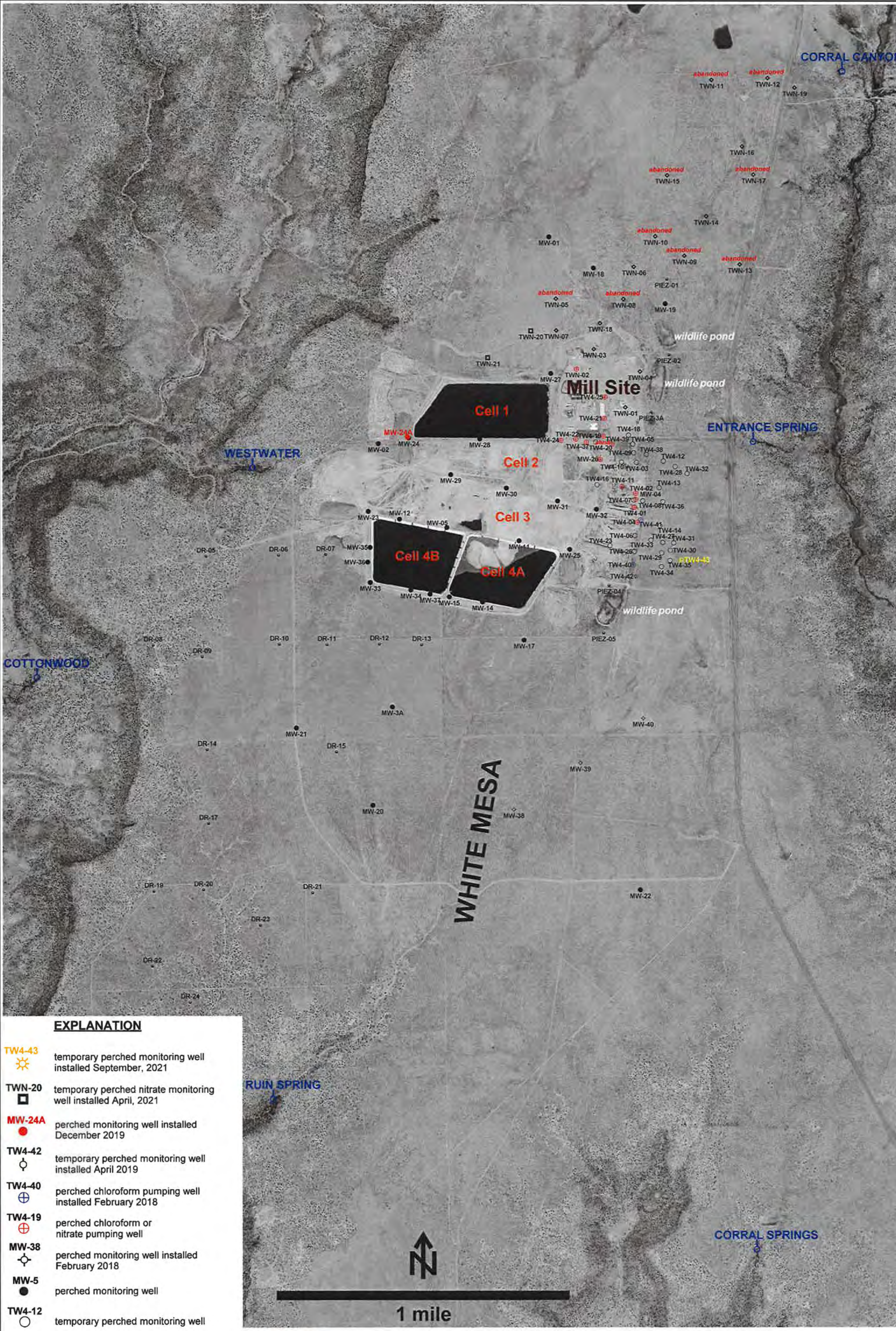
FIGURES



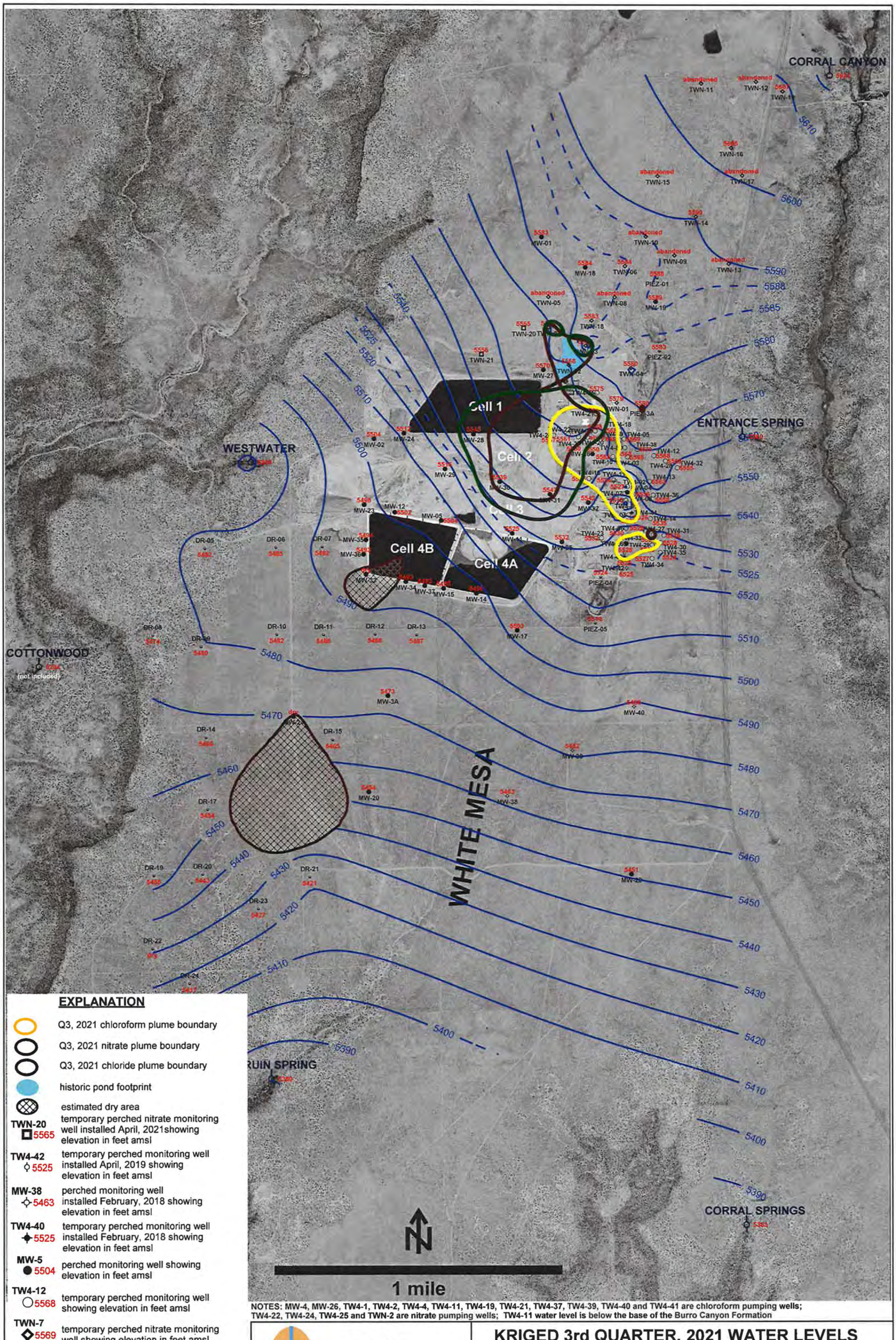
EXPLANATION

TW4-43	temporary perched monitoring well installed September, 2021
TWN-20	temporary perched nitrate monitoring well installed April, 2021
MW-24A	perched monitoring well installed December 2019
TW4-42	temporary perched monitoring well installed April 2019
TW4-40	perched chloroform pumping well installed February 2018
TW4-19	perched chloroform or nitrate pumping well
MW-38	perched monitoring well installed February 2018
MW-5	perched monitoring well
TW4-12	temporary perched monitoring well
TWN-7	temporary perched nitrate monitoring well
PIEZ-1	perched piezometer
RUIN SPRING	seep or spring

HYDRO GEO CHEM, INC.

WHITE MESA SITE PLAN SHOWING LOCATIONS OF PERCHED WELLS AND PIEZOMETERS

APPROVED	DATE	REFERENCE	FIGURE
		H :/718000/MW30_31/ 2021_MW30SAR/Figures/Uwelloc0921srf	1A

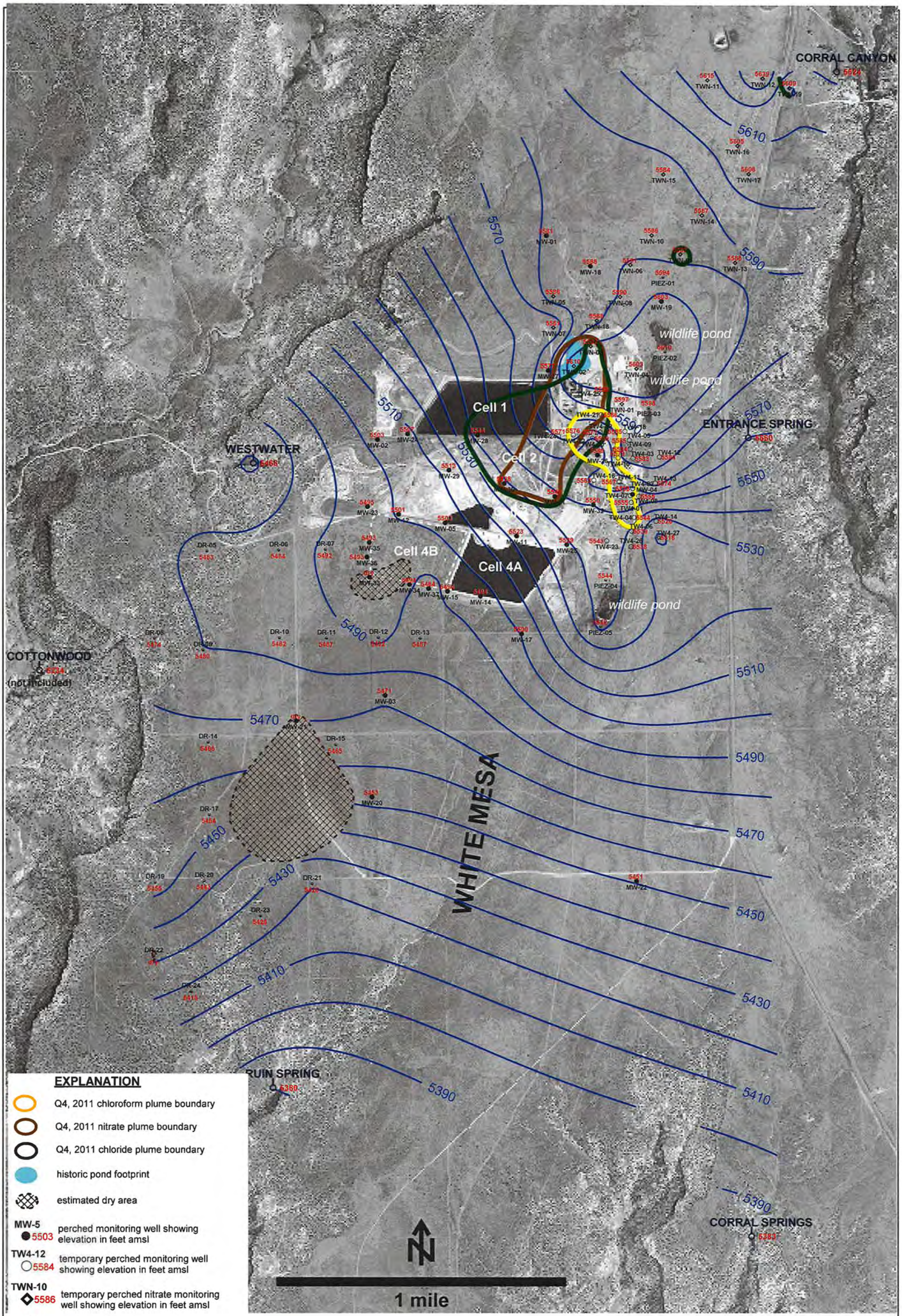


NOTES: MW-4, MW-26, TW4-1, TW4-2, TW4-4, TW4-11, TW4-19, TW4-21, TW4-37, TW4-39, TW4-40 and TW4-41 are chloroform pumping wells; TW4-22, TW4-24, TW4-25 and TWN-2 are nitrate pumping wells; TW4-11 water level is below the base of the Burro Canyon Formation

HYDRO GEO CHEM, INC.

KRIGED 3rd QUARTER, 2021 WATER LEVELS AND PLUME BOUNDARIES WHITE MESA SITE

APPROVED	DATE	REFERENCE	FIGURE
		H :/718000/MW30_31/ 2021_MW30SAR/Figures/Uwl_Plumes_3Q21.srf	1B



EXPLANATION

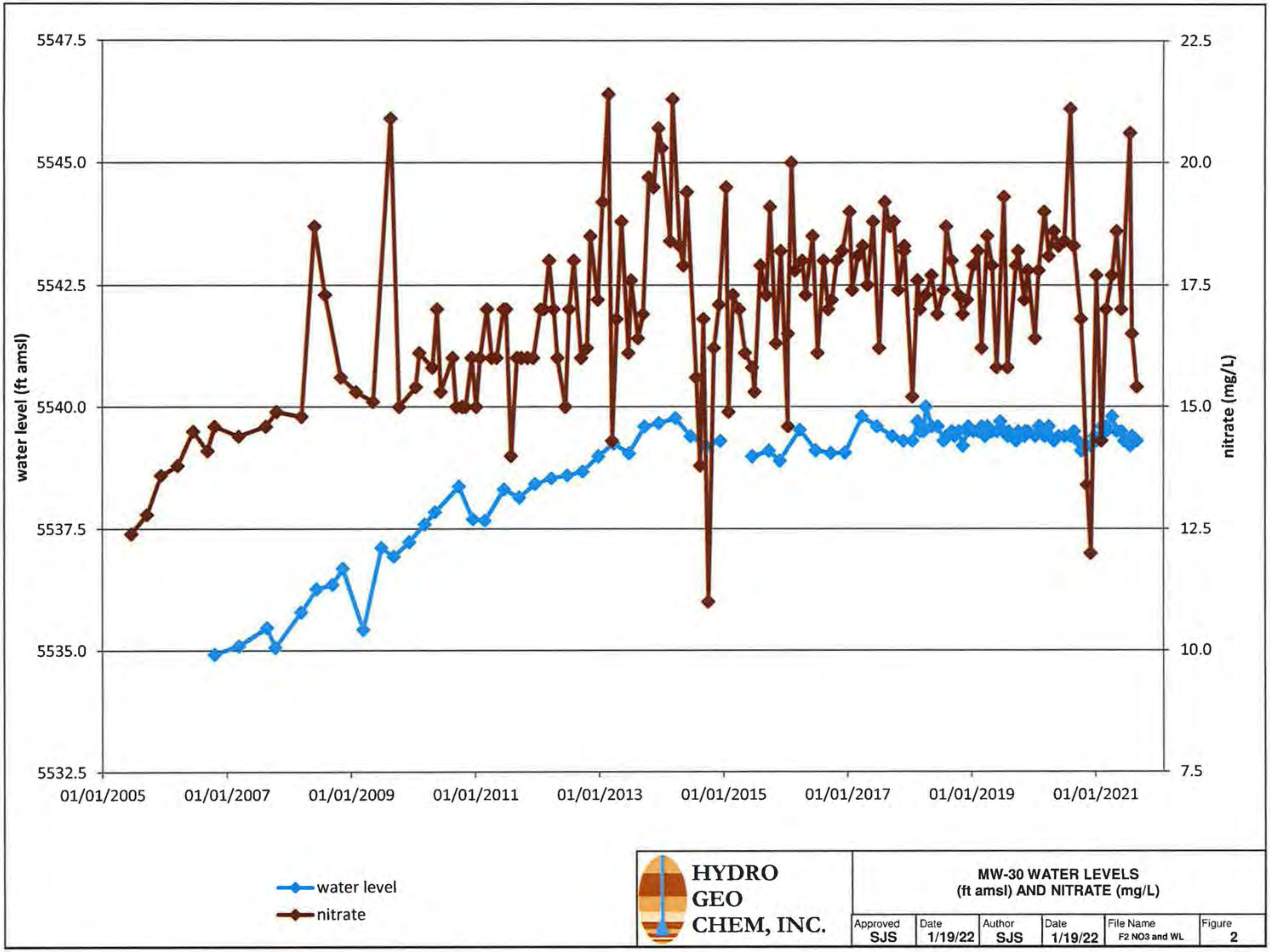
- Q4, 2011 chloroform plume boundary
- Q4, 2011 nitrate plume boundary
- Q4, 2011 chloride plume boundary
- historic pond footprint
- estimated dry area
- MW-5 ● 5503 — perched monitoring well showing elevation in feet amsl
- TW4-12 ○ 5584 — temporary perched monitoring well showing elevation in feet amsl
- TWN-10 ◆ 5586 — temporary perched nitrate monitoring well showing elevation in feet amsl
- PIEZ-1 ● 5594 — perched piezometer showing elevation in feet amsl
- TW4-27 ☼ 5518 — temporary perched monitoring well installed October, 2011 showing elevation in feet amsl
- RUIN SPRING ♁ 5380 — seep or spring showing elevation in feet amsl

NOTE: MW-4, MW-26, TW4-4, TW4-19, and TW4-20 are pumping wells

HYDRO GEO CHEM, INC.

KRIGED 4th QUARTER, 2011 WATER LEVELS AND PLUME BOUNDARIES WHITE MESA SITE

APPROVED	DATE	REFERENCE	FIGURE
		H:/718000/MW30_31/2021_MW30SAR/Figures/Uwl_Plumes_4Q11.srf	1C

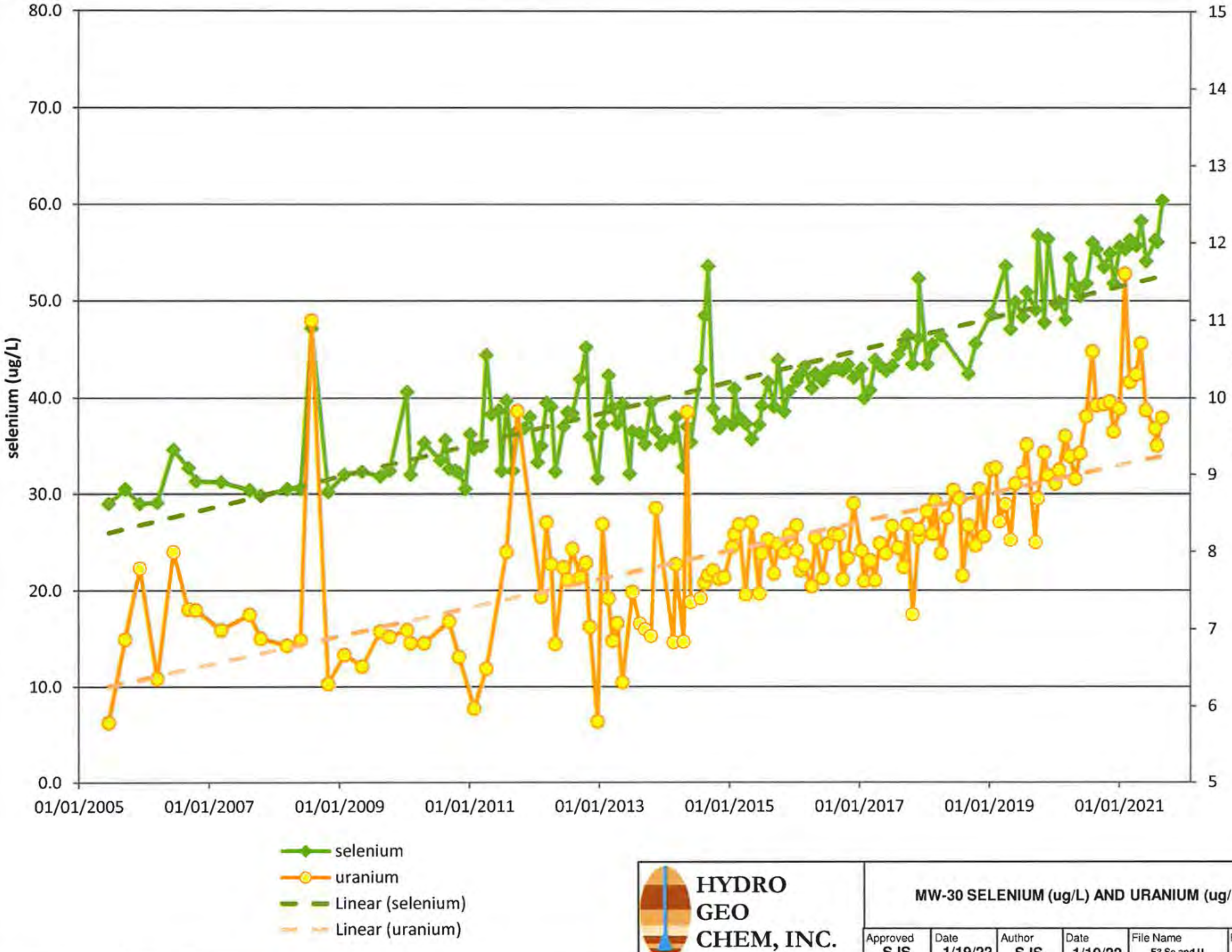


HYDRO GEO CHEM, INC.

MW-30 WATER LEVELS (ft amsl) AND NITRATE (mg/L)

Approved	Date	Author	Date	File Name	Figure
SJS	1/19/22	SJS	1/19/22	F2 NO3 and WL	2

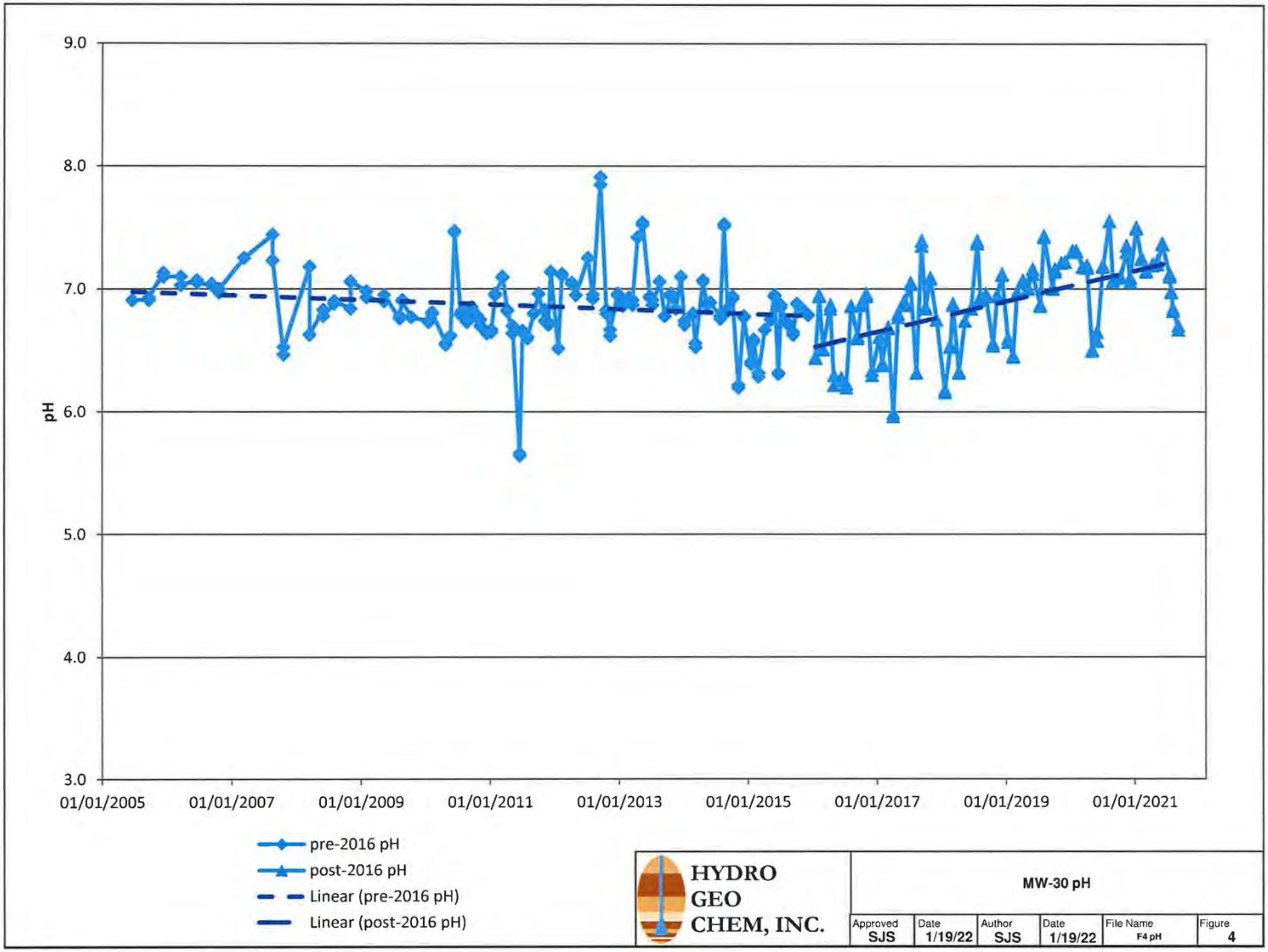
H:\718000\MW30_31\2021_MW30_SAR\Figures\MW30_AllAnalyt_111621.xlsx: F2 NO3 and WL

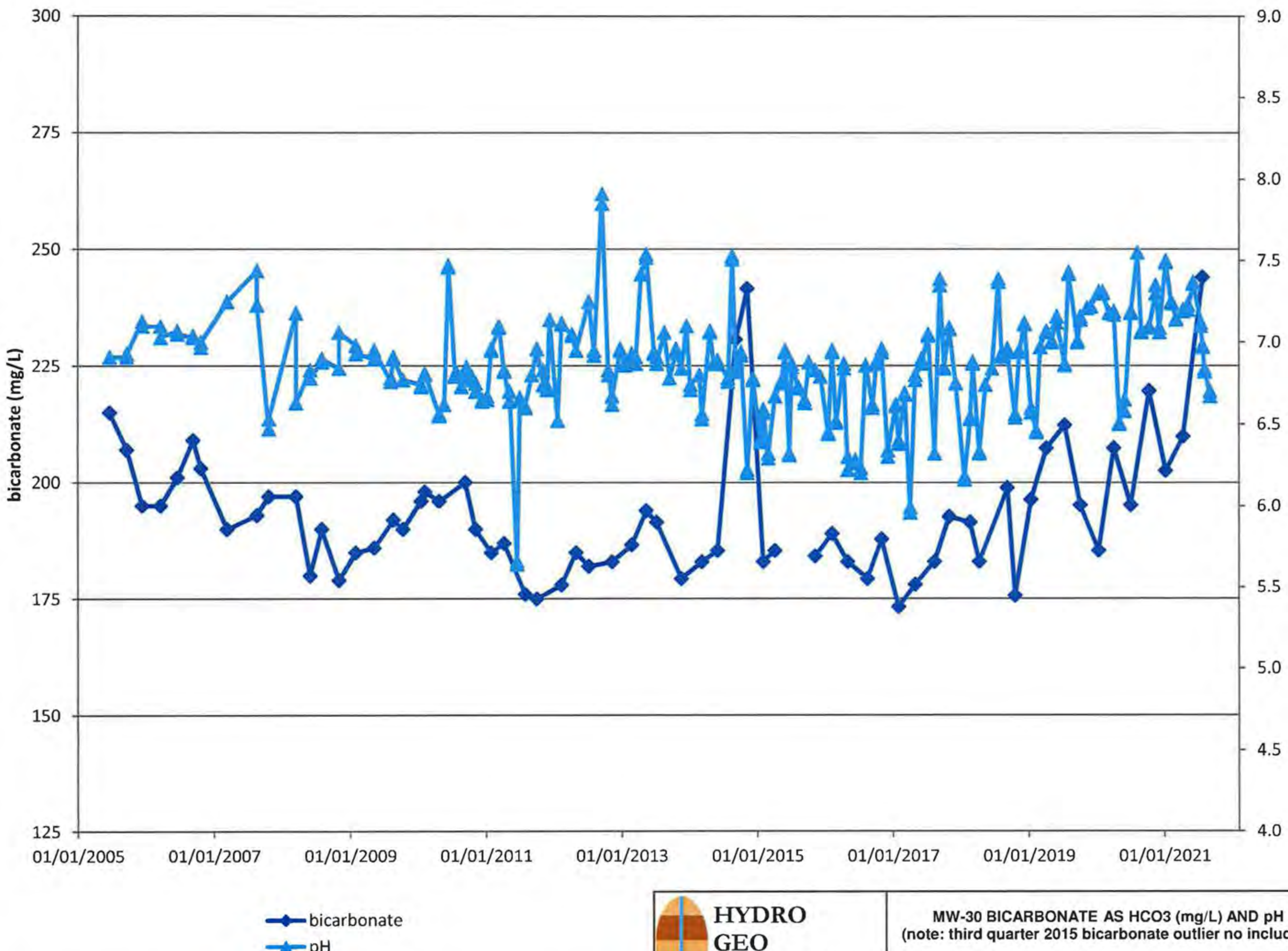


HYDRO GEO CHEM, INC.

MW-30 SELENIUM (ug/L) AND URANIUM (ug/L)					
Approved SJS	Date 1/19/22	Author SJS	Date 1/19/22	File Name F3 Se and U	Figure 3

H:\718000\MW30_31\2021_MW30_SAR\Figures\MW30_AllAnalyt_111621.xlsx: F3 Se and U


9.0
8.0
7.0
6.0
5.0
4.0
3.0
pH
01/01/2005
01/01/2007
01/01/2009
01/01/2011
01/01/2013
01/01/2015
01/01/2017
01/01/2019
01/01/2021
pre-2016 pH
post-2016 pH
Linear (pre-2016 pH)
Linear (post-2016 pH)
HYDRO
GEO
CHEM, INC.
MW-30 pH
Approved SJS
Date 1/19/22
Author SJS
Date 1/19/22
File Name F4 pH
Figure 4

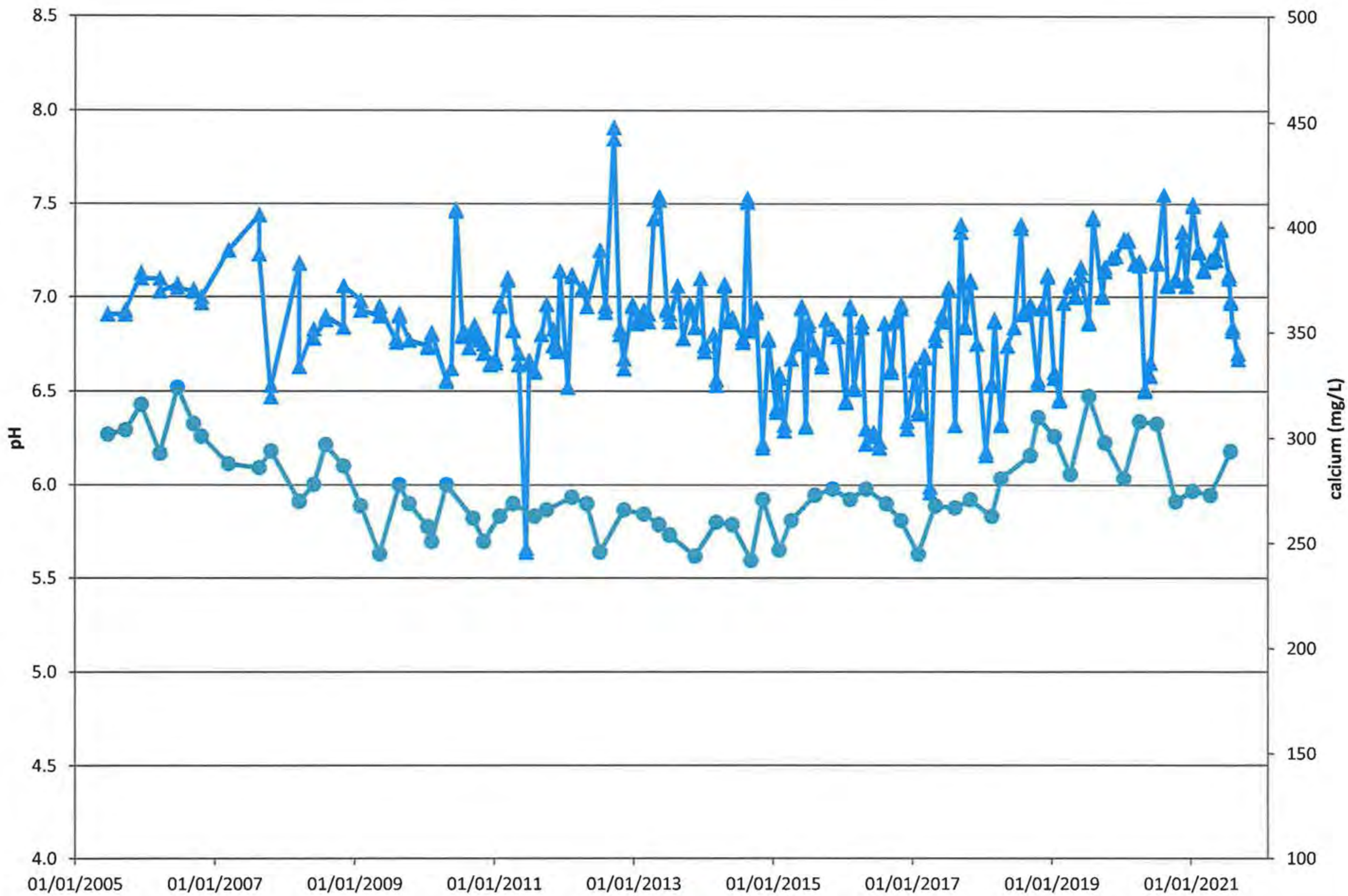


HYDRO GEO CHEM, INC.

MW-30 BICARBONATE AS HCO3 (mg/L) AND pH
(note: third quarter 2015 bicarbonate outlier no included)

Approved	Date	Author	Date	File Name	Figure
SJS	1/19/22	SJS	1/19/22	F5 bicarb and pH	5

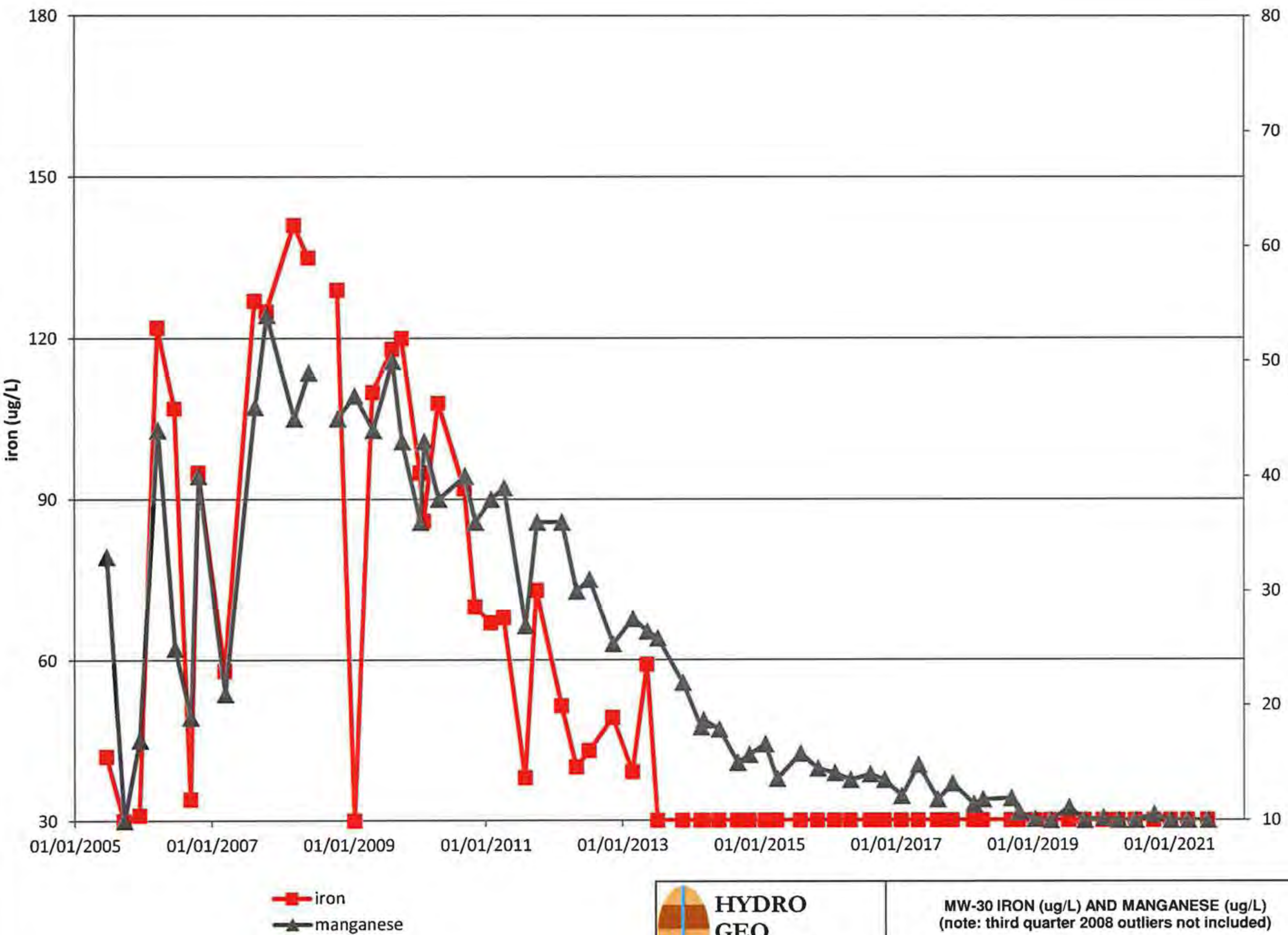
H:\718000\MW30_31\2021_MW30_SAR\Figures\MW30_AllAnalyt_111621.xlsx: F5 bicarb and pH



HYDRO GEO CHEM, INC.

MW-30 CALCIUM (mg/L) AND pH					
Approved SJS	Date 1/19/22	Author SJS	Date 1/19/22	File Name F6 Ca and pH	Figure 6

H:\718000\MW30_31\2021_MW30_SAR\Figures\MW30_AllAnalyt_111621.xlsx: F6 Ca and pH

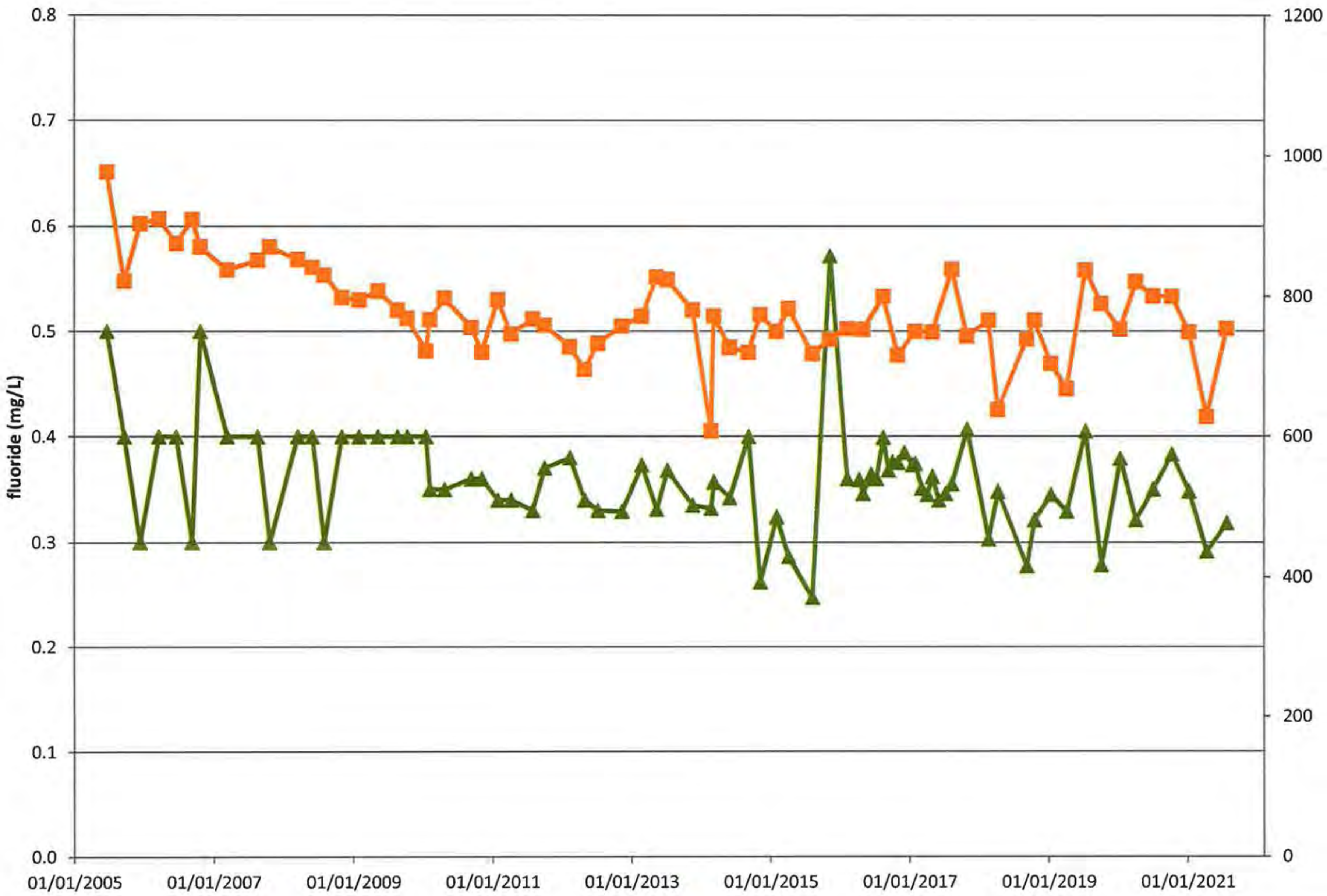


HYDRO GEO CHEM, INC.

MW-30 IRON (ug/L) AND MANGANESE (ug/L)
(note: third quarter 2008 outliers not included)

Approved	Date	Author	Date	File Name	Figure
SJS	1/19/22	SJS	1/19/22	F7 Fe and Mn	7

H:\718000\MW30_31\2021_MW30_SAR\Figures\MW30_AllAnalyt_111621.xlsx: F7 Fe and Mn

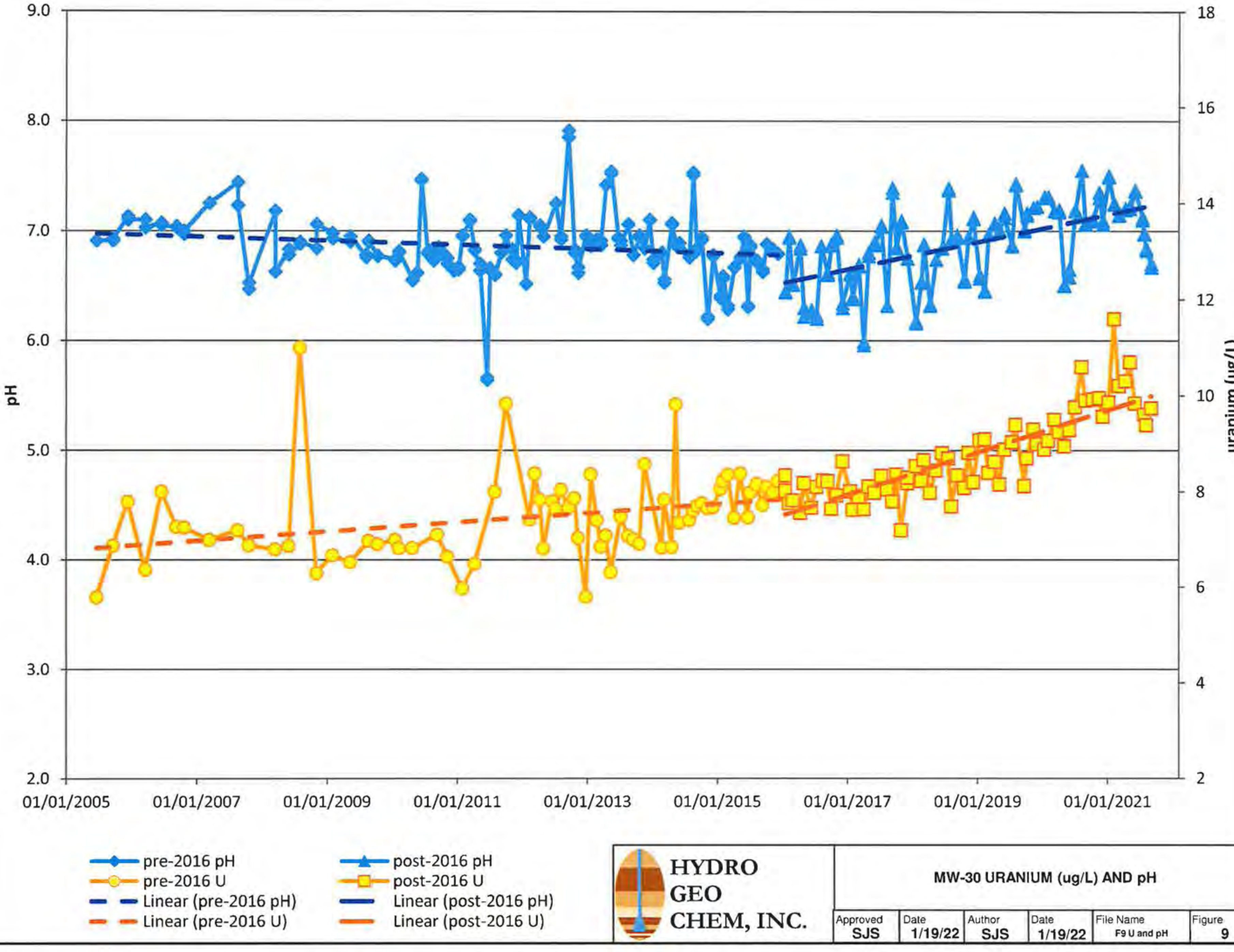


HYDRO GEO CHEM, INC.

MW-30 FLUORIDE (mg/L) AND SULFATE (mg/L)
(note: March 2016 fluoride outlier not included)

Approved	Date	Author	Date	File Name	Figure
SJS	1/19/22	SJS	1/19/22	F8 F and SO4	8

H:\718000\MW30_31\2021_MW30_SAR\Figures\MW30_AllAnalyt_111621.xlsx: F8 F and SO4



HYDRO GEO CHEM, INC.

MW-30 URANIUM (ug/L) AND pH					
Approved SJS	Date 1/19/22	Author SJS	Date 1/19/22	File Name F9 U and pH	Figure 9

H:\718000\MW30_31\2021_MW30_SAR\Figures\MW30_AllAnalyt_111621.xlsx: F9 U and pH

APPENDICES

APPENDIX A

Appendix A – GWCL Exceedances under the March 8, 2021 GWDP

Monitoring Well (Water Class)	Constituent Exceeding GWCL	GWCL in March 8, 2021 GWDP	Q1 2021 Sample Date	Q1 2021 Result	February 2021 Monthly Sample Date	February 2021 Monthly Result	March 2021 Monthly Sample Date	March 2021 Monthly Result	Q2 2021 Sample Date	Q2 2021 Result	May 2021 Monthly Sample Date	May 2021 Monthly Result	June 2021 Monthly Sample Date	June 2021 Monthly Result
			Q1 2021 Results						Q2 2021 Results					
			Required Quarterly Sampling Wells						Required Quarterly Sampling Wells					
MW-11 (Class II)	Chloride (mg/L)	39.16	1/21/2021	46.4	2/9/2021	46.4	3/8/2021	46.9	4/20/2021	47.7	5/10/2021	46.4	6/8/2021	52.1
	Sulfate (mg/L)	1309		1140		1260		1270		1290		1280		1270
	TDS (mg/L)	2528		2010		2160		1950		2110		2190		1960
MW-26 (Class III)	Nitrate + Nitrite (as N) (mg/L)	0.62	1/14/2021	0.619	2/10/2021	0.764	3/9/2021	0.617	4/21/2021	1.42	5/11/2021	1.06	6/8/2021	0.368
	Chloroform (ug/L)	70		2200		1930		2190		777		733		1590
	Chloride (mg/L)	58.31		57.4		71.3		63.9		57.5		69.6		54.9
	TDS (mg/L)	3284.19		3100		2700		3060		2790		NA		NA
	Carbon Tetrachloride	5		26.1		NA		NA		<1.00		<1.00		<1.00
	Methylene Chloride (ug/L)	5		7.65		3.43		1.27		<1.00		<1.00		1.90
MW-30 (Class II)	Nitrate + Nitrite (as N) (mg/L)	2.5	1/11/2021	17.7	2/10/2021	14.3	3/9/2021	17.0	4/14/2021	17.7	5/11/2021	18.6	6/8/2021	17.0
	Chloride (mg/L)	128		184		189		192		162		188		170
	Selenium (ug/L)	53.6		55.6		55.3		56.3		55.7		58.3		54.1
	Uranium (ug/L)	9.82		9.86		11.6		10.2		10.3		10.7		9.84
MW-31 (Class III)	Nitrate + Nitrite (as N) (mg/L)	5	1/12/2021	17.1	2/9/2021	14.3	3/8/2021	17.4	4/13/2021	18.6	5/10/2021	18.9	6/7/2021	20.6
	Sulfate (mg/L)	993		1070		1130		1210		1170		1200		1170
	TDS (mg/L)	2132		2460		2960		2400		2300		2610		2400
	Uranium (ug/L)	15		19.7		22.2		20.2		20.1		21.7		20.8
	Chloride (mg/L)	143		354		380		388		377		384		374
			Required Semiannual Sampling Wells						Required Semiannual Sampling Wells					
MW-12 (Class III)	Uranium (ug/L)	23.5	1/14/2021	25.0	NS	NA	NS	NA	4/20/2021	22.9	NS	NA	NS	NA
	Selenium (ug/L)	39		35.1						28.8				
MW-24 (Class III)	Beryllium (ug/L)	2	1/14/2021	2.75	NS	NA	NS	NA	4/29/2021	2.78	NS	NA	NS	NA
	Cadmium (ug/L)	6.43		8.79		NA		NA		8.08		NA		NA
	Fluoride (mg/L)	0.47		0.916		NA		NA		0.925		NA		NA
	Nickel (mg/L)	50		70.4		NA		NA		72.4		NA		NA
	Manganese (ug/L)	7507		7460		NA		NA		7540		NA		NA
	Thallium (ug/L)	2.01		2.74		NA		NA		3.02		NA		NA
	Gross Alpha (pCi/L)	7.5		2.94		NA		NA		3.18		NA		NA
	Sulfate (mg/L)	2903		2980		NA		NA		2960		NA		NA
	TDS (mg/L)	4450		4260		NA		NA		4460		NA		NA
	Field pH (S.U.)	5.03 - 8.5		5.08		NA		NA		5.00		NA		NA
MW-27 (Class III)	Nitrate + Nitrite (as N) (mg/L)	5.6	1/14/2021	5.16	NS	NA	NS	NA	4/15/2021	6.57	NS	NA	NS	NA
MW-28 (Class III)	Chloride (mg/L)	105	1/15/2021	128	NS	NA	NS	NA	4/15/2021	144	NS	NA	NS	NA
	Selenium (ug/L)	11.1		14.0		NA		NA		13.4		NA		NA
	Nitrate + Nitrite (as N) (mg/L)	5		3.44		NA		NA		4.09		NA		NA
	Gross Alpha (pCi/L)	2.42		1.81		NA		NA		2.08		NA		NA
	Uranium (ug/L)	4.9		10.3		NA		NA		8.52		NA		NA
MW-29 (Class III)	Uranium (ug/L)	15	1/15/2021	16.9	NS	NA	NS	NA	4/14/2021	16.2	NS	NA	NS	NA
MW-32 (Class III)	Chloride (mg/L)	35.39	1/14/2021	36.9	NS	NA	NS	NA	4/13/2021	31.8	NS	NA	NS	NA

Notes:

NS= Not Required and Not Sampled
NA= Not Applicable

Exceedances are shown in yellow

These GWCLs were reset with the issuance of the March 8, 2021 GWDP. The new GWCLs became effective on March 8, 2021 and the first exceedance under the revised GWDP was noted in the March monthly data.

Pursuant to the DWMRC letter of May 5, 2021, these constituents will no longer be monitored on an accelerated schedule. These constituents will be dropped from this report after this quarter

APPENDIX B

Appendix B-1: Summary of Statistical Analysis for Out of Compliance Constituents in MW-30

Well	Data Set	Constituent	Units	N	% Non-Detected Values	Mean	Standard Deviation	Shapiro-Wilk Test for Normality		Normally or Lognormally distributed?	Mann Kendall Trend Analysis		Linear Trend Analysis		Significant Trend	Previously Identified Increasing Trend?	Current GWCL[a]	Mean + 2σ	Mean x 1.5	Highest Historical Value (HHV)	Fractional Approach GWCL	Flowsheet GWCL	Rationale	Modified GWCL	Rationale
								W	p		S	p	r^2	p											
MW-30	ALL 2021 SAR Data	Selenium	µg/L	147	0	41.2	7.8	0.971	3.61E-03	Not normal	7898	0.00	NA	NA	Increasing	Yes	53.6	56.77	61.83	60.40	12.5	60.4	HHV	61.83	Mean x 1.5
	GWCL Subset Post 2016	Selenium	µg/L	60	0	48.3	5.6	0.924	1.09E-03	Not normal	1348	0.00	NA	NA	Increasing	Yes	53.6	59.56	72.52	60.40	12.5	60.4	HHV	72.52	Mean x 1.5
	ALL 2021 SAR Data	Uranium	µg/L	140	0	8.1	1.1	0.991	5.46E-01	Normal	6030	0.00	0.50	1.11E-22	Increasing	Yes	9.8	10.27	12.13	11.60	7.5	10.3	Mean + 2σ	12.13	Mean x 1.5
	GWCL Subset Post 2016	Uranium	µg/L	69	0	8.7	0.9	0.968	7.49E-02	Normal	1564	0.00	0.70	2.71E-19	Increasing	Yes	9.8	10.52	13.11	11.60	7.5	10.5	Mean + 2σ	13.11	Mean x 1.5

Notes:

σ = sigma
µg/L = micrograms per liter
N = number of valid data points

p = probability
W = Shapiro Wilk test value
S = Mann-Kendall statistic

r^2 = The measure of how well the trendline fits the data where r2=1 represents a perfect fit.
FA= Fraction of GWQS as defined in UAC R317-6
NA= Not Applicable

Distribution = Distribution as determined by the Shapiro-Wilk distribution test for constituents with % Detect > 50% and N>8
Mean = The arithmatic mean as determined for normally or log-normally distributed constituents with % Detect > 50%
Standard Deviation = The standard deviation as determined for normally or log-normally distributed constituents with % Detect > 85%
Highest Historical Value = The highest observed value for constituents with % Detect < 50%
Flowsheet GWCL does not take into account increasing trends
a = GWCL is based on the GWDP using 11 data points available at the time of the background report (INTERA, 2008)

ALL 2021 SAR Data = All data with extremes removed

Appendix B-2: Comparison of Calculated and Measured TDS in MW-30

Date Sampled	Alkalinity (mg/L as HCO_3)	Calcium (mg/L)	Chloride (mg/L)	Potassium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Sulfate (mg/L)	Measured TDS (mg/L)	Calculated TDS (mg/L)	Ratio
6/22/2005	215	302	125	8.9	83.7	113	977	1940	1825	94%
9/22/2005	207	304	125	8.7	84.8	103	822	1780	1655	93%
12/14/2005	195	316	128	8.5	84.5	102	904	1800	1738	97%
3/22/2006	195	293	125	8.0	76.8	113	911	1740	1722	99%
6/21/2006	201	324	124	179.0	76.5	106	876	1700	1887	111%
9/13/2006	209	307	118	8.5	76	110	910	1790	1739	97%
10/25/2006	203	301	124	8.5	78.6	114	871	1650	1700	103%
3/15/2007	190	288	125	8.2	73.7	102	838	1690	1625	96%
8/22/2007	193	286	126	7.3	72.3	108	852	1700	1645	97%
10/24/2007	197	294	122	8.1	72.9	110	871	1660	1675	101%
3/19/2008	197	270	118	7.8	68.9	108	853	1610	1623	101%
6/3/2008	180	278	125	7.3	71.3	109	842	1500	1613	108%
8/4/2008	190	297	121	7.6	75.8	115	831	1640	1637	100%
11/5/2008	179	287	162	7.4	73.3	111	799	1610	1619	101%
2/3/2009	185	268	113	6.9	67.3	99.7	795	1640	1535	94%
5/13/2009	186	245	122	6.5	65.1	104	808	1560	1537	99%
8/24/2009	192	278	118	7.4	69.1	111	781	1530	1557	102%
10/14/2009	190	269	129	7.4	68.5	109	769	1620	1542	95%
1/20/2010	196	258	106	6.9	68	101	722	1540	1458	95%
2/9/2010	198	251	127	6.9	65.1	103	767	1510	1518	101%
4/27/2010	196	278	97	7.1	71.5	111	798	1570	1559	99%
9/14/2010	200	262	111	6.9	67	106	756	1700	1509	89%
11/9/2010	190	251	126	6.9	64.1	94.7	720	1700	1453	85%
2/1/2011	185	263	134	6.6	67.5	102	796	1530	1554	102%
4/11/2011	187	269	134	7.2	67.9	107	746	1650	1518	92%
8/3/2011	176	263	126	6.8	66.7	102	768	1550	1509	97%
10/4/2011	175	266	129	6.7	68.3	93.1	759	1550	1497	97%
2/14/2012	178	272	126	6.6	70	102	728	1550	1483	96%
5/2/2012	185	269	124	7.7	69.3	87.9	696	1600	1439	90%
7/10/2012	182	246	128	6.2	65.9	96.9	733	1570	1458	93%
11/13/2012	183	266	114	6.6	70.6	105	758	1520	1503	99%
2/26/2013	186.66	264	129	7.2	72.1	109	772	1620	1540	95%
5/15/2013	193.98	259	119	6.3	70.9	106	828	1540	1583	103%
7/10/2013	191.54	254	130	6.7	69.8	106	824	1580	1582	100%
11/20/2013	179.34	244	124	6.3	63	92.3	781	1570	1490	95%
3/11/2014	183	260	144	6.5	69.5	98.1	772	1470	1533	104%
6/3/2014	185.44	259	128	6.4	72.6	94.9	727	1500	1473	98%
9/9/2014	230.58	242	136	6.3	66.8	94.9	720	1540	1497	97%
11/10/2014	241.56	271	154	6.3	72.1	102	774	1460	1621	111%
2/4/2015	183	247	136	6.7	68.3	95.9	750	1480	1487	100%
4/8/2015	185.44	261	142	6.4	72.4	103	783	1520	1553	102%
8/11/2015	319.64	273	165	6.9	71.8	99.3	718	1550	1654	107%
11/11/2015	184.22	276	140	6.1	69.6	97.3	739	1520	1512	99%
2/10/2016	189.1	271	145	6.3	70.3	99.6	754	1580	1535	97%
5/4/2016	183	276	139	6.9	74.2	103	753	1510	1535	102%
8/18/2016	179.34	269	150	6.5	73.6	110	800	1500	1588	106%
11/3/2016	187.88	261	143	7.0	71.8	99.7	716	1490	1486	100%
2/2/2017	173.24	245	150	6.6	66.5	95.6	750	1590	1487	94%
5/2/2017	178.12	268	146	6.6	71.3	101	749	1710	1520	89%
8/14/2017	183	267	173	6.0	67.2	98.3	839	1490	1634	110%
11/1/2017	192.76	271	156	6.5	74.5	101	743	1480	1545	104%
2/22/2018	191.54	263	158	6.8	76	97.1	766	1580	1558	99%
4/12/2018	183	281	145	6.4	77.5	97.3	638	1430	1428	100%
9/11/2018	198.86	292	183	7.0	78.1	107	739	1510	1605	106%

Appendix B-2: Comparison of Calculated and Measured TDS in MW-30

10/22/2018	175.68	310	140	7.3	80.6	110	766	1560	1590	102%
1/16/2019	196.42	301	157	7.0	80.6	112	704	1640	1558	95%
4/9/2019	207.4	283	138	6.5	72.8	95.5	668	1550	1471	95%
7/16/2019	212.28	320	181	7.0	86.8	109	838	1590	1754	110%
10/8/2019	195.2	298	170	6.4	82.5	114	790	1580	1656	105%
1/15/2020	185.44	281	182	7.4	77	103	753	1620	1589	98%
4/6/2020	207.4	308	195	6.1	78.3	106	821	1690	1722	102%
7/6/2020	195.2	307	185	7.3	81.5	120	801	1700	1697	100%
10/13/2020	219.6	270	183	6.6	74.5	103	800	968	1657	171%
1/11/2021	202.52	275	184	6.9	75	102	749	1660	1594	96%
4/14/2021	209.84	273	162	7.4	77.3	101	628	1580	1459	92%
7/29/2021	244	294	188	7.9	78.8	107	754	2010	1674	83%

Appendix B-3: Charge Balance Calculations for Major Cations and Anions in MW-30

Well	Date	Calcium (meq/L)	Sodium (meq/L)	Magnesium (meq/L)	Potassium (meq/L)	Total Cation Charge (meq/L)	HCO_3 (meq/L)	Chloride (meq/L)	SO_4 (meq/L)	Total Anion Charge (meq/L)	Charge Balance Error
MW-30	6/22/2005	15.07	4.92	6.89	0.23	**27.10**	-3.52	-3.53	-20.34	**-27.39**	-0.54%
MW-30	9/22/2005	15.17	4.48	6.98	0.22	**26.85**	-3.39	-3.53	-17.11	**-24.03**	5.53%
MW-30	12/14/2005	15.77	4.44	6.95	0.22	**27.37**	-3.20	-3.61	-18.82	**-25.63**	3.30%
MW-30	3/22/2006	14.62	4.92	6.32	0.20	**26.06**	-3.20	-3.53	-18.97	**-25.69**	0.71%
MW-30	6/21/2006	16.17	4.61	6.29	4.58	**31.65**	-3.29	-3.50	-18.24	**-25.03**	11.68%
MW-30	9/13/2006	15.32	4.78	6.25	0.22	**26.57**	-3.43	-3.33	-18.95	**-25.70**	1.67%
MW-30	10/25/2006	15.02	4.96	6.47	0.22	**26.66**	-3.33	-3.50	-18.13	**-24.96**	3.30%
MW-30	3/15/2007	14.37	4.44	6.06	0.21	**25.08**	-3.11	-3.53	-17.45	**-24.09**	2.02%
MW-30	8/22/2007	14.27	4.70	5.95	0.19	**25.10**	-3.16	-3.55	-17.74	**-24.46**	1.31%
MW-30	10/24/2007	14.67	4.78	6.00	0.21	**25.66**	-3.23	-3.44	-18.13	**-24.80**	1.70%
MW-30	3/19/2008	13.47	4.70	5.67	0.20	**24.04**	-3.23	-3.33	-17.76	**-24.32**	-0.58%
MW-30	6/3/2008	13.87	4.74	5.87	0.19	**24.67**	-2.95	-3.53	-17.53	**-24.01**	1.35%
MW-30	8/4/2008	14.82	5.00	6.24	0.20	**26.25**	-3.11	-3.41	-17.30	**-23.83**	4.84%
MW-30	11/5/2008	14.32	4.83	6.03	0.19	**25.37**	-2.93	-4.57	-16.64	**-24.14**	2.49%
MW-30	2/3/2009	13.37	4.34	5.54	0.18	**23.42**	-3.03	-3.19	-16.55	**-22.77**	1.41%
MW-30	5/13/2009	12.23	4.52	5.36	0.17	**22.27**	-3.05	-3.44	-16.82	**-23.31**	-2.28%
MW-30	8/24/2009	13.87	4.83	5.68	0.19	**24.57**	-3.15	-3.33	-16.26	**-22.74**	3.89%
MW-30	10/14/2009	13.42	4.74	5.64	0.19	**23.99**	-3.11	-3.64	-16.01	**-22.76**	2.62%
MW-30	1/20/2010	12.87	4.39	5.59	0.18	**23.04**	-3.21	-2.99	-15.03	**-21.23**	4.07%
MW-30	2/9/2010	12.52	4.48	5.36	0.18	**22.54**	-3.24	-3.58	-15.97	**-22.80**	-0.57%
MW-30	4/27/2010	13.87	4.83	5.88	0.18	**24.77**	-3.21	-2.74	-16.61	**-22.56**	4.65%
MW-30	9/14/2010	13.07	4.61	5.51	0.18	**23.37**	-3.28	-3.13	-15.74	**-22.15**	2.69%
MW-30	11/9/2010	12.52	4.12	5.27	0.18	**22.09**	-3.11	-3.55	-14.99	**-21.66**	1.00%
MW-30	2/1/2011	13.12	4.44	5.55	0.17	**23.28**	-3.03	-3.78	-16.57	**-23.38**	-0.22%
MW-30	4/11/2011	13.42	4.65	5.59	0.18	**23.85**	-3.06	-3.78	-15.53	**-22.38**	3.18%
MW-30	8/3/2011	13.12	4.44	5.49	0.17	**23.22**	-2.88	-3.55	-15.99	**-22.43**	1.74%
MW-30	10/4/2011	13.27	4.05	5.62	0.17	**23.11**	-2.87	-3.64	-15.80	**-22.31**	1.77%
MW-30	2/14/2012	13.57	4.44	5.76	0.17	**23.94**	-2.92	-3.55	-15.16	**-21.63**	5.07%
MW-30	5/2/2012	13.42	3.82	5.70	0.20	**23.14**	-3.03	-3.50	-14.49	**-21.02**	4.81%
MW-30	7/10/2012	12.28	4.21	5.42	0.16	**22.07**	-2.98	-3.61	-15.26	**-21.85**	0.49%
MW-30	11/13/2012	13.27	4.57	5.81	0.17	**23.82**	-3.00	-3.22	-15.78	**-22.00**	3.98%
MW-30	2/26/2013	13.17	4.74	5.93	0.18	**24.03**	-3.06	-3.64	-16.07	**-22.77**	2.69%
MW-30	05/15/2013	12.92	4.61	5.83	0.16	**23.53**	-3.18	-3.36	-17.24	**-23.78**	-0.52%
MW-30	7/10/2013	12.67	4.61	5.74	0.17	**23.20**	-3.14	-3.67	-17.16	**-23.96**	-1.62%
MW-30	11/20/2013	12.18	4.01	5.18	0.16	**21.53**	-2.94	-3.50	-16.26	**-22.70**	-2.63%
MW-30	3/11/2014	12.97	4.27	5.72	0.17	**23.13**	-3.00	-4.06	-16.07	**-23.13**	-0.02%
MW-30	6/3/2014	12.92	4.13	5.97	0.16	**23.19**	-3.04	-3.61	-15.14	**-21.79**	3.12%
MW-30	9/9/2014	12.08	4.13	5.50	0.16	**21.86**	-3.78	-3.84	-14.99	**-22.61**	-1.68%
MW-30	11/10/2014	13.52	4.44	5.93	0.16	**24.05**	-3.96	-4.34	-16.11	**-24.42**	-0.75%
MW-30	2/4/2015	12.33	4.17	5.62	0.17	**22.29**	-3.00	-3.84	-15.62	**-22.45**	-0.37%
MW-30	4/8/2015	13.02	4.48	5.96	0.16	**23.62**	-3.04	-4.01	-16.30	**-23.35**	0.59%
MW-30	8/11/2015	13.62	4.32	5.91	0.18	**24.03**	-5.24	-4.65	-14.95	**-24.84**	-1.67%
MW-30	11/11/2015	13.77	4.23	5.73	0.15	**23.89**	-3.02	-3.95	-15.39	**-22.35**	3.31%
MW-30	2/10/2016	13.52	4.33	5.78	0.16	**23.80**	-3.10	-4.09	-15.70	**-22.89**	1.95%
MW-30	5/4/2016	13.77	4.48	6.10	0.18	**24.53**	-3.00	-3.92	-15.68	**-22.60**	4.10%
MW-30	8/18/2016	13.42	4.78	6.06	0.17	**24.43**	-2.94	-4.23	-16.66	**-23.83**	1.25%
MW-30	11/3/2016	13.02	4.34	5.91	0.18	**23.45**	-3.08	-4.03	-14.91	**-22.02**	3.14%
MW-30	2/2/2017	12.23	4.16	5.47	0.17	**22.02**	-2.84	-4.23	-15.62	**-22.69**	-1.48%
MW-30	5/2/2017	13.37	4.39	5.87	0.17	**23.80**	-2.92	-4.12	-15.59	**-22.63**	2.52%
MW-30	8/14/2017	13.32	4.28	5.53	0.15	**23.28**	-3.00	-4.88	-17.47	**-25.35**	-4.25%
MW-30	11/1/2017	13.52	4.39	6.13	0.17	**24.21**	-3.16	-4.40	-15.47	**-23.03**	2.50%
MW-30	2/22/2018	13.12	4.22	6.25	0.17	**23.77**	-3.14	-4.46	-15.95	**-23.54**	0.49%
MW-30	4/12/2018	14.02	4.23	6.38	0.16	**24.79**	-3.00	-4.09	-13.28	**-20.37**	9.79%
MW-30	9/11/2018	14.57	4.65	6.43	0.18	**25.83**	-3.26	-5.16	-15.39	**-23.81**	4.07%
MW-30	10/22/2018	15.47	4.78	6.63	0.19	**27.07**	-2.88	-3.95	-15.95	**-22.78**	8.61%

Appendix B-3: Charge Balance Calculations for Major Cations and Anions in MW-30

MW-30	1/16/2019	15.02	4.87	6.63	0.18	**26.70**	-3.22	-4.43	-14.66	**-22.31**	8.97%
MW-30	4/9/2019	14.12	4.15	5.99	0.17	**24.43**	-3.40	-3.89	-13.91	**-21.20**	7.08%
MW-30	7/16/2019	15.97	4.74	7.14	0.18	**28.03**	-3.48	-5.11	-17.45	**-26.03**	3.69%
MW-30	10/8/2019	14.87	4.96	6.79	0.16	**26.78**	-3.20	-4.80	-16.45	**-24.44**	4.56%
MW-30	1/15/2020	14.02	4.48	6.33	0.19	**25.03**	-3.04	-5.13	-15.68	**-23.85**	2.40%
MW-30	4/6/2020	15.37	4.61	6.44	0.16	**26.58**	-3.40	-5.50	-17.09	**-25.99**	1.11%
MW-30	7/6/2020	15.32	5.22	6.71	0.19	**27.43**	-3.20	-5.22	-16.68	**-25.09**	4.45%
MW-30	10/13/2020	13.47	4.48	6.13	0.17	**24.25**	-3.60	-5.16	-16.66	**-25.42**	-2.35%
MW-30	1/11/2021	13.72	4.44	6.17	0.18	**24.51**	-3.32	-5.19	-15.59	**-24.10**	0.83%
MW-30	4/14/2021	13.62	4.39	6.36	0.19	**24.56**	-3.44	-4.57	-13.08	**-21.08**	7.62%
MW-30	7/29/2021	14.67	4.65	6.48	0.20	**26.01**	-4.00	-5.30	-15.70	**-25.00**	1.98%

meq/L= milliequivalent per liter

HCO_3 = Bicarbonate

SO_4 = Sulfate

Appendix B-4: Descriptive Statistics for Out of Compliance Constituents in MW-30

Data Set	Analyte	Units	% Non-Detects	N	Distribution	Mean	Min. Conc.	Max. Conc.	Std. Dev.	Range	Geometric Mean	Skewness	Q25	Median	Q75
2008 Background Report	Selenium	µg/L	0	10	Normal or Lognormal	30.7	28.6	34.6	1.8	6.0	30.7	1.00	29.1	30.5	31.3
2021 SAR ALL	Selenium	µg/L	0	147	Not normal	41.2	29	60.4	7.8	31.4	40.5	0.52	35.5	39.7	45.9
GWCL Subset post 2016	Selenium	µg/L	0	60	Not normal	48.3	40	60.4	5.6	20.4	48.0	0.36	43.2	47.5	53.7
2008 Background Report	Uranium	µg/L	0	10	Normal or Lognormal	7.0	5.8	8	0.6	2.2	7.0	-0.50	6.9	7.1	7.3
2021 SAR ALL	Uranium	µg/L	0	140	Normal	8.1	5.79	11.6	1.1	5.81	8.0	0.54	7.4	8	8.7
GWCL Subset Post 2016	Uranium	µg/L	0	69	Normal	8.7	7.19	11.6	0.9	4.41	8.7	0.80	8.1	8.6	9.3

ALL 2021 SAR Data = All data with extremes removed
GWCL Subset Post 2012 = All data post October 1, 2012
GWCL Subset Post 2016 = All data post January 1, 2016

µg/L = micrograms per liter

Appendix B-5: MW-30 Data Used for Analysis

Well	Date Sampled	Parameter Name	Report Result	Report Units	Qualifier
MW-30	6/22/2005	Uranium	5.8	ug/l	
MW-30	9/22/2005	Uranium	6.9	ug/l	
MW-30	12/14/2005	Uranium	7.8	ug/l	
MW-30	3/22/2006	Uranium	6.4	ug/l	
MW-30	6/21/2006	Uranium	8.0	ug/l	
MW-30	9/13/2006	Uranium	7.3	ug/l	
MW-30	10/25/2006	Uranium	7.3	ug/l	
MW-30	3/15/2007	Uranium	7.0	ug/l	
MW-30	8/22/2007	Uranium	7.2	ug/l	
MW-30	10/24/2007	Uranium	6.9	ug/l	
MW-30	3/19/2008	Uranium	6.8	ug/l	
MW-30	6/3/2008	Uranium	6.9	ug/l	
MW-30	8/4/2008	Uranium	11.0	ug/l	
MW-30	11/5/2008	Uranium	6.3	ug/l	
MW-30	2/3/2009	Uranium	6.7	ug/l	
MW-30	5/13/2009	Uranium	6.5	ug/l	
MW-30	8/24/2009	Uranium	7.0	ug/l	
MW-30	10/14/2009	Uranium	6.9	ug/l	
MW-30	1/20/2010	Uranium	7.0	ug/l	
MW-30	2/9/2010	Uranium	6.8	ug/l	
MW-30	4/27/2010	Uranium	6.8	ug/l	
MW-30	9/14/2010	Uranium	7.1	ug/l	
MW-30	11/9/2010	Uranium	6.6	ug/l	
MW-30	2/1/2011	Uranium	6.0	ug/l	
MW-30	4/11/2011	Uranium	6.5	ug/l	
MW-30	8/3/2011	Uranium	8.0	ug/l	
MW-30	10/4/2011	Uranium	9.8	ug/l	
MW-30	2/14/2012	Uranium	7.4	ug/l	
MW-30	3/14/2012	Uranium	8.4	ug/l	
MW-30	4/10/2012	Uranium	7.8	ug/l	
MW-30	5/2/2012	Uranium	6.8	ug/l	
MW-30	6/18/2012	Uranium	7.8	ug/l	
MW-30	7/10/2012	Uranium	7.6	ug/l	
MW-30	8/7/2012	Uranium	8.0	ug/l	
MW-30	9/19/2012	Uranium	7.7	ug/l	
MW-30	10/23/2012	Uranium	7.9	ug/l	
MW-30	11/13/2012	Uranium	7.0	ug/l	
MW-30	12/26/2012	Uranium	5.8	ug/l	
MW-30	1/23/2013	Uranium	8.4	ug/l	
MW-30	2/26/2013	Uranium	7.4	ug/l	
MW-30	3/20/2013	Uranium	6.9	ug/l	
MW-30	4/17/2013	Uranium	7.1	ug/l	
MW-30	5/15/2013	Uranium	6.3	ug/l	
MW-30	7/10/2013	Uranium	7.5	ug/l	
MW-30	8/20/2013	Uranium	7.1	ug/l	

Appendix B-5: MW-30 Data Used for Analysis

Well	Date Sampled	Parameter Name	Report Result	Report Units	Qualifier
MW-30	9/18/2013	Uranium	7.0	ug/l	
MW-30	10/22/2013	Uranium	6.9	ug/l	
MW-30	11/20/2013	Uranium	8.6	ug/l	
MW-30	2/25/2014	Uranium	6.8	ug/l	
MW-30	3/11/2014	Uranium	7.8	ug/l	
MW-30	4/23/2014	Uranium	6.8	ug/l	
MW-30	5/14/2014	Uranium	9.8	ug/l	
MW-30	6/3/2014	Uranium	7.4	ug/l	
MW-30	7/29/2014	Uranium	7.4	ug/l	
MW-30	8/20/2014	Uranium	7.6	ug/l	
MW-30	9/9/2014	Uranium	7.7	ug/l	
MW-30	10/7/2014	Uranium	7.8	ug/l	
MW-30	11/10/2014	Uranium	7.7	ug/l	
MW-30	12/10/2014	Uranium	7.7	ug/l	
MW-30	1/21/2015	Uranium	8.1	ug/l	
MW-30	2/4/2015	Uranium	8.2	ug/l	
MW-30	3/3/2015	Uranium	8.4	ug/l	
MW-30	4/8/2015	Uranium	7.5	ug/l	
MW-30	5/12/2015	Uranium	8.4	ug/l	
MW-30	6/24/2015	Uranium	7.5	ug/l	
MW-30	7/7/2015	Uranium	8.0	ug/l	
MW-30	8/11/2015	Uranium	8.2	ug/l	
MW-30	9/15/2015	Uranium	7.7	ug/l	
MW-30	10/7/2015	Uranium	8.1	ug/l	
MW-30	11/11/2015	Uranium	8.0	ug/l	
MW-30	12/9/2015	Uranium	8.2	ug/l	
MW-30	1/20/2016	Uranium	8.3	ug/l	
MW-30	2/10/2016	Uranium	7.8	ug/l	
MW-30	3/2/2016	Uranium	7.8	ug/l	
MW-30	4/13/2016	Uranium	7.6	ug/l	
MW-30	5/4/2016	Uranium	8.2	ug/l	
MW-30	6/14/2016	Uranium	7.7	ug/l	
MW-30	7/13/2016	Uranium	8.1	ug/l	
MW-30	8/18/2016	Uranium	8.2	ug/l	
MW-30	9/14/2016	Uranium	8.2	ug/l	
MW-30	10/5/2016	Uranium	7.6	ug/l	
MW-30	11/3/2016	Uranium	7.9	ug/l	
MW-30	12/6/2016	Uranium	8.6	ug/l	
MW-30	1/18/2017	Uranium	8.0	ug/l	
MW-30	2/2/2017	Uranium	7.6	ug/l	
MW-30	3/7/2017	Uranium	7.9	ug/l	
MW-30	4/5/2017	Uranium	7.6	ug/l	
MW-30	5/2/2017	Uranium	8.1	ug/l	
MW-30	6/5/2017	Uranium	8.0	ug/l	
MW-30	7/11/2017	Uranium	8.3	ug/l	

Appendix B-5: MW-30 Data Used for Analysis

Well	Date Sampled	Parameter Name	Report Result	Report Units	Qualifier
MW-30	8/14/2017	Uranium	8.1	ug/l	
MW-30	9/12/2017	Uranium	7.8	ug/l	
MW-30	10/5/2017	Uranium	8.4	ug/l	
MW-30	11/1/2017	Uranium	7.2	ug/l	
MW-30	12/6/2017	Uranium	8.2	ug/l	
MW-30	1/23/2018	Uranium	8.5	ug/l	
MW-30	2/22/2018	Uranium	8.2	ug/l	
MW-30	3/8/2018	Uranium	8.7	ug/l	
MW-30	4/12/2018	Uranium	8.0	ug/l	
MW-30	5/15/2018	Uranium	8.4	ug/l	
MW-30	6/19/2018	Uranium	8.8	ug/l	
MW-30	7/24/2018	Uranium	8.7	ug/l	
MW-30	8/10/2018	Uranium	7.7	ug/l	
MW-30	9/11/2018	Uranium	8.3	ug/l	
MW-30	10/22/2018	Uranium	8.1	ug/l	
MW-30	11/14/2018	Uranium	8.8	ug/l	
MW-30	12/11/2018	Uranium	8.2	ug/l	
MW-30	1/16/2019	Uranium	9.1	ug/l	
MW-30	2/13/2019	Uranium	9.1	ug/l	
MW-30	3/6/2019	Uranium	8.4	ug/l	
MW-30	4/9/2019	Uranium	8.6	ug/l	
MW-30	5/7/2019	Uranium	8.2	ug/l	
MW-30	6/3/2019	Uranium	8.9	ug/l	
MW-30	7/16/2019	Uranium	9.0	ug/l	
MW-30	8/6/2019	Uranium	9.4	ug/l	
MW-30	9/24/2019	Uranium	8.1	ug/l	
MW-30	10/8/2019	Uranium	8.7	ug/l	
MW-30	11/13/2019	Uranium	9.3	ug/l	
MW-30	12/4/2019	Uranium	9.0	ug/l	
MW-30	1/15/2020	Uranium	8.9	ug/l	
MW-30	2/5/2020	Uranium	9.1	ug/l	
MW-30	3/11/2020	Uranium	9.5	ug/l	
MW-30	4/6/2020	Uranium	9.2	ug/l	
MW-30	5/6/2020	Uranium	8.9	ug/l	
MW-30	6/3/2020	Uranium	9.3	ug/l	
MW-30	7/6/2020	Uranium	9.8	ug/l	
MW-30	8/11/2020	Uranium	10.6	ug/l	
MW-30	9/1/2020	Uranium	9.9	ug/l	
MW-30	10/13/2020	Uranium	9.9	ug/l	
MW-30	11/17/2020	Uranium	10.0	ug/l	
MW-30	12/8/2020	Uranium	9.6	ug/l	
MW-30	1/11/2021	Uranium	9.9	ug/l	
MW-30	2/10/2021	Uranium	11.6	ug/l	
MW-30	3/9/2021	Uranium	10.2	ug/l	
MW-30	4/14/2021	Uranium	10.3	ug/l	

Appendix B-5: MW-30 Data Used for Analysis

Well	Date Sampled	Parameter Name	Report Result	Report Units	Qualifier
MW-30	5/11/2021	Uranium	10.7	ug/l	
MW-30	6/8/2021	Uranium	9.8	ug/l	
MW-30	7/29/2021	Uranium	9.6	ug/l	
MW-30	8/9/2021	Uranium	9.4	ug/l	
MW-30	9/8/2021	Uranium	9.7	ug/l	
MW-30	6/22/2005	Selenium	29.0	ug/l	
MW-30	9/22/2005	Selenium	30.5	ug/l	
MW-30	12/14/2005	Selenium	29.0	ug/l	
MW-30	3/22/2006	Selenium	29.1	ug/l	
MW-30	6/21/2006	Selenium	34.6	ug/l	
MW-30	9/13/2006	Selenium	32.7	ug/l	
MW-30	10/25/2006	Selenium	31.3	ug/l	
MW-30	3/15/2007	Selenium	31.2	ug/l	
MW-30	8/22/2007	Selenium	30.4	ug/l	
MW-30	10/24/2007	Selenium	29.8	ug/l	
MW-30	3/19/2008	Selenium	30.5	ug/l	
MW-30	6/3/2008	Selenium	30.5	ug/l	
MW-30	8/4/2008	Selenium	47.2	ug/l	
MW-30	11/5/2008	Selenium	30.2	ug/l	
MW-30	2/3/2009	Selenium	32.0	ug/l	
MW-30	5/13/2009	Selenium	32.3	ug/l	
MW-30	8/24/2009	Selenium	31.8	ug/l	
MW-30	10/14/2009	Selenium	32.4	ug/l	
MW-30	1/20/2010	Selenium	40.6	ug/l	
MW-30	2/9/2010	Selenium	32.0	ug/l	
MW-30	4/27/2010	Selenium	35.3	ug/l	
MW-30	7/27/2010	Selenium	33.5	ug/l	
MW-30	8/24/2010	Selenium	35.6	ug/l	
MW-30	9/14/2010	Selenium	32.6	ug/l	
MW-30	10/19/2010	Selenium	32.4	ug/l	
MW-30	11/9/2010	Selenium	32.2	ug/l	
MW-30	12/14/2010	Selenium	30.5	ug/l	
MW-30	1/10/2011	Selenium	36.2	ug/l	
MW-30	2/1/2011	Selenium	34.7	ug/l	
MW-30	3/14/2011	Selenium	35.0	ug/l	
MW-30	4/11/2011	Selenium	44.4	ug/l	
MW-30	5/10/2011	Selenium	38.3	ug/l	
MW-30	6/20/2011	Selenium	38.7	ug/l	
MW-30	7/5/2011	Selenium	32.4	ug/l	
MW-30	8/3/2011	Selenium	39.7	ug/l	
MW-30	9/7/2011	Selenium	32.4	ug/l	
MW-30	10/4/2011	Selenium	36.6	ug/l	
MW-30	11/8/2011	Selenium	36.8	ug/l	
MW-30	12/12/2011	Selenium	38.0	ug/l	
MW-30	1/24/2012	Selenium	33.3	ug/l	
MW-30	2/14/2012	Selenium	35.0	ug/l	

Appendix B-5: MW-30 Data Used for Analysis

Well	Date Sampled	Parameter Name	Report Result	Report Units	Qualifier
MW-30	3/14/2012	Selenium	39.5	ug/l	
MW-30	4/10/2012	Selenium	39.1	ug/l	
MW-30	5/2/2012	Selenium	32.3	ug/l	
MW-30	6/18/2012	Selenium	37.0	ug/l	
MW-30	7/10/2012	Selenium	38.5	ug/l	
MW-30	8/7/2012	Selenium	38.4	ug/l	
MW-30	9/19/2012	Selenium	41.9	ug/l	
MW-30	10/23/2012	Selenium	45.2	ug/l	
MW-30	11/13/2012	Selenium	36.0	ug/l	
MW-30	12/26/2012	Selenium	31.6	ug/l	
MW-30	1/23/2013	Selenium	37.2	ug/l	
MW-30	2/26/2013	Selenium	42.3	ug/l	
MW-30	3/20/2013	Selenium	39.0	ug/l	
MW-30	4/17/2013	Selenium	37.3	ug/l	
MW-30	5/15/2013	Selenium	39.4	ug/l	
MW-30	6/25/2013	Selenium	32.1	ug/l	
MW-30	7/10/2013	Selenium	36.5	ug/l	
MW-30	8/20/2013	Selenium	36.3	ug/l	
MW-30	9/18/2013	Selenium	35.2	ug/l	
MW-30	10/22/2013	Selenium	39.5	ug/l	
MW-30	11/20/2013	Selenium	36.6	ug/l	
MW-30	12/18/2013	Selenium	35.1	ug/l	
MW-30	1/8/2014	Selenium	35.6	ug/l	
MW-30	2/25/2014	Selenium	35.8	ug/l	
MW-30	3/11/2014	Selenium	38.0	ug/l	
MW-30	4/23/2014	Selenium	32.8	ug/l	
MW-30	5/14/2014	Selenium	37.0	ug/l	
MW-30	6/3/2014	Selenium	35.4	ug/l	
MW-30	7/29/2014	Selenium	42.9	ug/l	
MW-30	8/20/2014	Selenium	48.5	ug/l	
MW-30	9/9/2014	Selenium	53.6	ug/l	
MW-30	10/7/2014	Selenium	38.9	ug/l	
MW-30	11/10/2014	Selenium	36.8	ug/l	
MW-30	12/10/2014	Selenium	37.5	ug/l	
MW-30	1/21/2015	Selenium	37.2	ug/l	
MW-30	2/4/2015	Selenium	40.9	ug/l	
MW-30	3/3/2015	Selenium	38.0	ug/l	
MW-30	4/8/2015	Selenium	37.3	ug/l	
MW-30	5/12/2015	Selenium	35.7	ug/l	
MW-30	6/24/2015	Selenium	37.2	ug/l	
MW-30	7/7/2015	Selenium	39.2	ug/l	
MW-30	8/11/2015	Selenium	41.6	ug/l	
MW-30	9/15/2015	Selenium	39.1	ug/l	
MW-30	10/7/2015	Selenium	43.9	ug/l	
MW-30	11/11/2015	Selenium	38.6	ug/l	
MW-30	12/9/2015	Selenium	40.7	ug/l	
MW-30	1/20/2016	Selenium	41.7	ug/l	

Appendix B-5: MW-30 Data Used for Analysis

Well	Date Sampled	Parameter Name	Report Result	Report Units	Qualifier
MW-30	2/10/2016	Selenium	42.5	ug/l	
MW-30	3/2/2016	Selenium	43.2	ug/l	
MW-30	4/13/2016	Selenium	41.0	ug/l	
MW-30	5/4/2016	Selenium	42.5	ug/l	
MW-30	6/14/2016	Selenium	41.8	ug/l	
MW-30	7/13/2016	Selenium	42.7	ug/l	
MW-30	8/18/2016	Selenium	43.1	ug/l	
MW-30	9/14/2016	Selenium	43.0	ug/l	
MW-30	10/5/2016	Selenium	42.8	ug/l	
MW-30	11/3/2016	Selenium	43.4	ug/l	
MW-30	12/6/2016	Selenium	42.1	ug/l	
MW-30	1/18/2017	Selenium	43.0	ug/l	
MW-30	2/2/2017	Selenium	40.0	ug/l	
MW-30	3/7/2017	Selenium	40.8	ug/l	
MW-30	4/5/2017	Selenium	43.9	ug/l	
MW-30	5/2/2017	Selenium	43.3	ug/l	
MW-30	6/5/2017	Selenium	42.8	ug/l	
MW-30	7/11/2017	Selenium	43.3	ug/l	
MW-30	8/14/2017	Selenium	44.5	ug/l	
MW-30	9/12/2017	Selenium	45.5	ug/l	
MW-30	10/5/2017	Selenium	46.5	ug/l	
MW-30	11/1/2017	Selenium	43.5	ug/l	
MW-30	12/6/2017	Selenium	46.2	ug/l	
MW-30	1/23/2018	Selenium	43.5	ug/l	
MW-30	2/22/2018	Selenium	45.5	ug/l	
MW-30	4/12/2018	Selenium	46.4	ug/l	
MW-30	9/11/2018	Selenium	42.5	ug/l	
MW-30	10/22/2018	Selenium	45.6	ug/l	
MW-30	1/16/2019	Selenium	48.6	ug/l	
MW-30	4/9/2019	Selenium	53.6	ug/l	
MW-30	5/7/2019	Selenium	47.1	ug/l	
MW-30	6/3/2019	Selenium	49.9	ug/l	
MW-30	7/16/2019	Selenium	48.4	ug/l	
MW-30	8/6/2019	Selenium	50.9	ug/l	
MW-30	9/24/2019	Selenium	49.1	ug/l	
MW-30	10/8/2019	Selenium	56.8	ug/l	
MW-30	11/13/2019	Selenium	47.8	ug/l	
MW-30	12/4/2019	Selenium	56.4	ug/l	
MW-30	1/15/2020	Selenium	49.7	ug/l	
MW-30	2/5/2020	Selenium	49.9	ug/l	
MW-30	3/11/2020	Selenium	48.1	ug/l	
MW-30	4/6/2020	Selenium	54.4	ug/l	
MW-30	5/6/2020	Selenium	51.5	ug/l	
MW-30	6/3/2020	Selenium	50.5	ug/l	
MW-30	7/6/2020	Selenium	51.8	ug/l	
MW-30	8/11/2020	Selenium	56.0	ug/l	
MW-30	9/1/2020	Selenium	55.3	ug/l	

Appendix B-5: MW-30 Data Used for Analysis

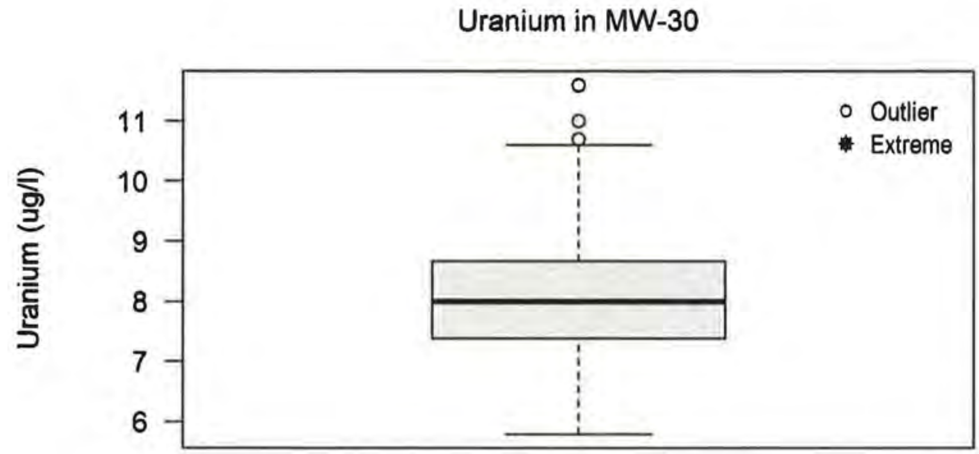
Well	Date Sampled	Parameter Name	Report Result	Report Units	Qualifier
MW-30	10/13/2020	Selenium	53.5	ug/l	
MW-30	11/17/2020	Selenium	54.9	ug/l	
MW-30	12/8/2020	Selenium	51.8	ug/l	
MW-30	1/11/2021	Selenium	55.6	ug/l	
MW-30	2/10/2021	Selenium	55.3	ug/l	
MW-30	3/9/2021	Selenium	56.3	ug/l	
MW-30	4/14/2021	Selenium	55.7	ug/l	
MW-30	5/11/2021	Selenium	58.3	ug/l	
MW-30	6/8/2021	Selenium	54.1	ug/l	
MW-30	7/29/2021	Selenium	56.3	ug/l	
MW-30	8/9/2021	Selenium	56.1	ug/l	
MW-30	9/8/2021	Selenium	60.4	ug/l	

Appendix B-6: Extreme Outliers Removed from Analysis

Reason	Location ID	Date Sampled	Parameter Name	Report Result	Report Units
Removed					
No extreme outliers for SAR parameters removed from analysis					

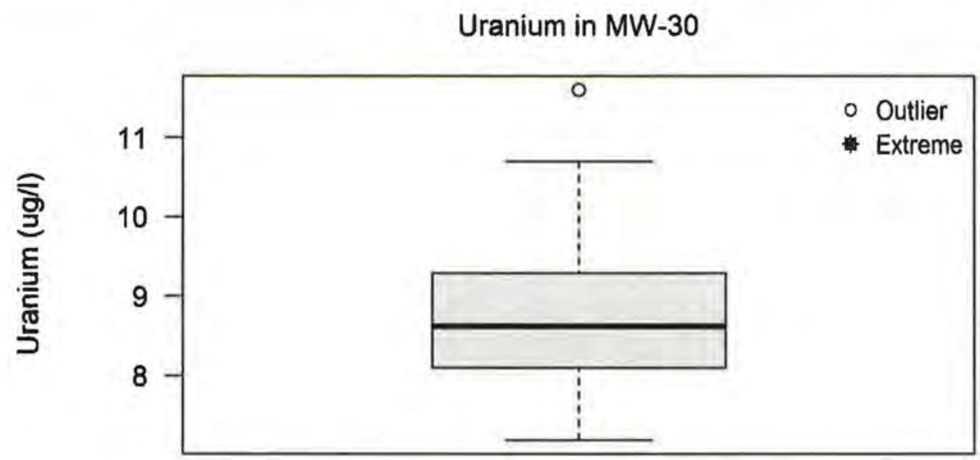
Appendix B-7: Box Plots

Uranium in MW-30 for All Data



Percent nondetect: 0%
Min: 5.79, Mean: 8.09, Max: 11.6, Std Dev: 1.09
Upper extreme threshold (Q75 + 3xH): 12.5075
Lower extreme threshold (Q25 - 3xH): 3.5475

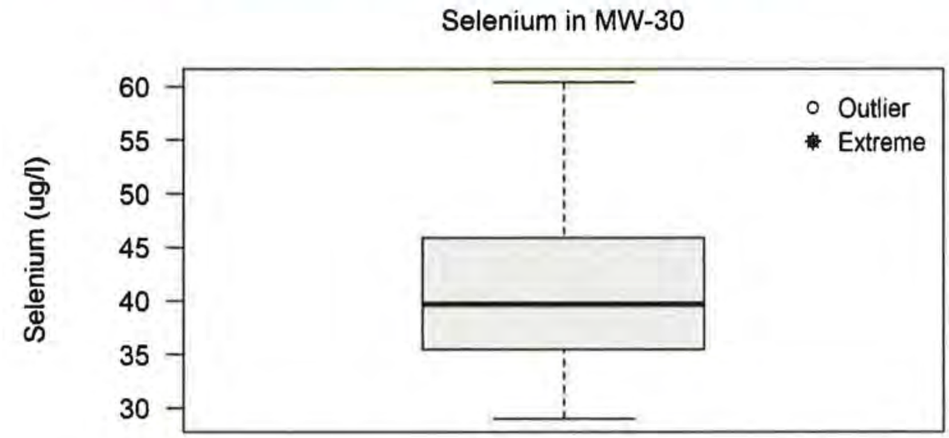
Uranium in MW-30 Post January 1, 2016



Percent nondetect: 0%
Min: 7.19, Mean: 8.74, Max: 11.6, Std Dev: 0.89
Upper extreme threshold (Q75 + 3xH): 12.86
Lower extreme threshold (Q25 - 3xH): 4.53

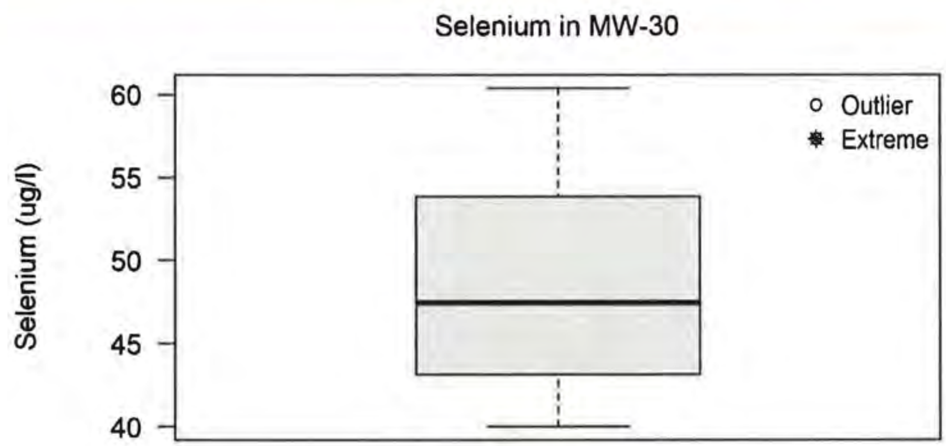
Appendix B-7: Box Plots

Selenium in MW-30 for All Data



Percent nondetect: 0%
Min: 29, Mean: 41.22, Max: 60.4, Std Dev: 7.77
Upper extreme threshold (Q75 + 3xH): 77.1
Lower extreme threshold (Q25 - 3xH): 4.29999999999998

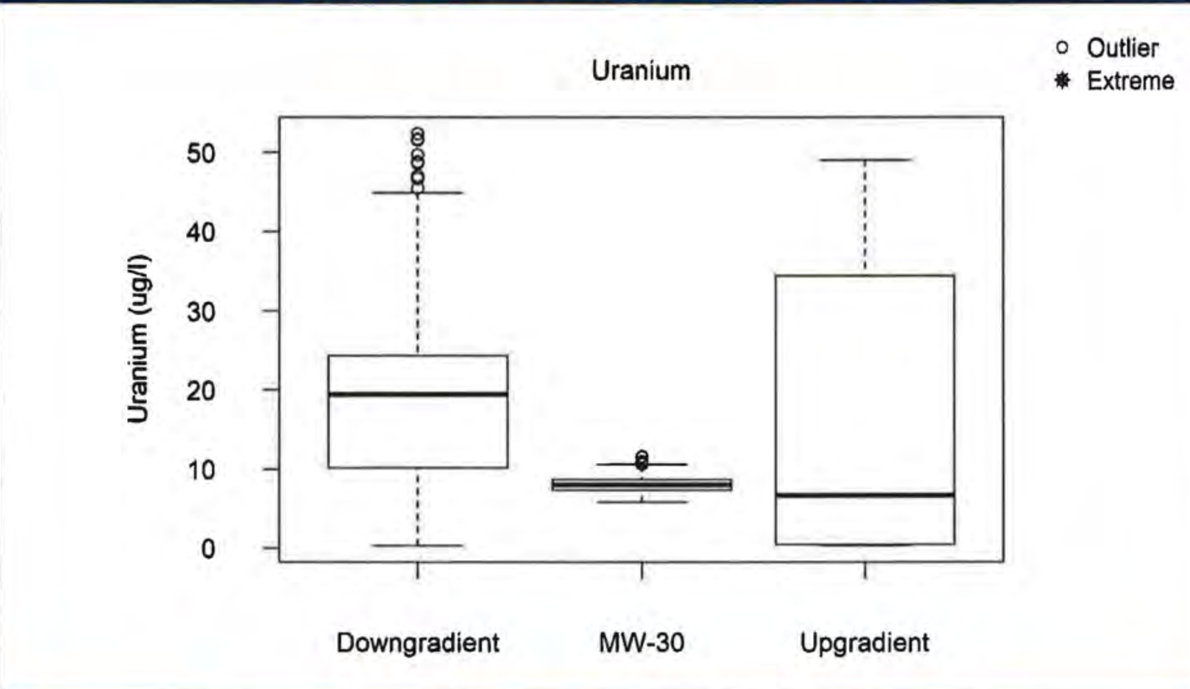
Selenium in MW-30 Post January 1, 2016



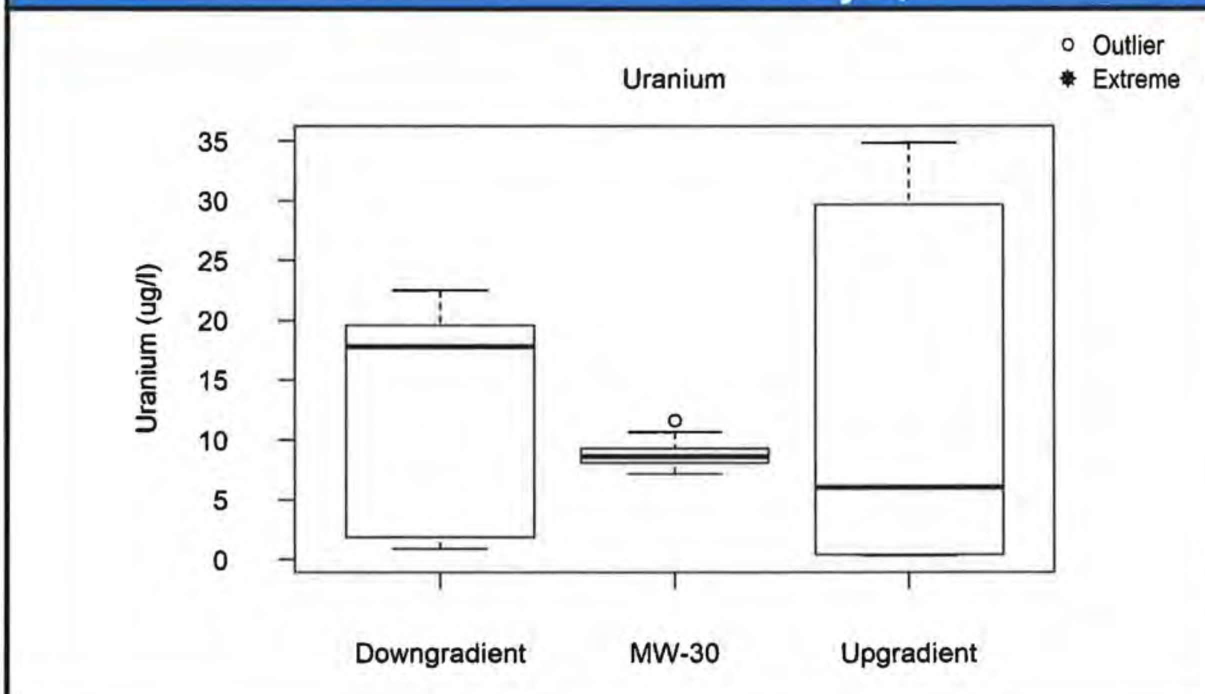
Percent nondetect: 0%
Min: 40, Mean: 48.34, Max: 60.4, Std Dev: 5.61
Upper extreme threshold (Q75 + 3xH): 85.375
Lower extreme threshold (Q25 - 3xH): 11.525

Appendix B-8: Box Plots for MW-30 and Upgradient and Downgradient Wells

Uranium in MW-30 for All Data



Uranium in MW-30 Post January 1, 2016



Notes

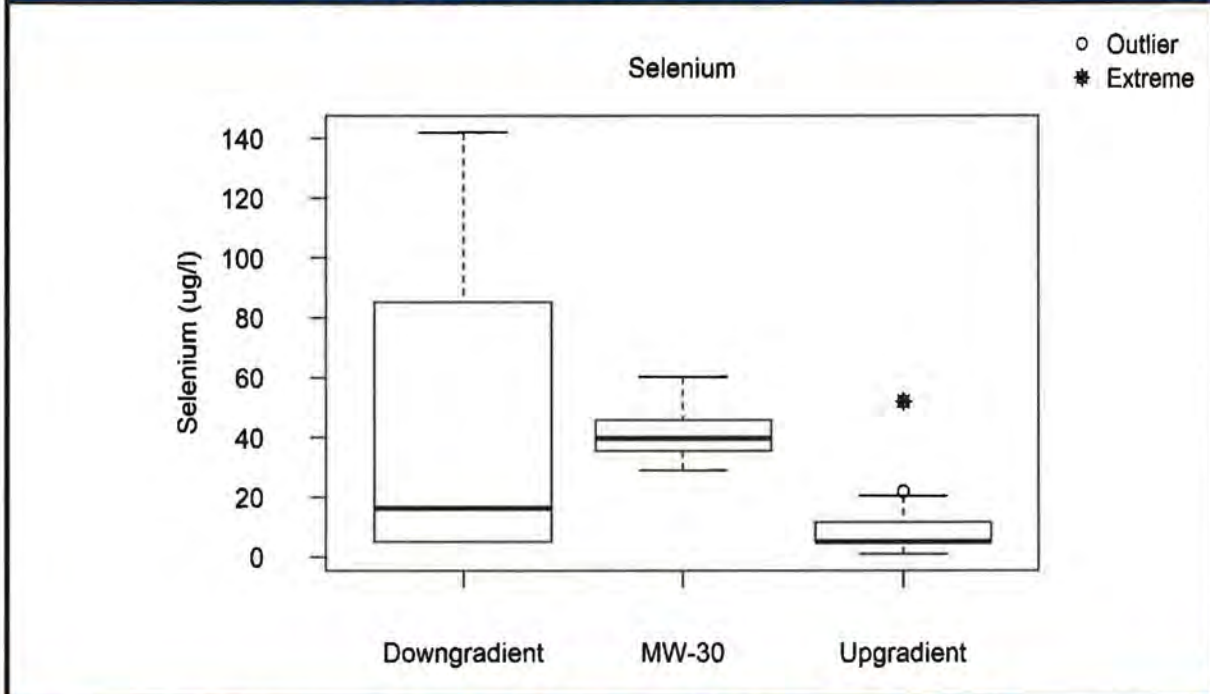
All available data used in box plots

Downgradient wells: MW-3A, MW-20, and MW-22.

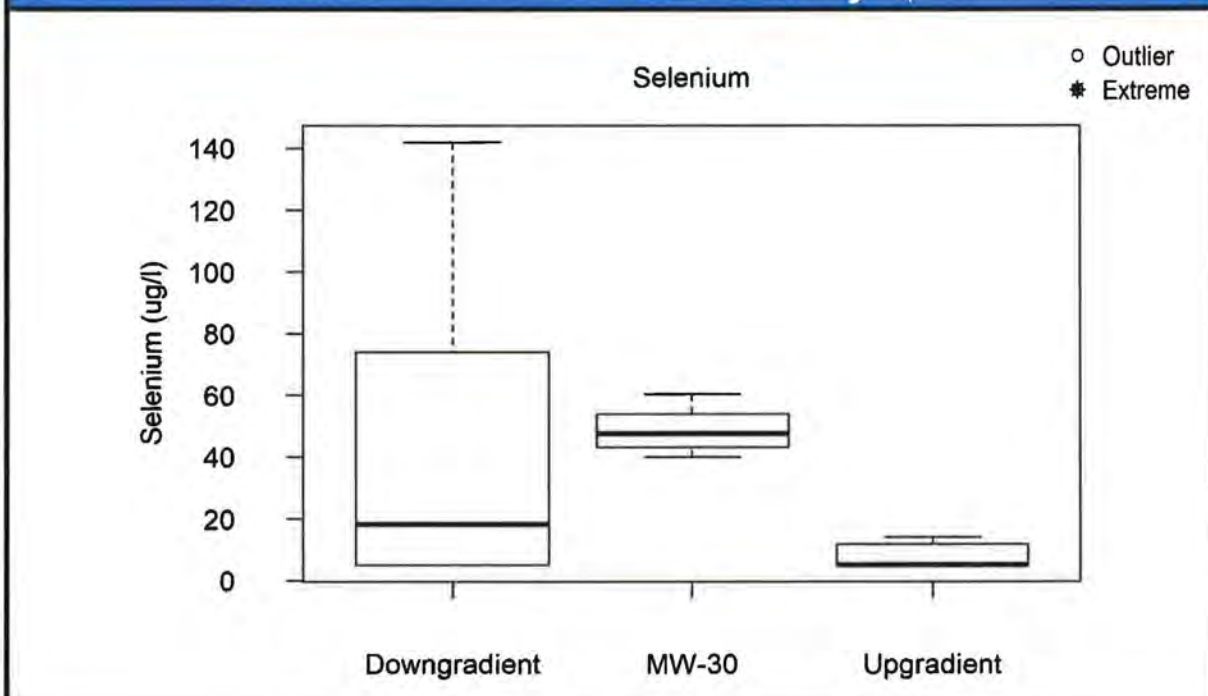
Upgradient wells: MW-1, MW-18, and MW-19

Appendix B-8: Box Plots for MW-30 and Upgradient and Downgradient Wells

Selenium in MW-30 for All Data



Selenium in MW-30 Post January 1, 2016



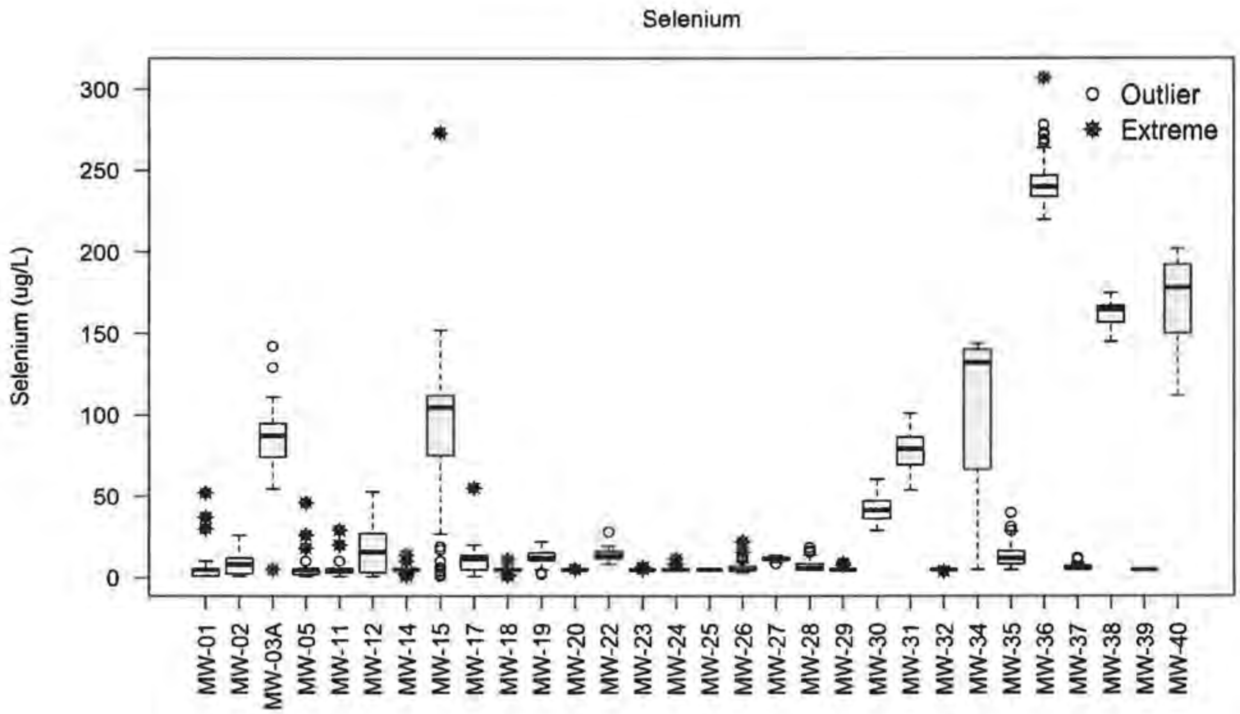
Notes

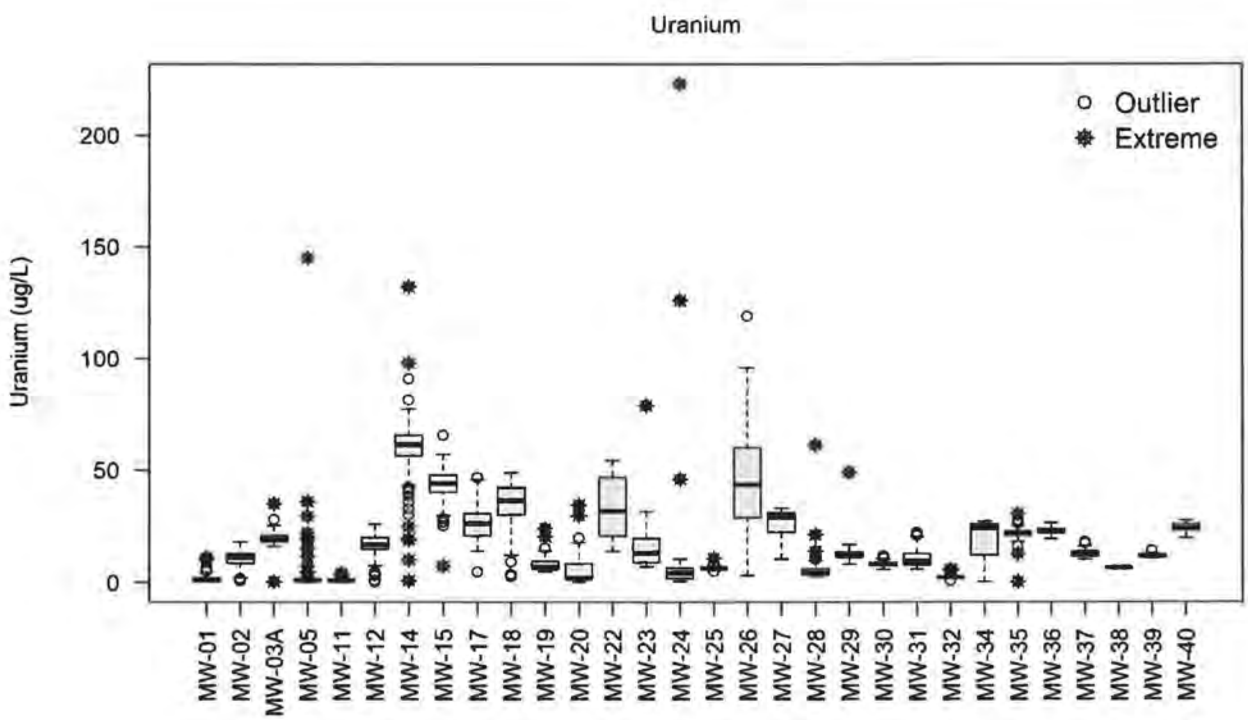
All available data used in box plots

Downgradient wells: MW-3A, MW-20, and MW-22.

Upgradient wells: MW-1, MW-18, and MW-19

Appendix B-9: Box Plots for SAR Parameters in Groundwater Monitoring Wells



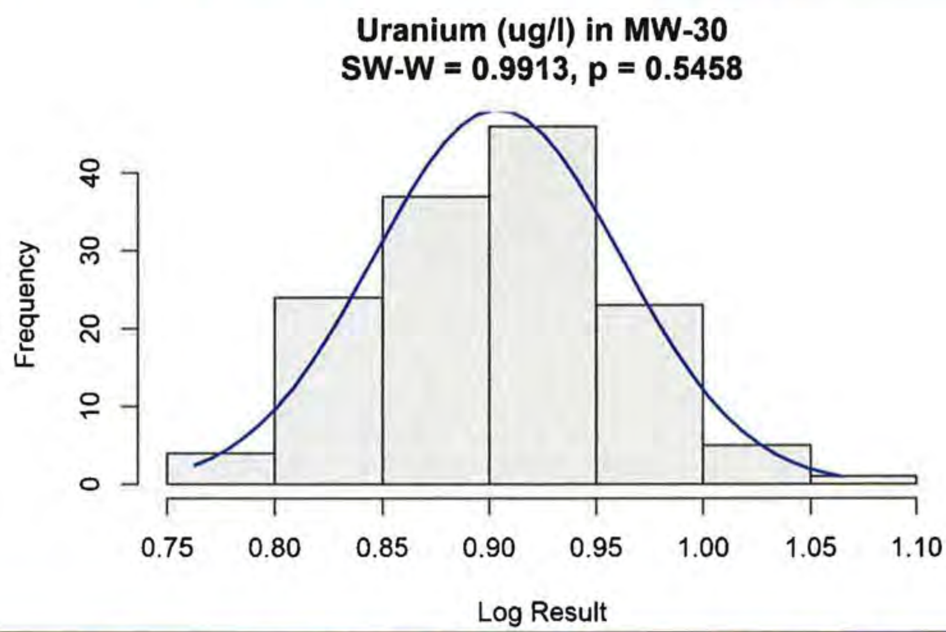


Notes

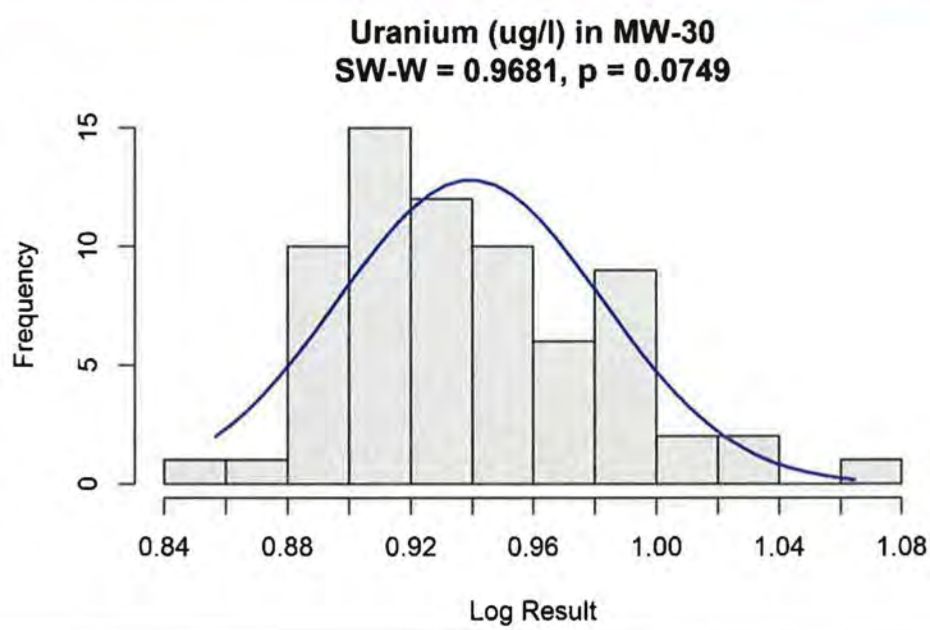
All available data used in box plots

Appendix B-10: Histograms

Uranium in MW-30 for All Data

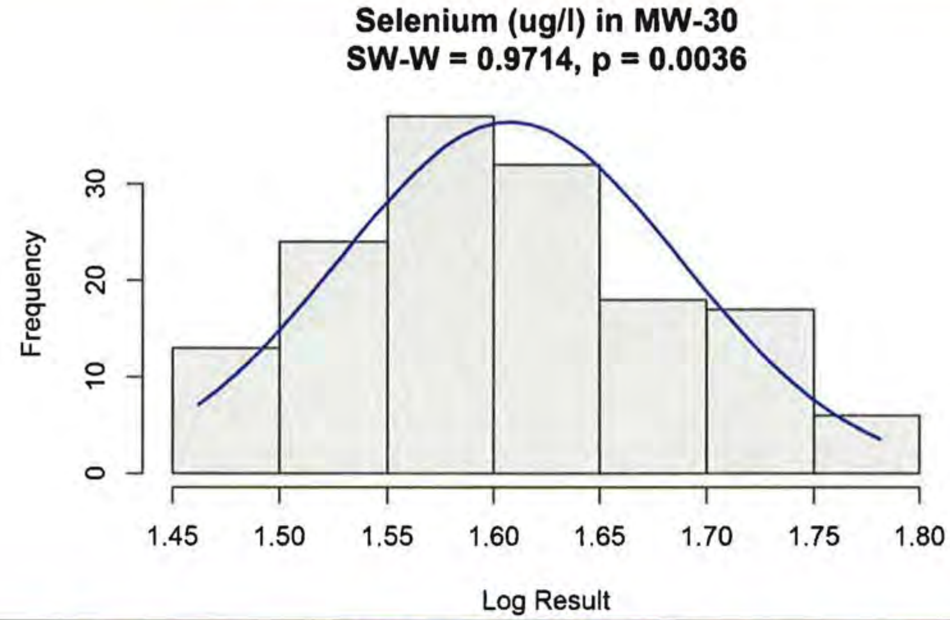


Uranium in MW-30 Post January 1, 2016

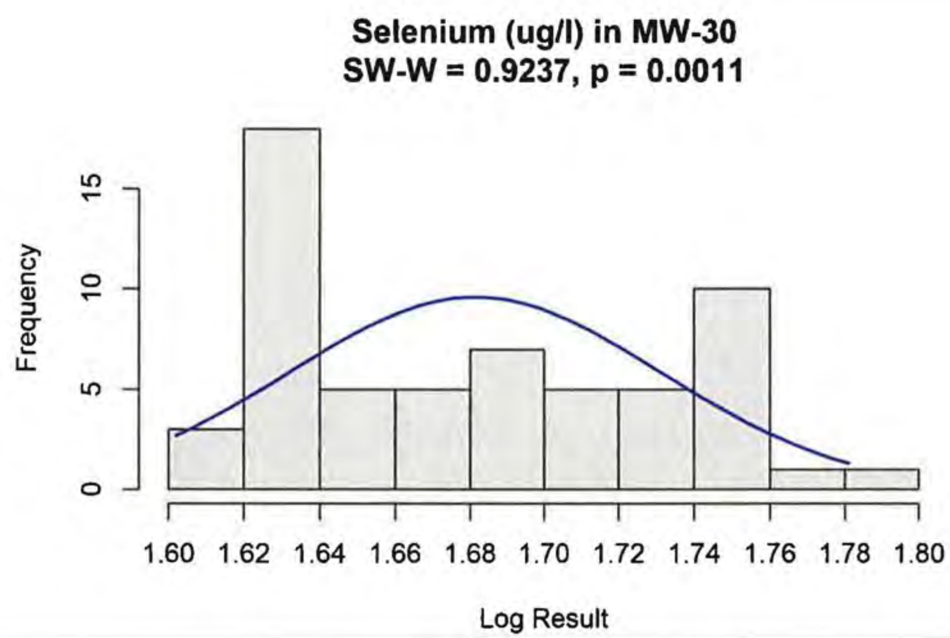


Appendix B-10: Histograms

Selenium in MW-30 for All Data

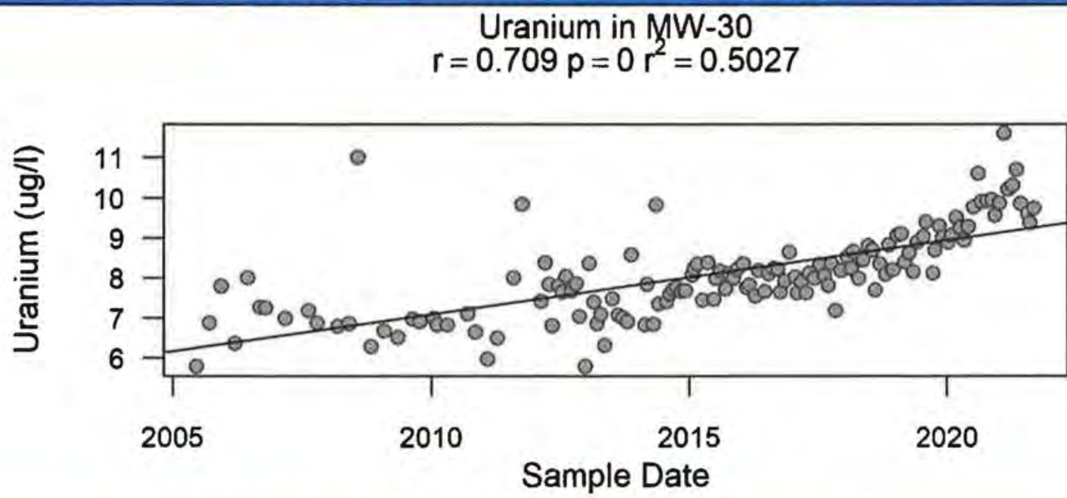


Selenium in MW-30 Post January 1, 2016

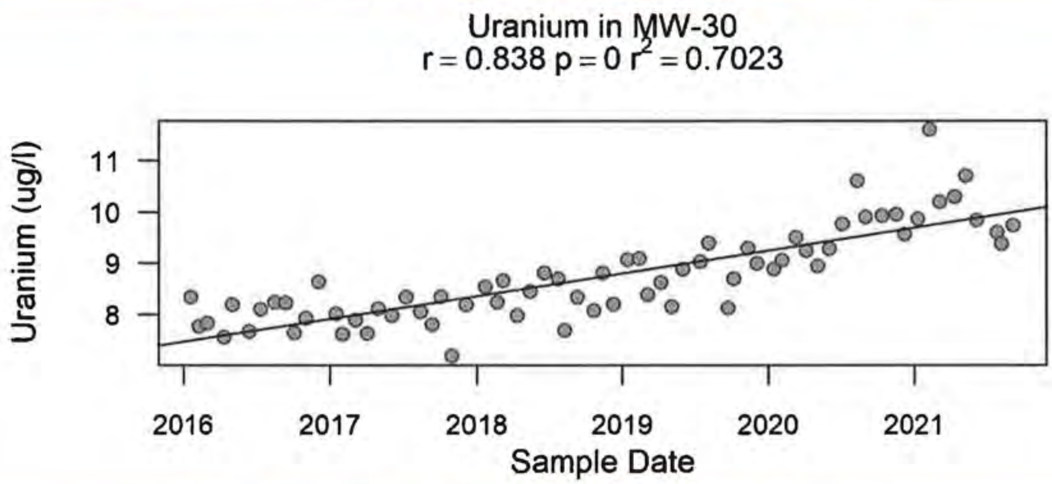


Appendix B-11: Timeseries Plots

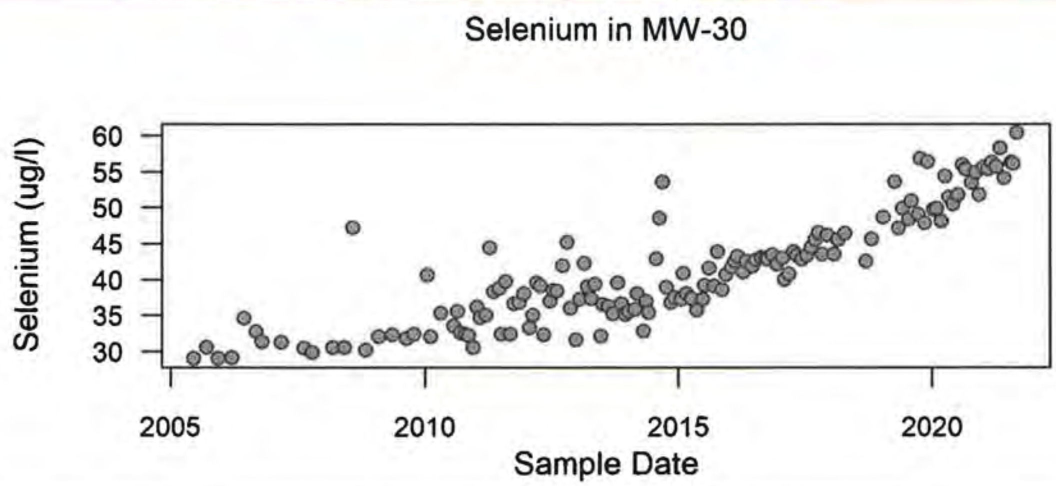
Uranium in MW-30 for All Data



Uranium in MW-30 Post January 1, 2016

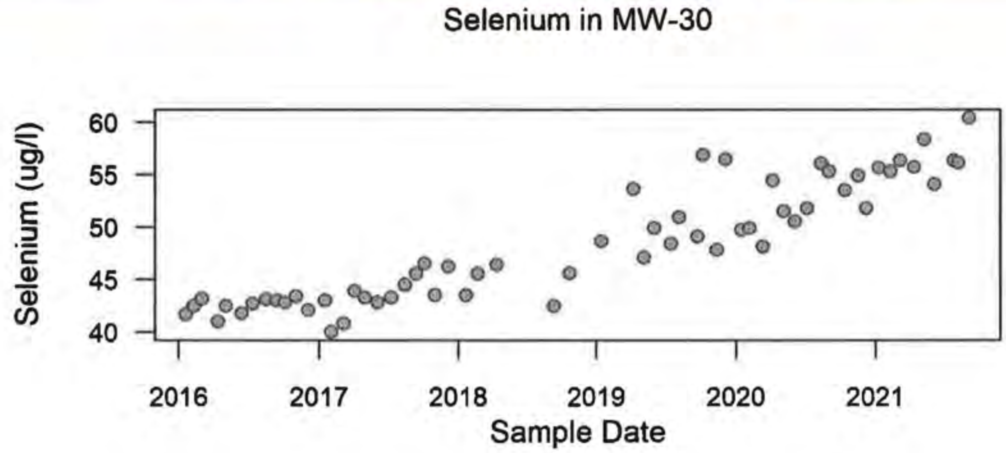


Selenium in MW-30 for All Data

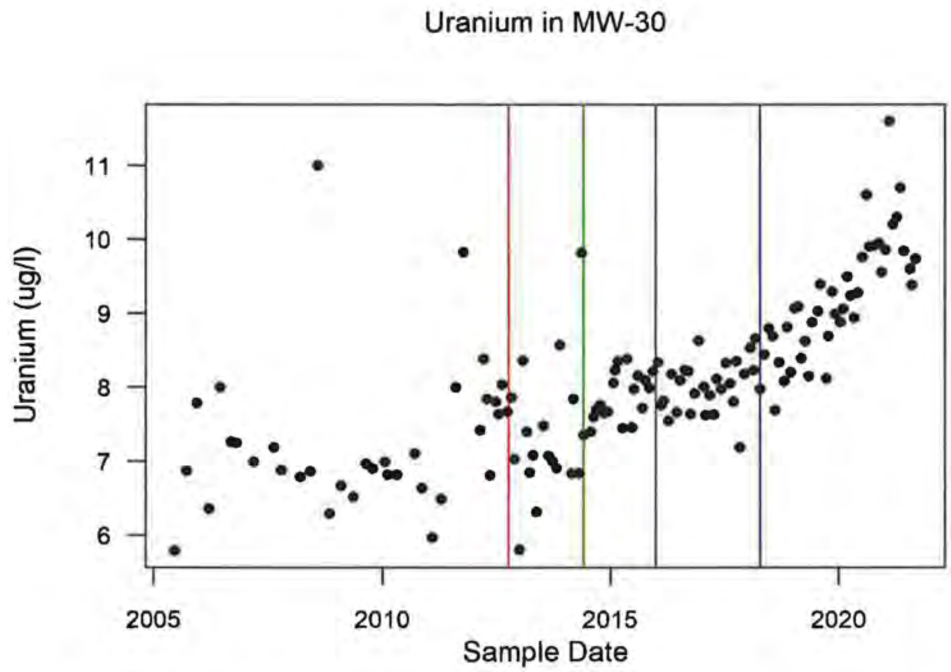


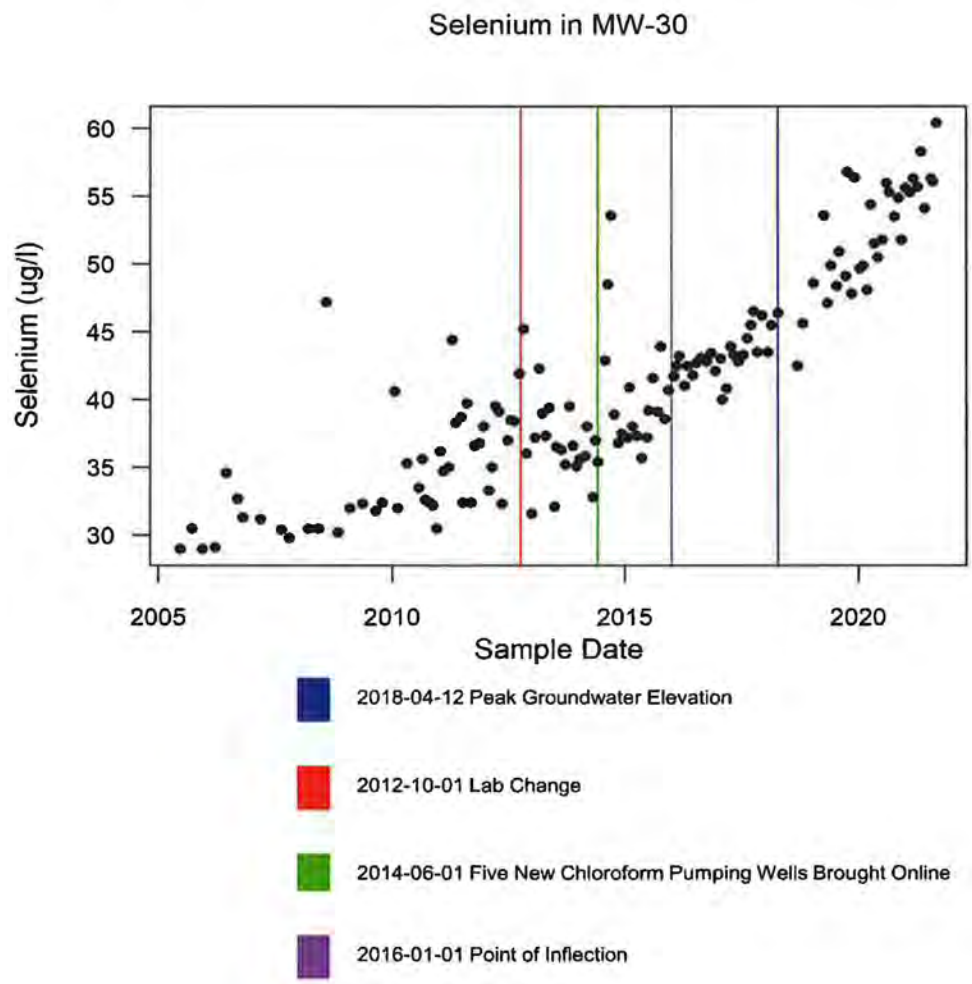
Appendix B-11: Timeseries Plots

Selenium in MW-30 Post January 1, 2016



Appendix B-12: Timeseries Plots with Events





APPENDIX C

Appendix C-1: Summary of Statistical Analysis for Indicator Parameters in MW-30

Well	Data Set	Constituent	N	% Non-Detected Values	Mean	Standard Deviation	Shapiro-Wilk Test for Normality		Normally or Lognormally distributed?	Least Squares Regression Trend Analysis[a]		Mann-Kendall Trend Analysis[b]		Background Report Trend?	Background Significant Trend?	2021 Significant Trend
							W	p		r^2	p	S	p			
MW-30	ALL 2021 SAR Data	Chloride (mg/L)	150	0	145.9	22.0	0.964	5.41E-04	Not normal	NA	NA	8074	0.00	Decreasing	No	Increasing
	GWCL Subset Post 2016	Chloride (mg/L)	69	0	164.2	16.6	0.945	4.50E-03	Not normal	NA	NA	1361	0.00	Decreasing	No	Increasing
	ALL 2021 SAR Data	Fluoride (mg/L)	76	0	0.4	0.0	0.938	1.05E-03	Not normal	NA	NA	-488	0.01	Decreasing	No	Decreasing
	GWCL Subset Post 2016	Fluoride (mg/L)	35	0	0.4	0.0	0.933	3.79E-02	Not normal	NA	NA	-156	0.01	Decreasing	No	Decreasing
	ALL 2021 SAR Data	pH (pH Units)	162	0	6.9	0.4	0.962	2.12E-04	Not normal	NA	NA	1774	0.01	Decreasing	No	Increasing
	GWCL Subset Post 2016	pH (pH Units)	70	0	6.9	0.4	0.940	2.13E-03	Not normal	NA	NA	979	0.00	Decreasing	No	Increasing
	ALL 2021 SAR Data	Sulfate (mg/L)	67	0	778.7	66.4	0.975	2.01E-01	Normal	0.32	6.7E-07	-865	0.00	Decreasing	No	Decreasing
	GWCL Subset Post 2016	Sulfate (mg/L)	23	0	753.0	55.5	0.913	4.62E-02	Not normal	NA	NA	0	0.50	Decreasing	No	Decreasing
	ALL 2021 SAR Data	Uranium (µg/L)	140	0	8.1	1.1	0.991	5.46E-01	Normal	0.50	1.1E-22	6030	0.00	Increasing	No	Increasing
	GWCL Subset Post 2016	Uranium (µg/L)	69	0	8.7	0.9	0.968	7.49E-02	Normal	0.70	2.7E-19	1564	0.00	Increasing	No	Increasing

Notes:

σ = sigma
%ND = percent of non-detected values
µg/L = micrograms per liter
mg/L = milligrams per liter

N = number of valid data points
p = probability
W = Shapiro-Wilk test value
r^2 = The measure of how well the trendline fits the data where r2=1 represents a perfect fit.

S = Mann-Kendall statistic

a = A regression test was performed on data that was determined to have normal or log-normal distribution
b = The Mann-Kendall test was performed on data that are not normally or lognormally distributed

Appendix C-2: Descriptive Statistics for Indicator Parameters in MW-30

Data Set	2008 Background Report				2012 SAR				2019 SAR				2021 SAR			
Analyte	Chloride	Fluoride	Sulfate	Uranium	Chloride	Fluoride	Sulfate	Uranium	Chloride	Fluoride	Sulfate	Uranium	Chloride	Fluoride	Sulfate	Uranium
Units	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	ug/L	mg/L	mg/L	mg/L	ug/L
% Non-Detects	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
N	9	10	10	10	36	29	29	31	116	64	55	106	150	76	67	140
Normally or Lognormally Distributed?	Normal or Lognormal	Normal or Lognormal	Normal or Lognormal	Normal or Lognormal	Not Normal	Normal	Normal	Normal	Normal	Not Normal	Normal	Not Normal	Not normal	Not normal	Normal	Normal
Mean	124.9	0.4	883.2	7.0	124.6	0.4	812.6	7.0	137.4	0.4	783.6	7.7	145.9	0.4	778.7	8.1
Min. Conc.	122.0	0.3	822	5.8	106.0	0.3	696	5.8	97.0	0.2	608	5.8	97.0	0.2	608	5.8
Max. Conc.	128.0	0.5	977	8.0	145.0	0.4	977	8.4	183.0	0.5	977	11.0	195.0	0.5	977	11.6
Std. Dev.	1.6	0.1	45	0.6	6.6	0.2	67	0.6	15.8	0.0	67	0.8	22.0	0.0	66	1.1
Range	6.0	0.2	155	2.2	39.0	0.1	281	2.6	86.0	0.2	369	5.2	98.0	0.2	369	5.8
Geometric Mean	124.9	0.4	882	7.0	124.4	0.4	810	7.0	136.5	0.4	781	7.6	144.3	0.4	776	8.0
Skewness	0.2	0.6	0.8	-0.5	-0.1	0.2	0.4	0.4	0.6	-0.5	0.3	0.6	0.5	-0.4	0.2	0.5
25th Quartile	124.0	0.3	852	6.9	122.0	0.3	767	6.7	126.0	0.3	745	7.0	128.0	0.3	745	7.4
Median	125.0	0.4	874	7.1	125.0	0.4	799	6.9	135.0	0.4	772	7.7	142.0	0.4	769	8.0
75th Quartile	125.0	0.4	910	7.3	127.5	0.4	853	7.3	146.0	0.4	826	8.2	162.0	0.4	822	8.7

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	10/23/2012	Chloride	135	mg/l	
MW-30	11/13/2012	Chloride	114	mg/l	
MW-30	12/26/2012	Chloride	122	mg/l	
MW-30	01/23/2013	Chloride	128	mg/l	
MW-30	02/26/2013	Chloride	129	mg/l	
MW-30	03/20/2013	Chloride	126	mg/l	
MW-30	04/17/2013	Chloride	117	mg/l	
MW-30	05/15/2013	Chloride	119	mg/l	
MW-30	06/25/2013	Chloride	127	mg/l	
MW-30	07/10/2013	Chloride	130	mg/l	
MW-30	08/20/2013	Chloride	126	mg/l	
MW-30	09/18/2013	Chloride	131	mg/l	
MW-30	10/22/2013	Chloride	128	mg/l	
MW-30	11/20/2013	Chloride	124	mg/l	
MW-30	12/18/2013	Chloride	134	mg/l	
MW-30	01/08/2014	Chloride	131	mg/l	
MW-30	02/25/2014	Chloride	135	mg/l	
MW-30	03/11/2014	Chloride	144	mg/l	
MW-30	04/23/2014	Chloride	154	mg/l	
MW-30	05/14/2014	Chloride	128	mg/l	
MW-30	06/03/2014	Chloride	128	mg/l	
MW-30	07/29/2014	Chloride	140	mg/l	
MW-30	08/20/2014	Chloride	139	mg/l	
MW-30	09/09/2014	Chloride	136	mg/l	
MW-30	10/07/2014	Chloride	136	mg/l	
MW-30	11/10/2014	Chloride	154	mg/l	
MW-30	12/10/2014	Chloride	138	mg/l	
MW-30	01/21/2015	Chloride	144	mg/l	
MW-30	02/04/2015	Chloride	136	mg/l	
MW-30	03/03/2015	Chloride	132	mg/l	
MW-30	04/08/2015	Chloride	142	mg/l	
MW-30	05/12/2015	Chloride	145	mg/l	
MW-30	06/24/2015	Chloride	142	mg/l	
MW-30	07/07/2015	Chloride	145	mg/l	
MW-30	08/11/2015	Chloride	165	mg/l	
MW-30	09/15/2015	Chloride	165	mg/l	
MW-30	10/07/2015	Chloride	137	mg/l	
MW-30	11/11/2015	Chloride	140	mg/l	
MW-30	12/09/2015	Chloride	144	mg/l	
MW-30	01/20/2016	Chloride	143	mg/l	
MW-30	02/10/2016	Chloride	145	mg/l	
MW-30	03/02/2016	Chloride	142.00	mg/l	
MW-30	04/13/2016	Chloride	144.00	mg/l	
MW-30	05/04/2016	Chloride	139.00	mg/l	
MW-30	06/14/2016	Chloride	142.00	mg/l	
MW-30	07/13/2016	Chloride	137.00	mg/l	
MW-30	08/18/2016	Chloride	150.00	mg/l	
MW-30	09/14/2016	Chloride	146.00	mg/l	

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	10/05/2016	Chloride	148.00	mg/l	
MW-30	11/03/2016	Chloride	143.00	mg/l	
MW-30	12/06/2016	Chloride	158.00	mg/l	
MW-30	01/18/2017	Chloride	150.00	mg/l	
MW-30	02/02/2017	Chloride	150.00	mg/l	
MW-30	03/07/2017	Chloride	147.00	mg/l	
MW-30	04/05/2017	Chloride	146.00	mg/l	
MW-30	05/02/2017	Chloride	146.00	mg/l	
MW-30	06/05/2017	Chloride	153.00	mg/l	
MW-30	07/11/2017	Chloride	160.00	mg/l	
MW-30	08/14/2017	Chloride	173.00	mg/l	
MW-30	09/12/2017	Chloride	149.00	mg/l	
MW-30	10/05/2017	Chloride	153.00	mg/l	
MW-30	11/01/2017	Chloride	156.00	mg/l	
MW-30	12/06/2017	Chloride	159.00	mg/l	
MW-30	01/23/2018	Chloride	152.00	mg/l	
MW-30	02/22/2018	Chloride	158.00	mg/l	
MW-30	03/08/2018	Chloride	167.00	mg/l	
MW-30	04/12/2018	Chloride	145.00	mg/l	
MW-30	05/15/2018	Chloride	174.00	mg/l	
MW-30	06/19/2018	Chloride	169.00	mg/l	
MW-30	07/24/2018	Chloride	177.00	mg/l	
MW-30	08/10/2018	Chloride	170.00	mg/l	
MW-30	09/11/2018	Chloride	183.00	mg/l	
MW-30	10/22/2018	Chloride	140.00	mg/l	
MW-30	11/14/2018	Chloride	166.00	mg/l	
MW-30	12/11/2018	Chloride	154.00	mg/l	
MW-30	01/16/2019	Chloride	157.00	mg/l	
MW-30	02/13/2019	Chloride	167.00	mg/l	
MW-30	03/06/2019	Chloride	160.00	mg/l	
MW-30	04/09/2019	Chloride	138.00	mg/l	
MW-30	05/07/2019	Chloride	175.00	mg/l	
MW-30	06/03/2019	Chloride	165.00	mg/l	
MW-30	07/16/2019	Chloride	181.00	mg/l	
MW-30	08/06/2019	Chloride	190.00	mg/l	
MW-30	09/24/2019	Chloride	176.00	mg/l	
MW-30	10/08/2019	Chloride	170.00	mg/l	
MW-30	11/13/2019	Chloride	180.00	mg/l	
MW-30	12/04/2019	Chloride	185.00	mg/l	
MW-30	01/15/2020	Chloride	182.00	mg/l	
MW-30	02/05/2020	Chloride	187.00	mg/l	
MW-30	03/11/2020	Chloride	182.00	mg/l	
MW-30	04/06/2020	Chloride	195.00	mg/l	
MW-30	05/06/2020	Chloride	177.00	mg/l	
MW-30	06/03/2020	Chloride	180.00	mg/l	
MW-30	07/06/2020	Chloride	185.00	mg/l	
MW-30	08/11/2020	Chloride	183.00	mg/l	
MW-30	09/01/2020	Chloride	166.00	mg/l	

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	10/13/2020	Chloride	183.00	mg/l	
MW-30	11/17/2020	Chloride	150.00	mg/l	
MW-30	12/08/2020	Chloride	166.00	mg/l	
MW-30	01/11/2021	Chloride	184.00	mg/l	
MW-30	02/10/2021	Chloride	189.00	mg/l	
MW-30	03/09/2021	Chloride	192.00	mg/l	
MW-30	04/14/2021	Chloride	162.00	mg/l	
MW-30	05/11/2021	Chloride	188.00	mg/l	
MW-30	06/08/2021	Chloride	170.00	mg/l	
MW-30	07/29/2021	Chloride	188.00	mg/l	
MW-30	08/09/2021	Chloride	161.00	mg/l	
MW-30	09/08/2021	Chloride	183.00	mg/l	
MW-30	11/13/2012	Fluoride	0.33	mg/l	
MW-30	02/26/2013	Fluoride	0.37	mg/l	
MW-30	05/15/2013	Fluoride	0.33	mg/l	
MW-30	07/10/2013	Fluoride	0.37	mg/l	
MW-30	11/20/2013	Fluoride	0.34	mg/l	
MW-30	02/25/2014	Fluoride	0.33	mg/l	
MW-30	03/11/2014	Fluoride	0.36	mg/l	
MW-30	06/03/2014	Fluoride	0.34	mg/l	
MW-30	09/09/2014	Fluoride	0.40	mg/l	
MW-30	11/10/2014	Fluoride	0.26	mg/l	
MW-30	02/04/2015	Fluoride	0.32	mg/l	
MW-30	04/08/2015	Fluoride	0.29	mg/l	
MW-30	08/11/2015	Fluoride	0.25	mg/l	
MW-31	11/11/2015	Fluoride	0.57	mg/l	
MW-30	02/10/2016	Fluoride	0.36	mg/l	
MW-30	03/02/2016	Fluoride	10.00	mg/l	
MW-30	04/13/2016	Fluoride	0.36	mg/l	
MW-30	05/04/2016	Fluoride	0.35	mg/l	
MW-30	06/14/2016	Fluoride	0.36	mg/l	
MW-30	07/13/2016	Fluoride	0.36	mg/l	
MW-30	08/18/2016	Fluoride	0.40	mg/l	
MW-30	09/14/2016	Fluoride	0.37	mg/l	
MW-30	10/05/2016	Fluoride	0.38	mg/l	
MW-30	11/03/2016	Fluoride	0.38	mg/l	
MW-30	12/06/2016	Fluoride	0.39	mg/l	
MW-30	01/18/2017	Fluoride	0.37	mg/l	
MW-30	02/02/2017	Fluoride	0.37	mg/l	
MW-30	03/07/2017	Fluoride	0.35	mg/l	
MW-30	04/05/2017	Fluoride	0.35	mg/l	
MW-30	05/02/2017	Fluoride	0.36	mg/l	
MW-30	06/05/2017	Fluoride	0.34	mg/l	
MW-30	07/11/2017	Fluoride	0.35	mg/l	
MW-30	08/14/2017	Fluoride	0.36	mg/l	
MW-30	11/01/2017	Fluoride	0.41	mg/l	
MW-30	02/22/2018	Fluoride	0.30	mg/l	
MW-30	04/12/2018	Fluoride	0.35	mg/l	

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	09/11/2018	Fluoride	0.28	mg/l	
MW-30	10/22/2018	Fluoride	0.32	mg/l	
MW-30	01/16/2019	Fluoride	0.35	mg/l	
MW-30	04/09/2019	Fluoride	0.33	mg/l	
MW-30	07/16/2019	Fluoride	0.41	mg/l	
MW-30	10/08/2019	Fluoride	0.28	mg/l	
MW-30	01/15/2020	Fluoride	0.38	mg/l	
MW-30	04/06/2020	Fluoride	0.32	mg/l	
MW-30	07/06/2020	Fluoride	0.35	mg/l	
MW-30	10/13/2020	Fluoride	0.38	mg/l	
MW-30	01/11/2021	Fluoride	0.35	mg/l	
MW-30	04/14/2021	Fluoride	0.29	mg/l	
MW-30	07/29/2021	Fluoride	0.32	mg/l	
MW-30	10/23/2012	pH	6.74	pH Units	
MW-30	11/13/2012	pH	6.40	pH Units	
MW-30	12/26/2012	pH	6.98	pH Units	
MW-30	01/23/2013	pH	6.87	pH Units	
MW-30	02/26/2013	pH	6.93	pH Units	
MW-30	03/20/2013	pH	6.89	pH Units	
MW-30	04/17/2013	pH	7.34	pH Units	
MW-30	05/15/2013	pH	7.49	pH Units	
MW-30	06/25/2013	pH	6.97	pH Units	
MW-30	07/10/2013	pH	6.96	pH Units	
MW-30	08/20/2013	pH	7.08	pH Units	
MW-30	09/18/2013	pH	6.77	pH Units	
MW-30	10/22/2013	pH	6.87	pH Units	
MW-30	11/20/2013	pH	6.86	pH Units	
MW-30	12/18/2013	pH	7.10	pH Units	
MW-30	01/08/2014	pH	6.72	pH Units	
MW-30	02/25/2014	pH	6.78	pH Units	
MW-30	03/11/2014	pH	6.49	pH Units	
MW-30	04/23/2014	pH	7.07	pH Units	
MW-30	05/14/2014	pH	6.80	pH Units	
MW-30	06/03/2014	pH	6.84	pH Units	
MW-30	07/29/2014	pH	6.84	pH Units	
MW-30	08/20/2014	pH	7.62	pH Units	
MW-30	09/09/2014	pH	6.92	pH Units	
MW-30	10/07/2014	pH	7.03	pH Units	
MW-30	11/10/2014	pH	6.11	pH Units	
MW-30	12/10/2014	pH	6.81	pH Units	
MW-30	01/21/2015	pH	6.34	pH Units	
MW-30	02/04/2015	pH	6.53	pH Units	
MW-30	03/03/2015	pH	6.22	pH Units	
MW-30	04/08/2015	pH	6.59	pH Units	
MW-30	05/12/2015	pH	6.79	pH Units	
MW-30	06/02/2015	pH	6.96	pH Units	
MW-30	06/24/2015	pH	6.32	pH Units	
MW-30	07/07/2015	pH	6.85	pH Units	

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	08/11/2015	pH	6.70	pH Units	
MW-30	09/15/2015	pH	6.53	pH Units	
MW-30	10/07/2015	pH	6.90	pH Units	
MW-30	11/11/2015	pH	6.88	pH Units	
MW-30	12/09/2015	pH	6.75	pH Units	
MW-30	01/20/2016	pH	6.40	pH Units	
MW-30	02/10/2016	pH	6.95	pH Units	
MW-30	03/02/2016	pH	6.54	pH Units	
MW-30	04/13/2016	pH	6.94	pH Units	
MW-30	05/04/2016	pH	6.20	pH Units	
MW-30	06/14/2016	pH	6.20	pH Units	
MW-30	07/13/2016	pH	6.15	pH Units	
MW-30	08/08/2016	pH	6.89	pH Units	
MW-30	09/14/2016	pH	6.64	pH Units	
MW-30	10/05/2016	pH	6.95	pH Units	
MW-30	11/03/2016	pH	7.03	pH Units	
MW-30	12/06/2016	pH	6.23	pH Units	
MW-30	01/18/2017	pH	6.64	pH Units	
MW-30	02/02/2017	pH	6.25	pH Units	
MW-30	03/07/2017	pH	6.67	pH Units	
MW-30	04/05/2017	pH	5.90	pH Units	
MW-30	05/02/2017	pH	6.87	pH Units	
MW-30	06/05/2017	pH	6.95	pH Units	
MW-30	07/11/2017	pH	7.11	pH Units	
MW-30	08/14/2017	pH	6.33	pH Units	
MW-30	09/12/2017	pH	7.42	pH Units	
MW-30	10/05/2017	pH	6.85	pH Units	
MW-30	11/01/2017	pH	7.13	pH Units	
MW-30	12/06/2017	pH	6.77	pH Units	
MW-30	01/23/2018	pH	6.12	pH Units	
MW-30	02/22/2018	pH	6.56	pH Units	
MW-30	03/08/2018	pH	6.89	pH Units	
MW-30	04/12/2018	pH	6.30	pH Units	
MW-30	05/15/2018	pH	6.75	pH Units	
MW-30	06/19/2018	pH	6.84	pH Units	
MW-30	07/24/2018	pH	7.20	pH Units	
MW-30	08/10/2018	pH	6.98	pH Units	
MW-30	09/11/2018	pH	7.02	pH Units	
MW-30	10/22/2018	pH	6.47	pH Units	
MW-30	11/14/2018	pH	6.98	pH Units	
MW-30	12/11/2018	pH	7.14	pH Units	
MW-30	01/16/2019	pH	6.46	pH Units	
MW-30	02/13/2019	pH	6.40	pH Units	
MW-30	03/06/2019	pH	7.00	pH Units	
MW-30	04/09/2019	pH	7.11	pH Units	
MW-30	05/07/2019	pH	7.04	pH Units	
MW-30	06/03/2019	pH	7.23	pH Units	
MW-30	07/16/2019	pH	6.92	pH Units	

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	08/06/2019	pH	7.50	pH Units	
MW-30	09/24/2019	pH	7.08	pH Units	
MW-30	10/08/2019	pH	7.11	pH Units	
MW-30	11/13/2019	pH	7.21	pH Units	
MW-30	12/04/2019	pH	7.21	pH Units	
MW-30	01/15/2020	pH	7.37	pH Units	
MW-30	02/05/2020	pH	7.32	pH Units	
MW-30	03/11/2020	pH	7.19	pH Units	
MW-30	04/06/2020	pH	7.14	pH Units	
MW-30	05/06/2020	pH	6.48	pH Units	
MW-30	06/03/2020	pH	6.53	pH Units	
MW-30	07/06/2020	pH	7.21	pH Units	
MW-30	08/11/2020	pH	7.55	pH Units	
MW-30	09/01/2020	pH	7.13	pH Units	
MW-30	10/13/2020	pH	7.15	pH Units	
MW-30	11/17/2020	pH	7.22	pH Units	
MW-30	12/08/2020	pH	7.11	pH Units	
MW-30	01/11/2021	pH	7.54	pH Units	
MW-30	02/10/2021	pH	7.20	pH Units	
MW-30	03/09/2021	pH	7.19	pH Units	
MW-30	04/14/2021	pH	7.14	pH Units	
MW-30	05/11/2021	pH	7.18	pH Units	
MW-30	06/08/2021	pH	7.40	pH Units	
MW-30	07/20/2021	pH	7.19	pH Units	
MW-30	07/29/2021	pH	6.95	pH Units	
MW-30	08/09/2021	pH	6.76	pH Units	
MW-30	09/08/2021	pH	6.60	pH Units	
MW-30	11/13/2012	Sulfate	758	mg/l	
MW-30	02/26/2013	Sulfate	772	mg/l	
MW-30	05/15/2013	Sulfate	828	mg/l	
MW-30	07/10/2013	Sulfate	824	mg/l	
MW-30	11/20/2013	Sulfate	781	mg/l	
MW-30	02/25/2014	Sulfate	608	mg/l	
MW-30	03/11/2014	Sulfate	772	mg/l	
MW-30	06/03/2014	Sulfate	727	mg/l	
MW-30	09/09/2014	Sulfate	720	mg/l	
MW-30	11/10/2014	Sulfate	774	mg/l	
MW-30	02/04/2015	Sulfate	750	mg/l	
MW-30	04/08/2015	Sulfate	783	mg/l	
MW-30	08/11/2015	Sulfate	718	mg/l	
MW-30	11/11/2015	Sulfate	739	mg/l	
MW-30	02/10/2016	Sulfate	754	mg/l	
MW-30	05/04/2016	Sulfate	753	mg/l	
MW-30	08/18/2016	Sulfate	800	mg/l	
MW-30	11/03/2016	Sulfate	716	mg/l	
MW-30	02/02/2017	Sulfate	750	mg/l	
MW-30	05/02/2017	Sulfate	749	mg/l	
MW-30	08/14/2017	Sulfate	839	mg/l	

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	11/01/2017	Sulfate	743	mg/l	
MW-30	02/22/2018	Sulfate	766	mg/l	
MW-30	04/12/2018	Sulfate	638	mg/l	
MW-30	09/11/2018	Sulfate	739	mg/l	
MW-30	10/22/2018	Sulfate	766	mg/l	
MW-30	01/16/2019	Sulfate	704	mg/l	
MW-30	04/09/2019	Sulfate	668	mg/l	
MW-30	07/16/2019	Sulfate	838	mg/l	
MW-30	10/08/2019	Sulfate	790	mg/l	
MW-30	01/15/2020	Sulfate	753	mg/l	
MW-30	04/06/2020	Sulfate	821	mg/l	
MW-30	07/06/2020	Sulfate	801	mg/l	
MW-30	10/13/2020	Sulfate	800	mg/l	
MW-30	01/11/2021	Sulfate	749	mg/l	
MW-30	04/14/2021	Sulfate	628	mg/l	
MW-30	07/29/2021	Sulfate	754	mg/l	
MW-30	10/23/2012	Uranium	7.86	ug/l	
MW-30	11/13/2012	Uranium	7.03	ug/l	
MW-30	12/26/2012	Uranium	5.80	ug/l	
MW-30	01/23/2013	Uranium	8.36	ug/l	
MW-30	02/26/2013	Uranium	7.40	ug/l	
MW-30	03/20/2013	Uranium	6.85	ug/l	
MW-30	04/17/2013	Uranium	7.08	ug/l	
MW-30	05/15/2013	Uranium	6.31	ug/l	
MW-30	07/10/2013	Uranium	7.48	ug/l	
MW-30	08/20/2013	Uranium	7.07	ug/l	
MW-30	09/18/2013	Uranium	7.00	ug/l	
MW-30	10/22/2013	Uranium	6.91	ug/l	
MW-30	11/20/2013	Uranium	8.57	ug/l	
MW-30	02/25/2014	Uranium	6.83	ug/l	
MW-30	03/11/2014	Uranium	7.84	ug/l	
MW-30	04/23/2014	Uranium	6.84	ug/l	
MW-30	05/14/2014	Uranium	9.82	ug/l	
MW-30	06/03/2014	Uranium	7.35	ug/l	
MW-30	07/29/2014	Uranium	7.40	ug/l	
MW-30	08/20/2014	Uranium	7.60	ug/l	
MW-30	09/09/2014	Uranium	7.70	ug/l	
MW-30	10/07/2014	Uranium	7.76	ug/l	
MW-30	11/10/2014	Uranium	7.65	ug/l	
MW-30	12/10/2014	Uranium	7.67	ug/l	
MW-30	01/21/2015	Uranium	8.06	ug/l	
MW-30	02/04/2015	Uranium	8.23	ug/l	
MW-30	03/03/2015	Uranium	8.35	ug/l	
MW-30	04/08/2015	Uranium	7.45	ug/l	
MW-30	05/12/2015	Uranium	8.38	ug/l	
MW-30	06/24/2015	Uranium	7.46	ug/l	
MW-30	07/07/2015	Uranium	7.98	ug/l	
MW-30	08/11/2015	Uranium	8.16	ug/l	

Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	09/15/2015	Uranium	7.72	ug/l	
MW-30	10/07/2015	Uranium	8.10	ug/l	
MW-30	11/11/2015	Uranium	7.99	ug/l	
MW-30	12/09/2015	Uranium	8.22	ug/l	
MW-30	01/20/2016	Uranium	8.34	ug/l	
MW-30	02/10/2016	Uranium	7.76	ug/l	
MW-30	03/02/2016	Uranium	7.82	ug/l	
MW-30	04/13/2016	Uranium	7.55	ug/l	
MW-30	05/04/2016	Uranium	8.18	ug/l	
MW-30	06/14/2016	Uranium	7.66	ug/l	
MW-30	07/13/2016	Uranium	8.10	ug/l	
MW-30	08/18/2016	Uranium	8.23	ug/l	
MW-30	09/14/2016	Uranium	8.22	ug/l	
MW-30	10/05/2016	Uranium	7.64	ug/l	
MW-30	11/03/2016	Uranium	7.92	ug/l	
MW-30	12/06/2016	Uranium	8.63	ug/l	
MW-30	01/18/2017	Uranium	8.01	ug/l	
MW-30	02/02/2017	Uranium	7.62	ug/l	
MW-30	03/07/2017	Uranium	7.89	ug/l	
MW-30	04/05/2017	Uranium	7.63	ug/l	
MW-30	05/02/2017	Uranium	8.11	ug/l	
MW-30	06/05/2017	Uranium	7.98	ug/l	
MW-30	07/11/2017	Uranium	8.33	ug/l	
MW-30	08/14/2017	Uranium	8.05	ug/l	
MW-30	09/12/2017	Uranium	7.80	ug/l	
MW-30	10/05/2017	Uranium	8.35	ug/l	
MW-30	11/01/2017	Uranium	7.19	ug/l	
MW-30	12/06/2017	Uranium	8.18	ug/l	
MW-30	01/23/2018	Uranium	8.53	ug/l	
MW-30	02/22/2018	Uranium	8.23	ug/l	
MW-30	03/08/2018	Uranium	8.66	ug/l	
MW-30	04/12/2018	Uranium	7.98	ug/l	
MW-30	05/15/2018	Uranium	8.44	ug/l	
MW-30	06/19/2018	Uranium	8.80	ug/l	
MW-30	07/24/2018	Uranium	8.69	ug/l	
MW-30	08/10/2018	Uranium	7.69	ug/l	
MW-30	09/11/2018	Uranium	8.34	ug/l	
MW-30	10/22/2018	Uranium	8.08	ug/l	
MW-30	11/14/2018	Uranium	8.81	ug/l	
MW-30	12/11/2018	Uranium	8.20	ug/l	
MW-30	01/16/2019	Uranium	9.07	ug/l	
MW-30	02/13/2019	Uranium	9.09	ug/l	
MW-30	03/06/2019	Uranium	8.39	ug/l	
MW-30	04/09/2019	Uranium	8.62	ug/l	
MW-30	05/07/2019	Uranium	8.15	ug/l	
MW-30	06/03/2019	Uranium	8.88	ug/l	
MW-30	07/16/2019	Uranium	9.03	ug/l	
MW-30	08/06/2019	Uranium	9.39	ug/l	

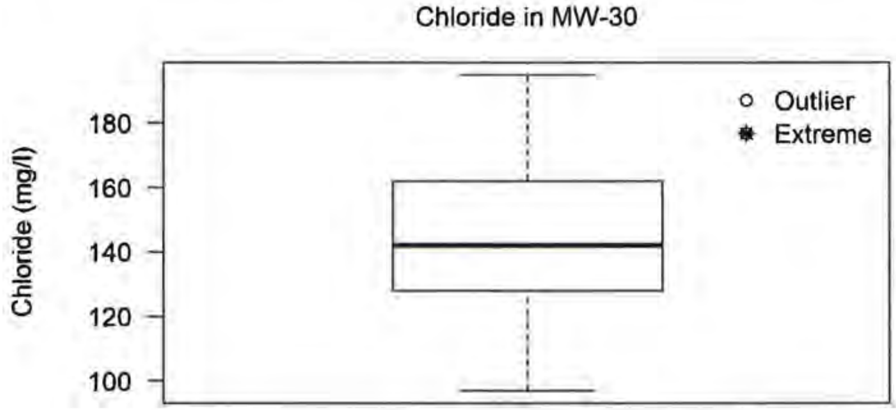
Appendix C-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units	Qualifier
MW-30	09/24/2019	Uranium	8.12	ug/l	
MW-30	10/08/2019	Uranium	8.69	ug/l	
MW-30	11/13/2019	Uranium	9.29	ug/l	
MW-30	12/04/2019	Uranium	8.99	ug/l	
MW-30	01/15/2020	Uranium	8.88	ug/l	
MW-30	02/05/2020	Uranium	9.06	ug/l	
MW-30	03/11/2020	Uranium	9.50	ug/l	
MW-30	04/06/2020	Uranium	9.24	ug/l	
MW-30	05/06/2020	Uranium	8.94	ug/l	
MW-30	06/03/2020	Uranium	9.28	ug/l	
MW-30	07/06/2020	Uranium	9.76	ug/l	
MW-30	08/11/2020	Uranium	10.60	ug/l	
MW-30	09/01/2020	Uranium	9.90	ug/l	
MW-30	10/13/2020	Uranium	9.92	ug/l	
MW-30	11/17/2020	Uranium	9.95	ug/l	
MW-30	12/08/2020	Uranium	9.56	ug/l	
MW-30	01/11/2021	Uranium	9.86	ug/l	
MW-30	02/10/2021	Uranium	11.60	ug/l	
MW-30	03/09/2021	Uranium	10.20	ug/l	
MW-30	04/14/2021	Uranium	10.30	ug/l	
MW-30	05/11/2021	Uranium	10.70	ug/l	
MW-30	06/08/2021	Uranium	9.84	ug/l	
MW-30	07/29/2021	Uranium	9.60	ug/l	
MW-30	08/09/2021	Uranium	9.38	ug/l	
MW-30	09/08/2021	Uranium	9.74	ug/l	

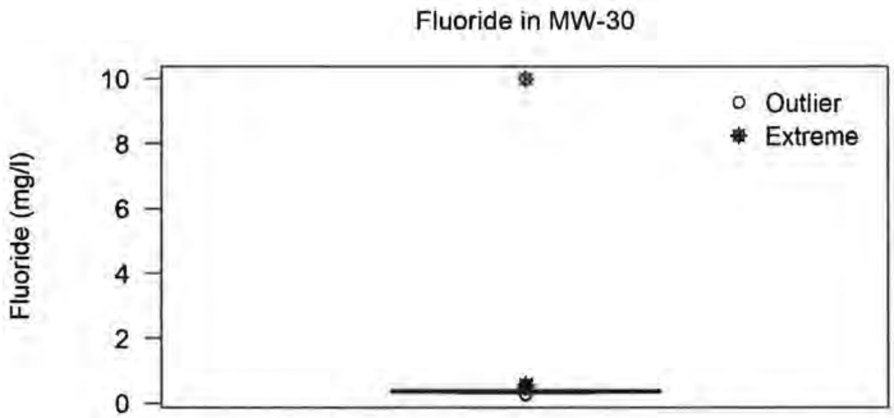
Appendix C-4: Indicator Parameter Data Removed from Analysis

Reason	Location ID	Date Sampled	Parameter Name	Report Result	Report Units
Removed					
Extreme Outlier (upper)	MW-30	10/25/2006	Fluoride	0.49	mg/l
Extreme Outlier (upper)	MW-30	11/11/2015	Fluoride	0.57	mg/l
Extreme Outlier (upper)	MW-30	03/02/2016	Fluoride	10.00	mg/l

Appendix C-5: Box Plots for Indicator Parameters in MW-30

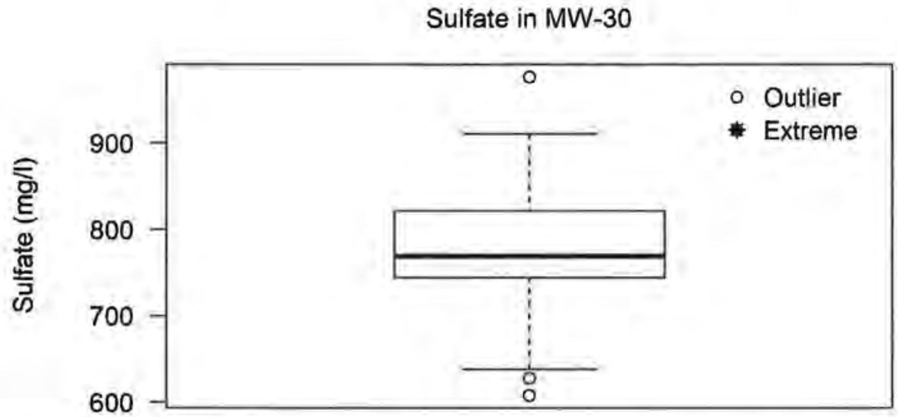


Percent nondetect: 0%
Min: 97, Mean: 145.95, Max: 195, Std Dev: 22.03
Upper extreme threshold (Q75 + 3xH): 264
Lower extreme threshold (Q25 - 3xH): 26

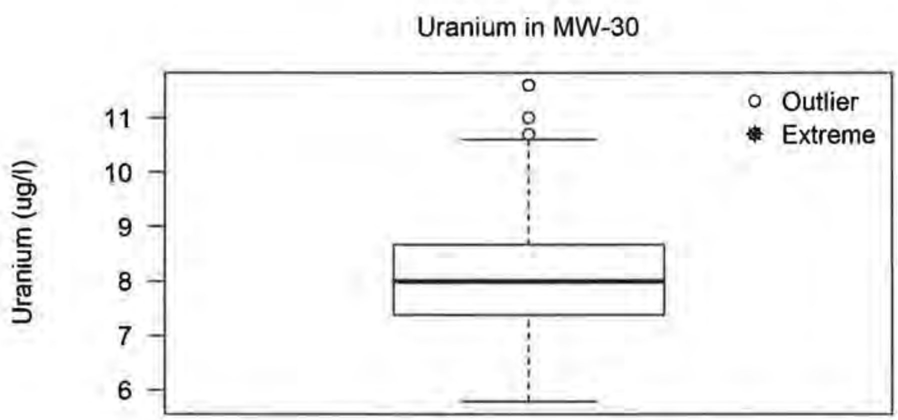


Percent nondetect: 1%
Min: 0.247, Mean: 0.48, Max: 10, Std Dev: 1.09
Upper extreme threshold (Q75 + 3xH): 0.472
Lower extreme threshold (Q25 - 3xH): 0.241

Appendix C-5: Box Plots for Indicator Parameters in MW-30

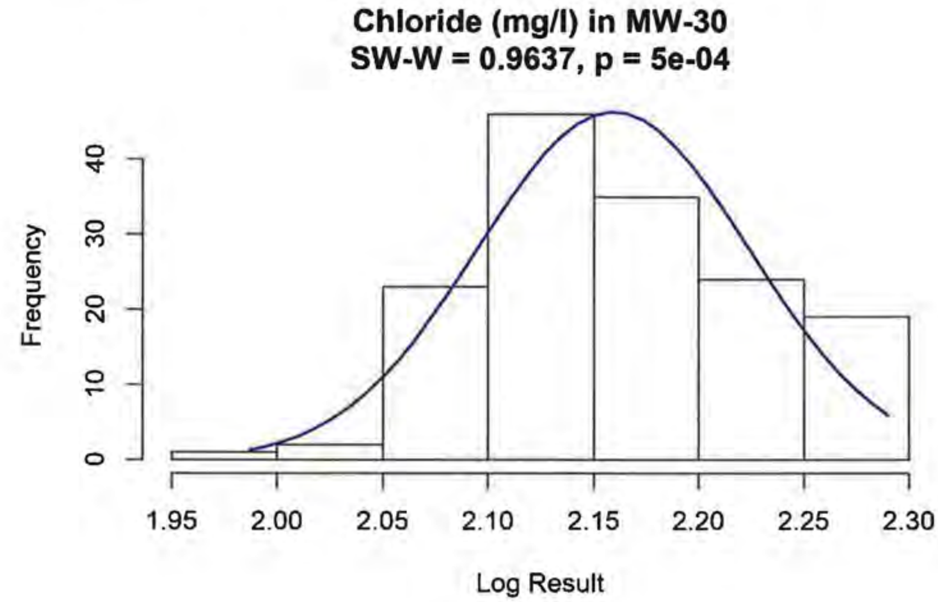


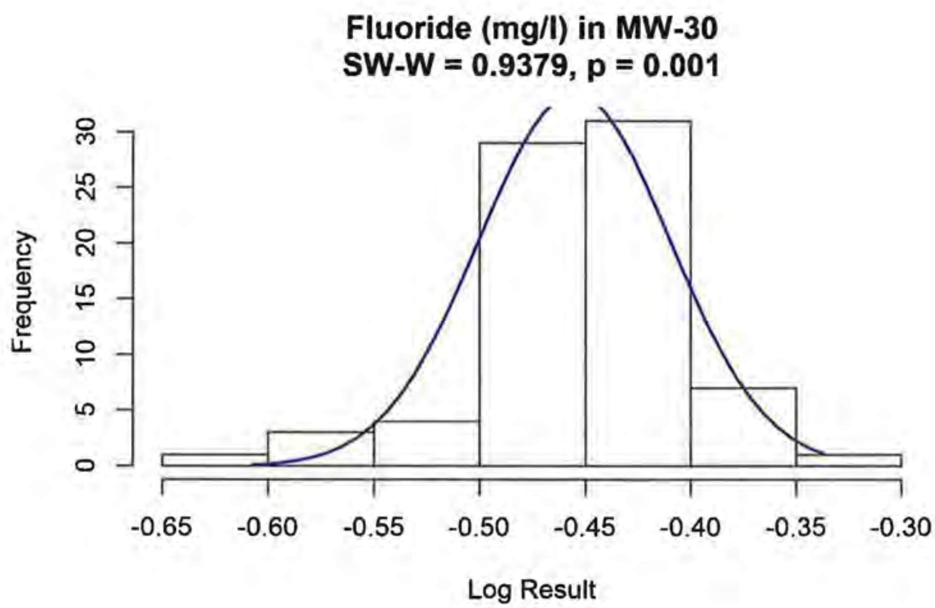
Percent nondetect: 0%
Min: 608, Mean: 778.69, Max: 977, Std Dev: 66.45
Upper extreme threshold (Q75 + 3xH): 1052.5
Lower extreme threshold (Q25 - 3xH): 513.5



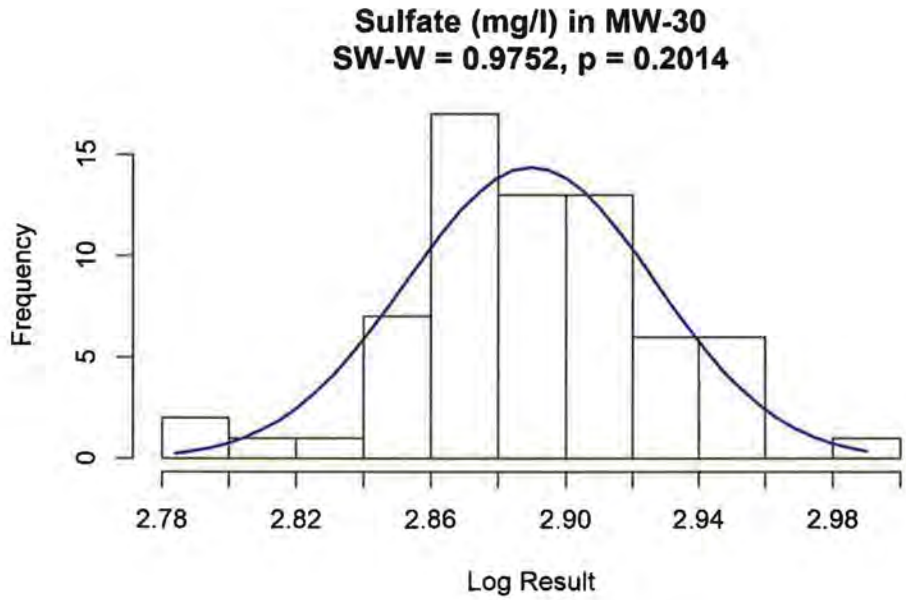
Percent nondetect: 0%
Min: 5.79, Mean: 8.09, Max: 11.6, Std Dev: 1.09
Upper extreme threshold (Q75 + 3xH): 12.5075
Lower extreme threshold (Q25 - 3xH): 3.5475

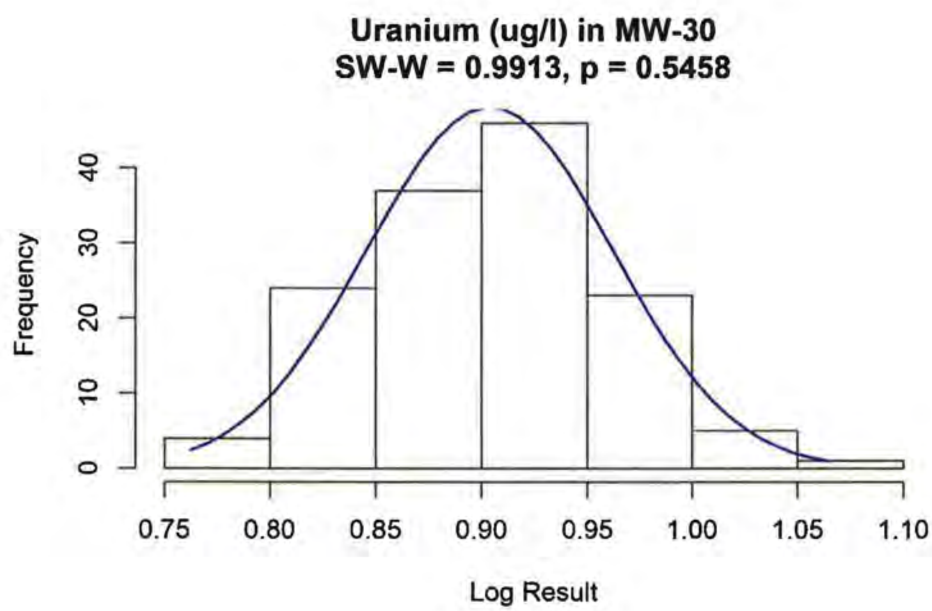
Appendix C-6: Histograms for Indicator Parameters in MW-30



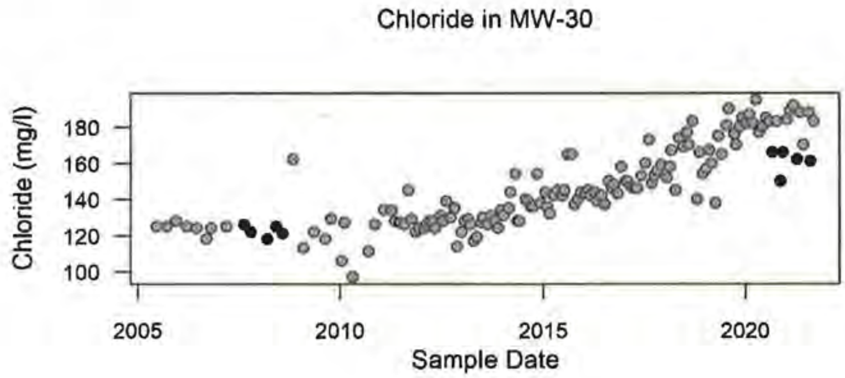


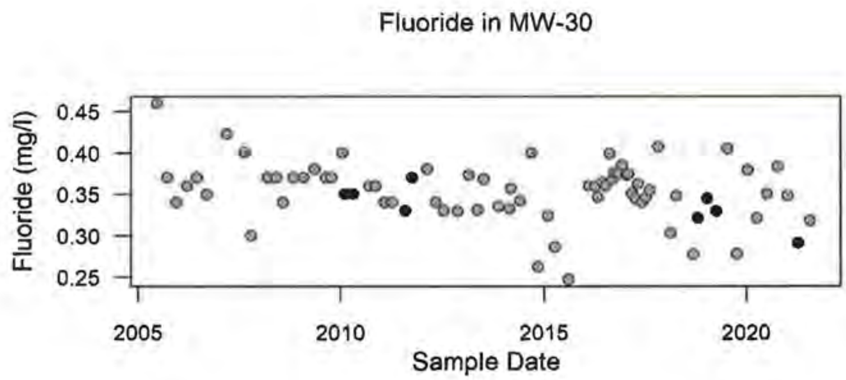
Appendix C-6: Histograms for Indicator Parameters in MW-30

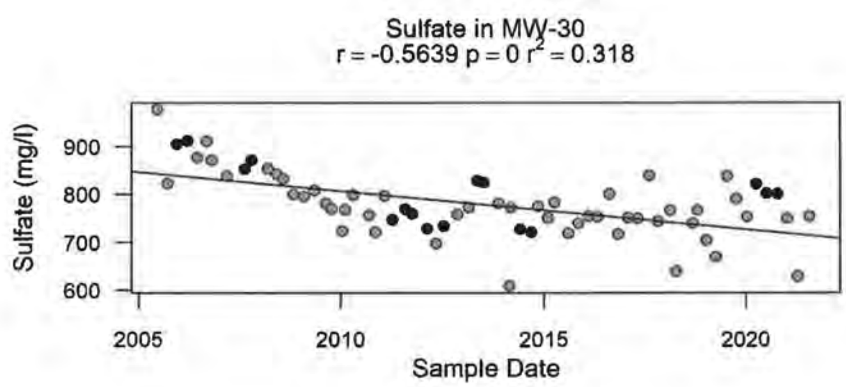




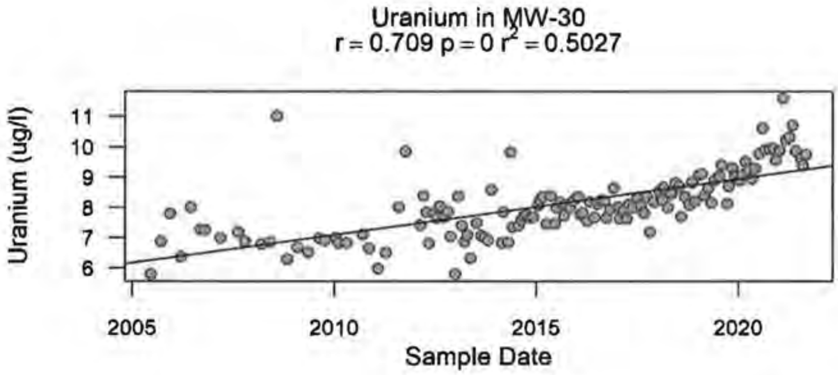
Appendix C-7: Time Series Plots and Linear Regressions for Indicator Parameters in MW-30

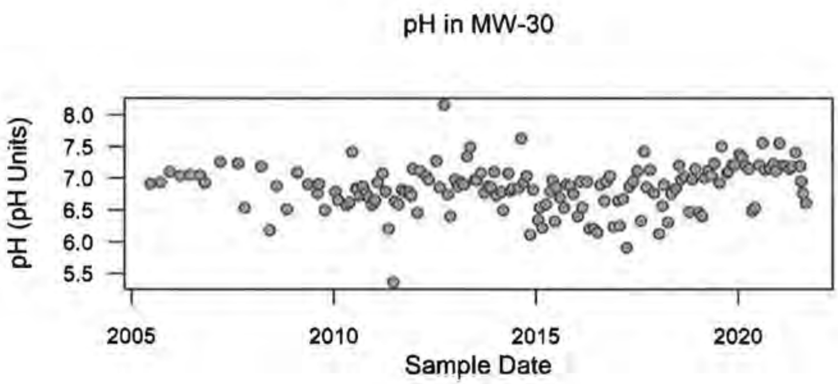






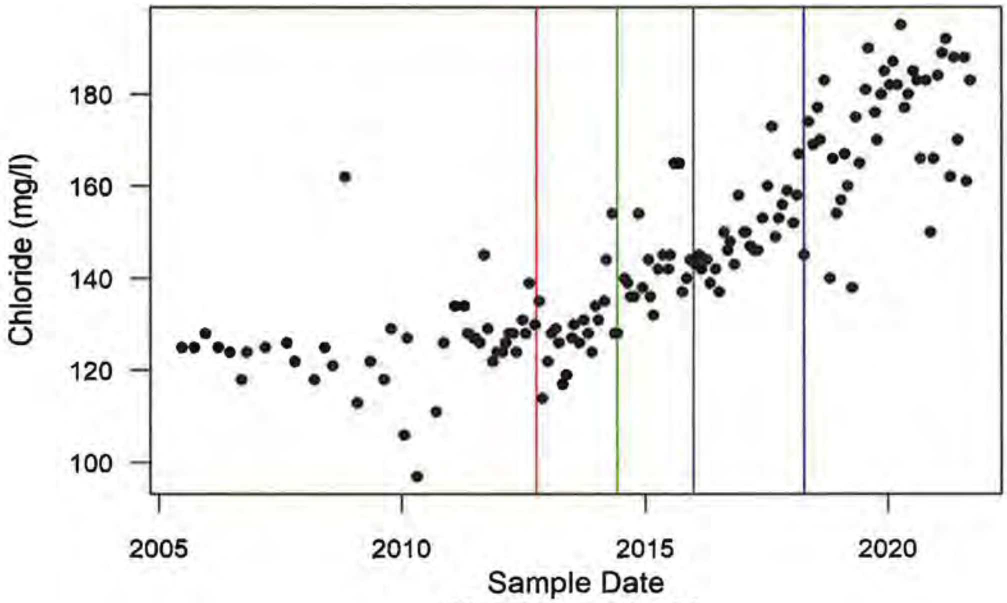
Appendix C-7: Time Series Plots and Linear Regressions for Indicator Parameters in MW-30



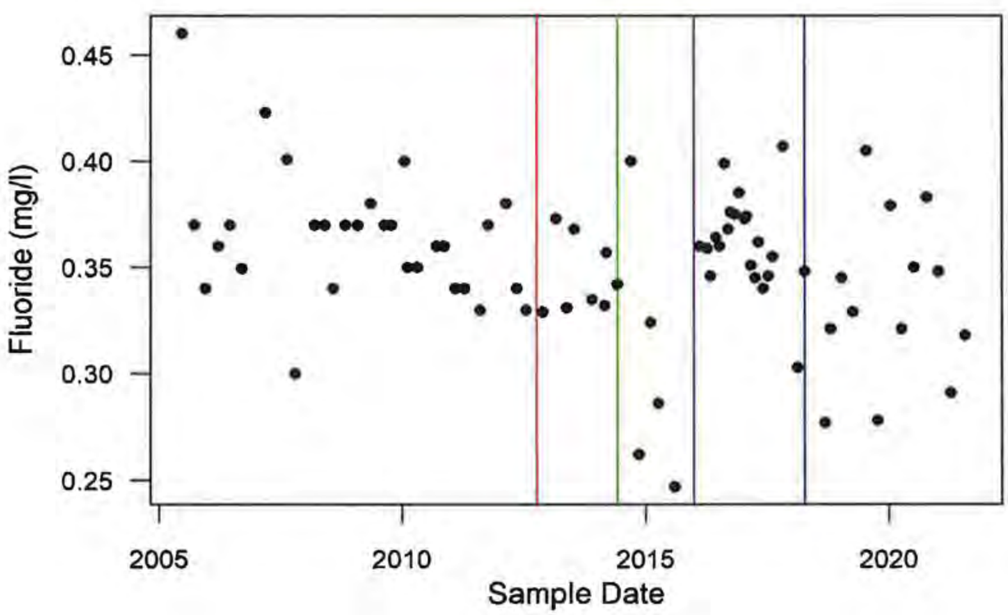


Appendix C-8: Time Series with Events

Chloride in MW-30



Fluoride in MW-30



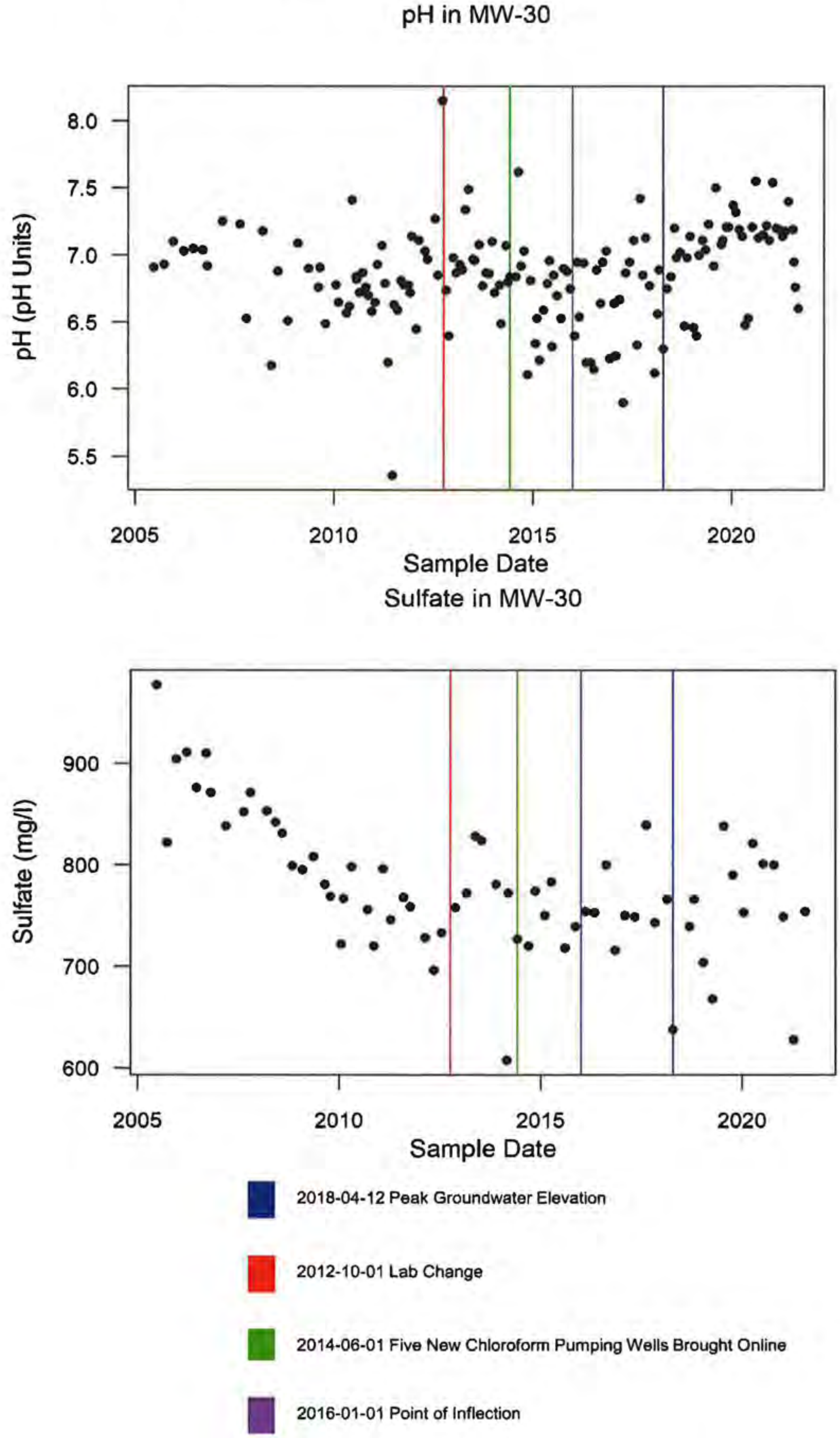
2018-04-12 Peak Groundwater Elevation

2012-10-01 Lab Change

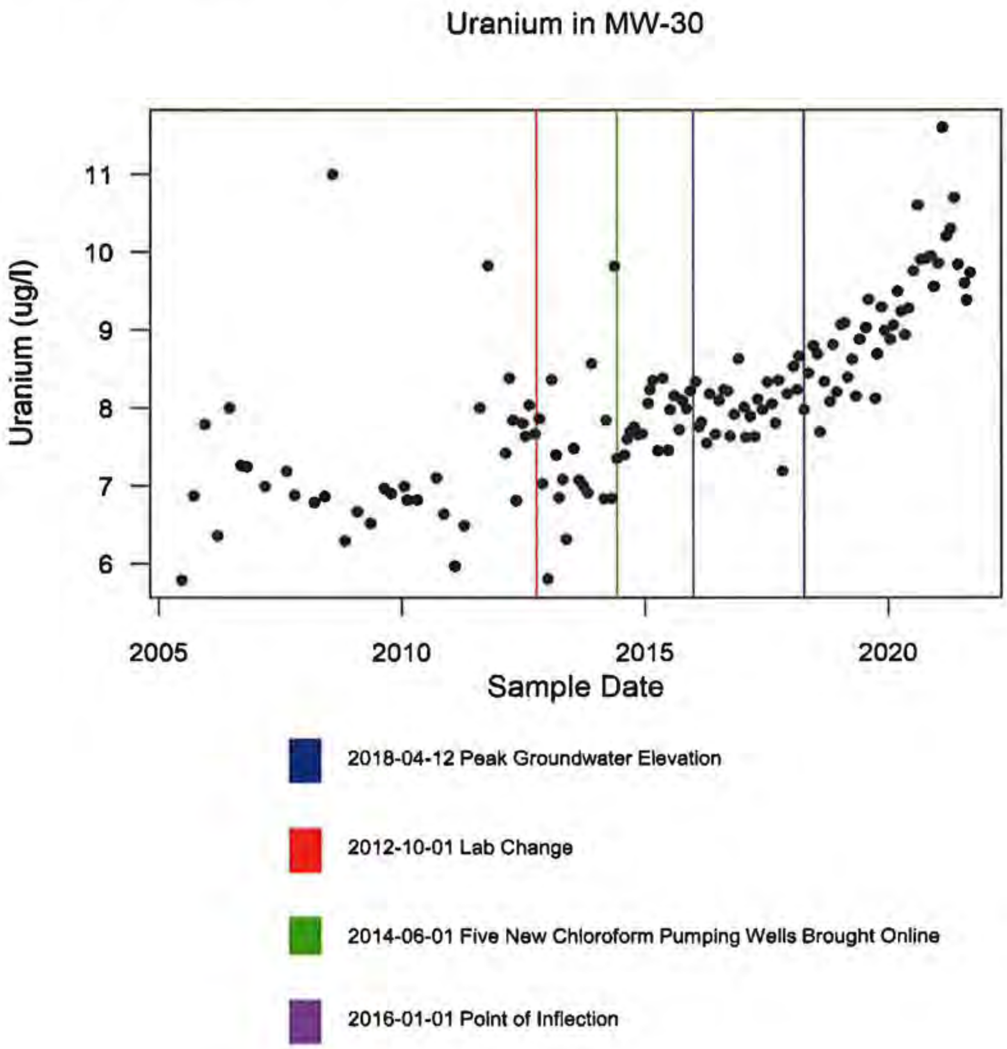
2014-06-01 Five New Chloroform Pumping Wells Brought Online

2016-01-01 Point of Inflection

Appendix C-8: Time Series with Events



Appendix C-8: Time Series with Events



APPENDIX D

Table D.1
Predicted MW-30 Concentrations Based on a Mass Balance Assuming a TMS Impact[1]

constituent	average constituent concentration in TMS	[2]predicted concentration in MW-30 assuming TMS impact	Q3, 2021 measured concentration in MW-30
chloride (mg/L)	28,359	4,943	183
fluoride (mg/L)	3,357	571	0.318
sulfate (mg/L)	184,267	31,951	754
uranium (ug/L)	401,320	68,232	9.7
selenium (ug/L)	9,490	1,663	60

[1] *assumes water level increase at MW-30 due to TMS impact*

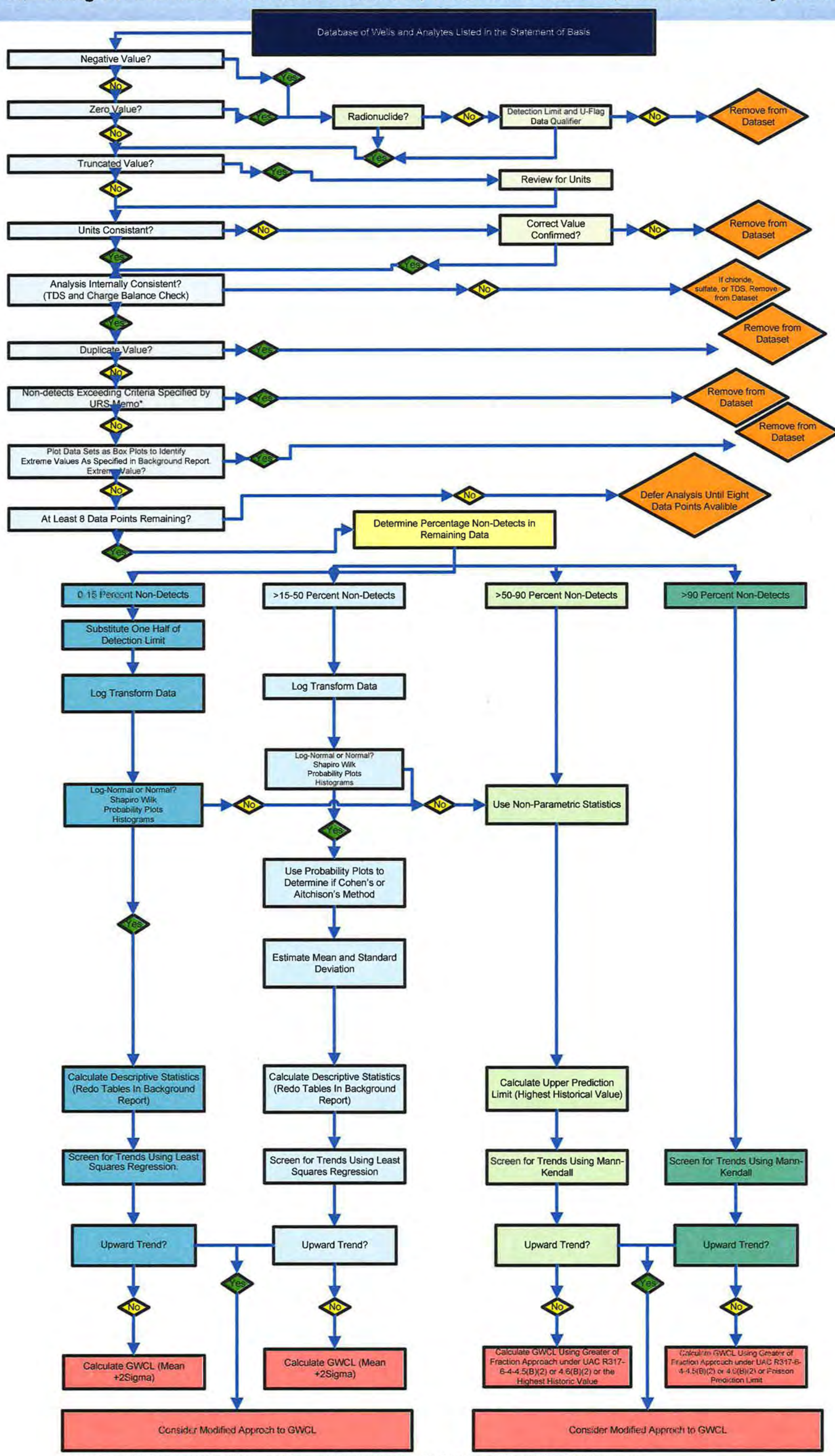
[2] *assumes conservative behavior (no sorption, hydrodynamic dispersion or degradation)*

mg/L = milligrams per liter

ug/L = micrograms per liter

APPENDIX E

Appendix E. Flowsheet
Groundwater Data Preparation and Statistical Process Flow for Calculating Groundwater Protection Standards, White Mesa Mill Site, San Juan County, Utah



*A non-detect considered "insensitive" will be the maximum reporting limit in a dataset and will exceed other non-detects by, for example, an order of magnitude (e.g., <10 versus <1.0 μg/L). In some cases, insensitive non-detects may also exceed detectable values in a dataset (e.g., <10 versus 3.5 μg/L).

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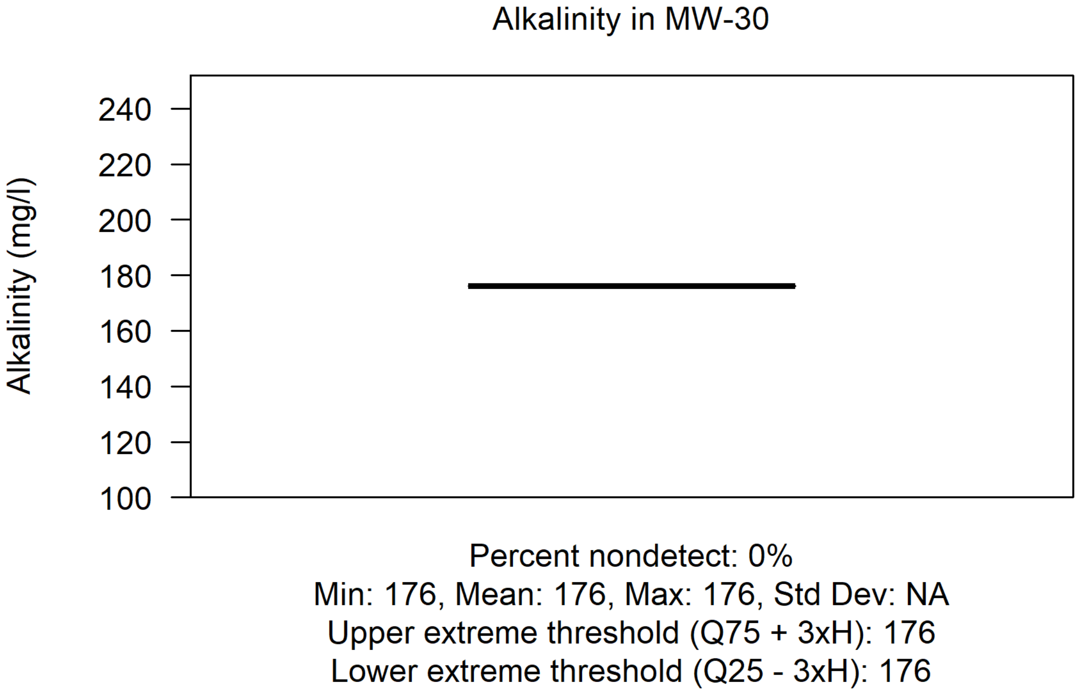
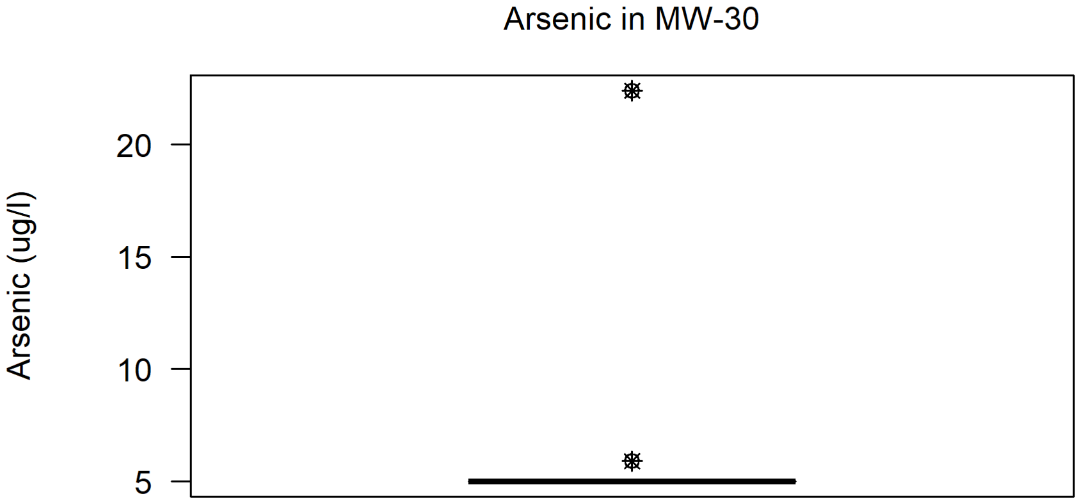
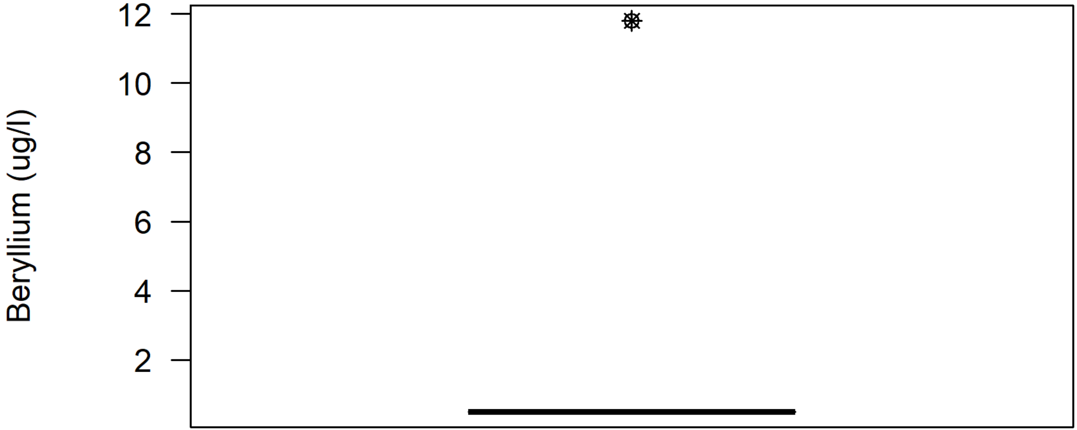
APPENDIX F
Input and Output Files (Electronic Only)


Alkalinity in MW-30
Alkalinity (mg/l)
240
220
200
180
160
140
120
100
Percent nondetect: 0%
Min: 176, Mean: 176, Max: 176, Std Dev: NA
Upper extreme threshold (Q75 + 3xH): 176
Lower extreme threshold (Q25 - 3xH): 176

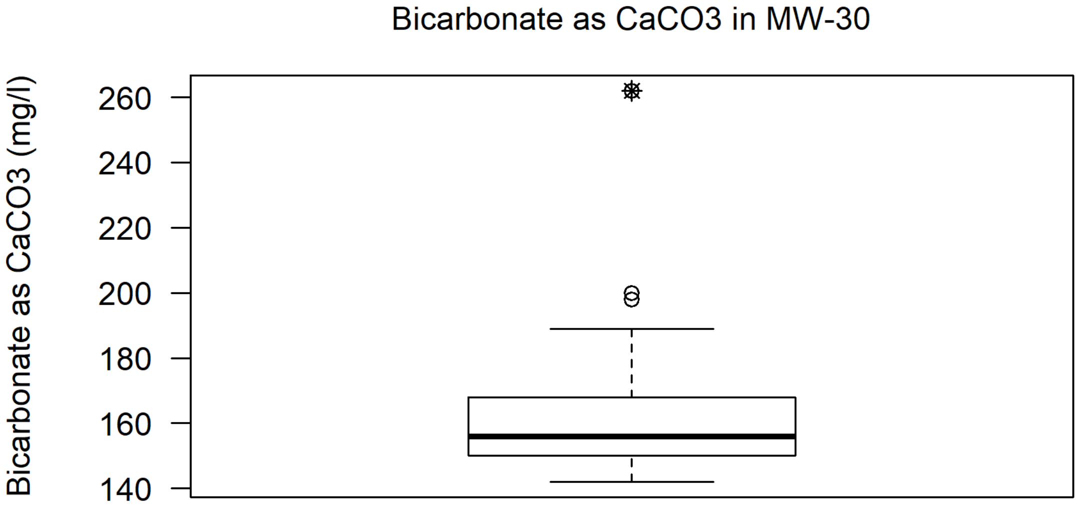


Percent nondetect: 97%
Min: 5, Mean: 5.28, Max: 22.4, Std Dev: 2.14
Upper extreme threshold (Q75 + 3xH): 5
Lower extreme threshold (Q25 - 3xH): 5

Beryllium in MW-30

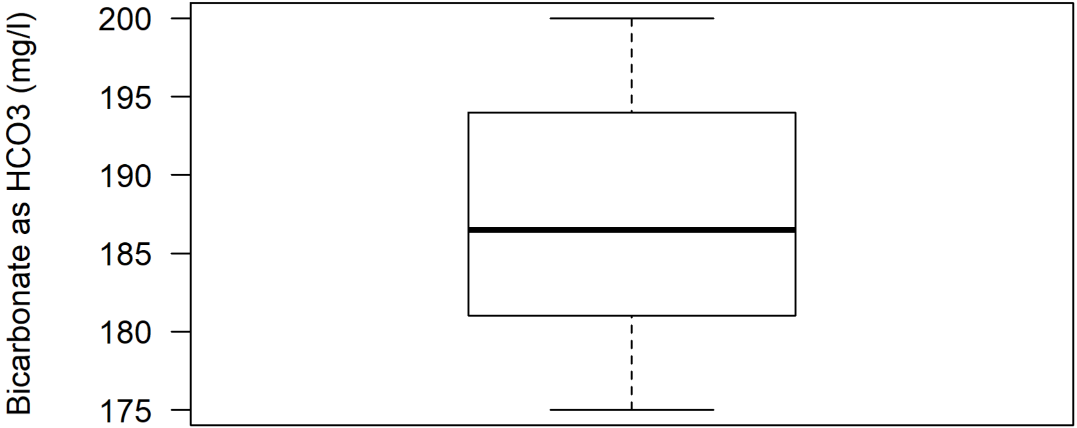


Percent nondetect: 98%
Min: 0.5, Mean: 0.67, Max: 11.8, Std Dev: 1.39
Upper extreme threshold (Q75 + 3xH): 0.5
Lower extreme threshold (Q25 - 3xH): 0.5



Percent nondetect: 0%
Min: 142, Mean: 162.53, Max: 262, Std Dev: 22.15
Upper extreme threshold (Q75 + 3xH): 218
Lower extreme threshold (Q25 - 3xH): 99

Bicarbonate as HCO3 in MW-30

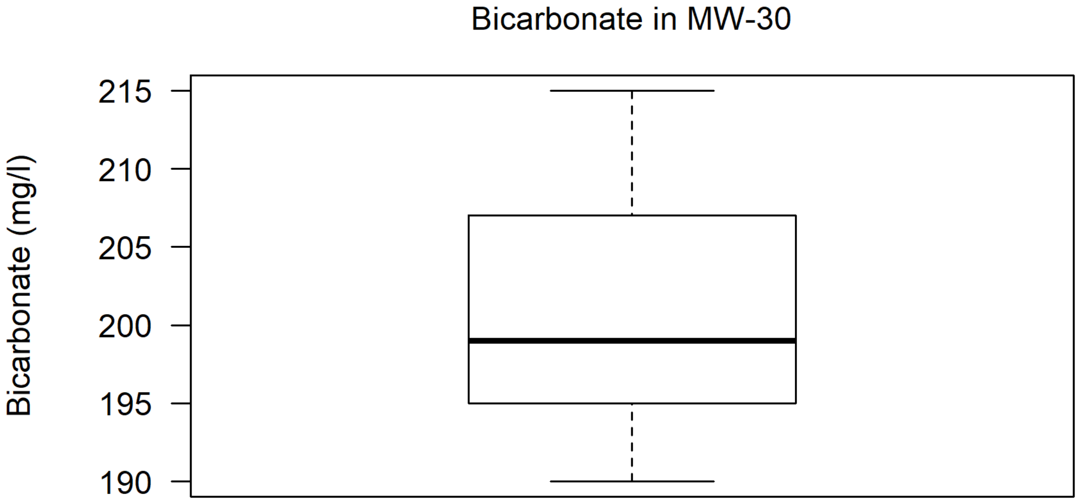


Percent nondetect: 0%

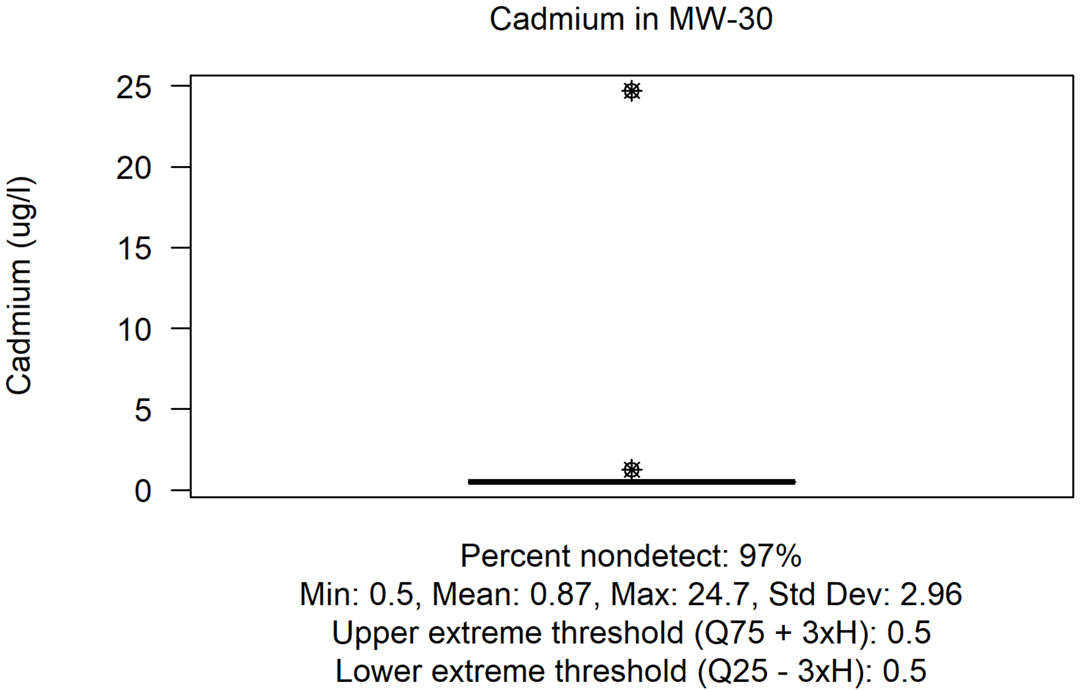
Min: 175, Mean: 187.35, Max: 200, Std Dev: 7.6

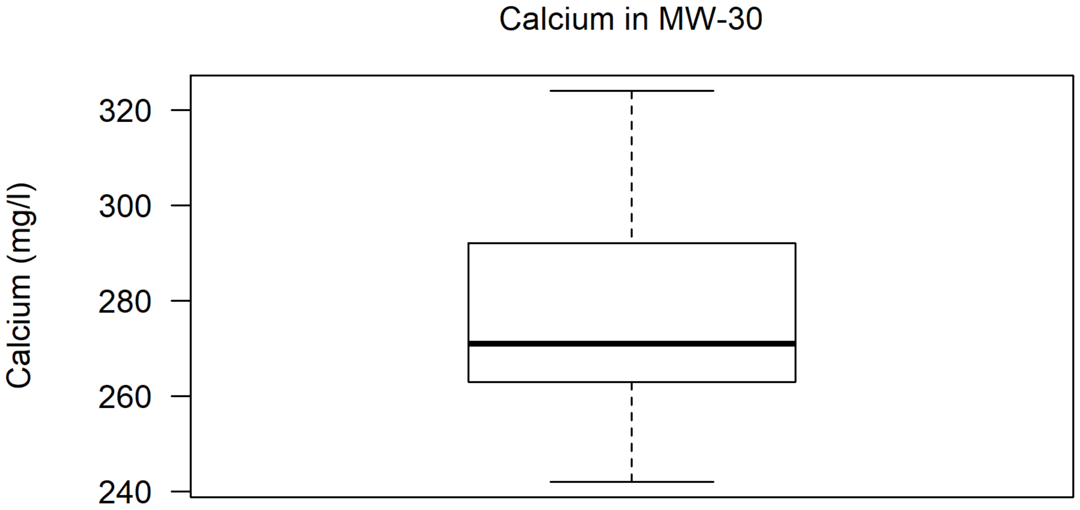
Upper extreme threshold (Q75 + 3xH): 227.5

Lower extreme threshold (Q25 - 3xH): 147

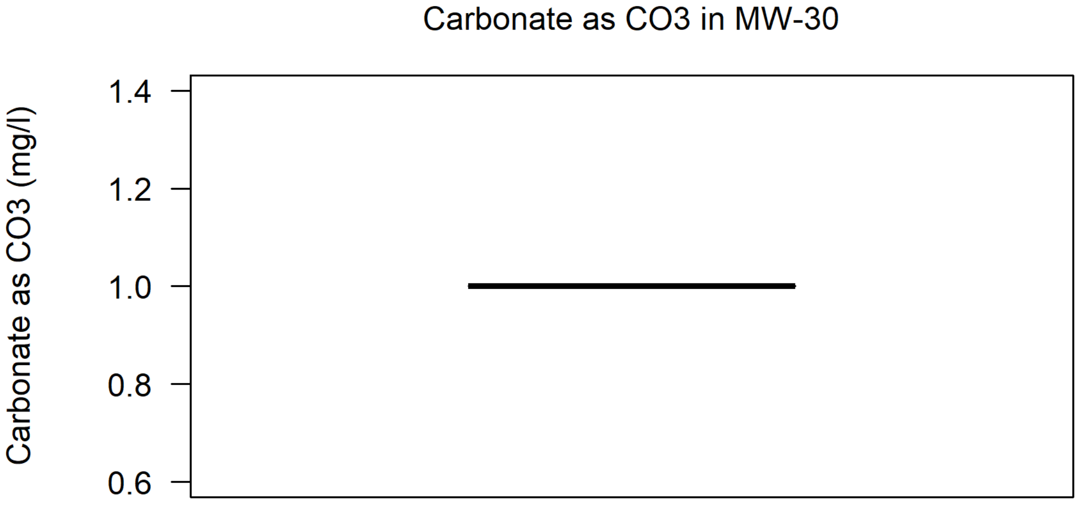


Percent nondetect: 0%
Min: 190, Mean: 200.5, Max: 215, Std Dev: 7.96
Upper extreme threshold (Q75 + 3xH): 239
Lower extreme threshold (Q25 - 3xH): 162

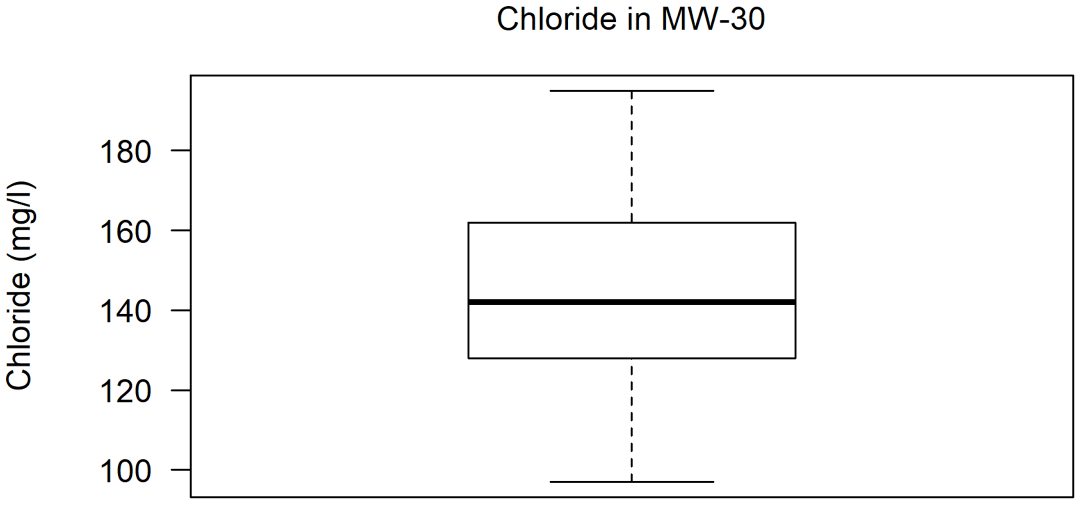

Cadmium in MW-30
Cadmium (ug/l)
25
20
15
10
5
0
Percent nondetect: 97%
Min: 0.5, Mean: 0.87, Max: 24.7, Std Dev: 2.96
Upper extreme threshold (Q75 + 3xH): 0.5
Lower extreme threshold (Q25 - 3xH): 0.5



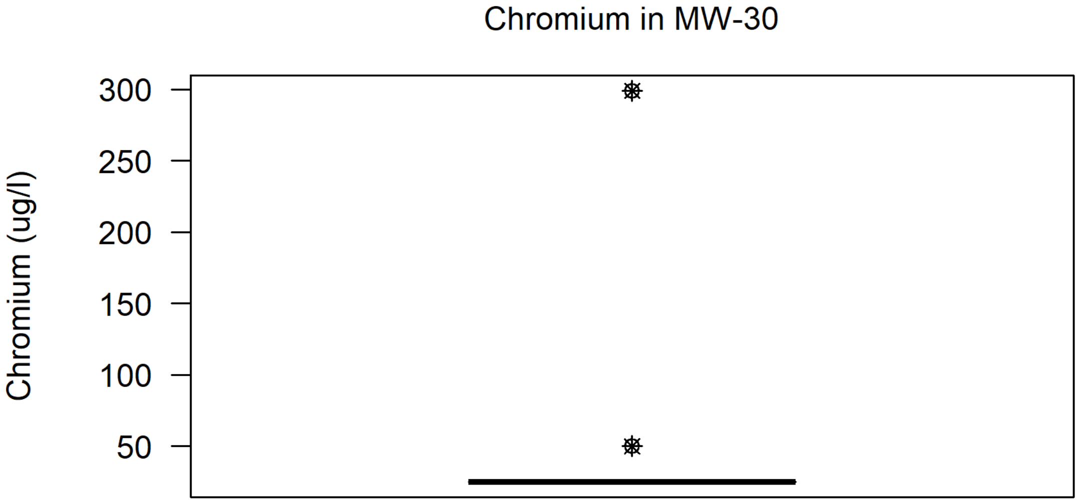
Percent nondetect: 0%
Min: 242, Mean: 275.98, Max: 324, Std Dev: 20.02
Upper extreme threshold (Q75 + 3xH): 375
Lower extreme threshold (Q25 - 3xH): 179



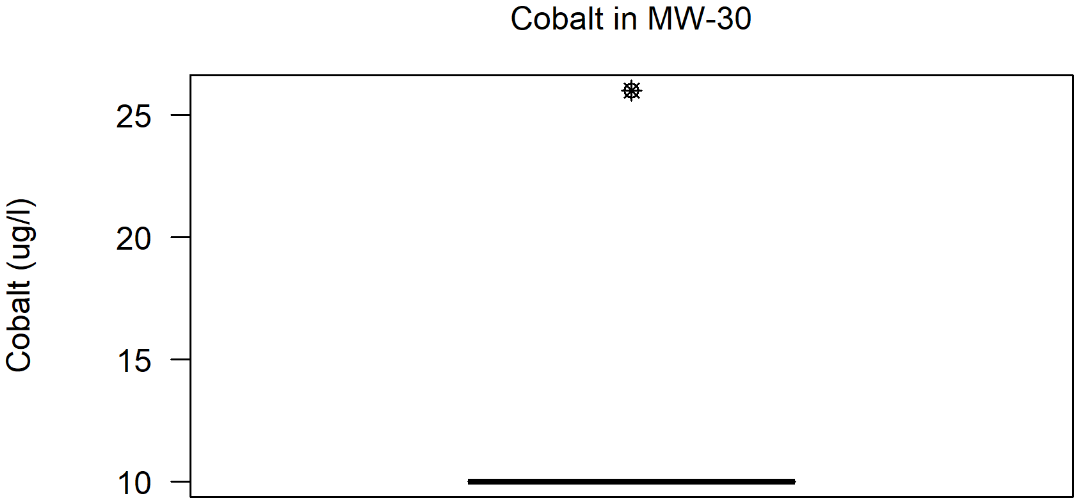
Percent nondetect: 100%
Min: 1, Mean: 1, Max: 1, Std Dev: 0
Upper extreme threshold (Q75 + 3xH): 1
Lower extreme threshold (Q25 - 3xH): 1



Percent nondetect: 0%
Min: 97, Mean: 145.95, Max: 195, Std Dev: 22.03
Upper extreme threshold (Q75 + 3xH): 264
Lower extreme threshold (Q25 - 3xH): 26

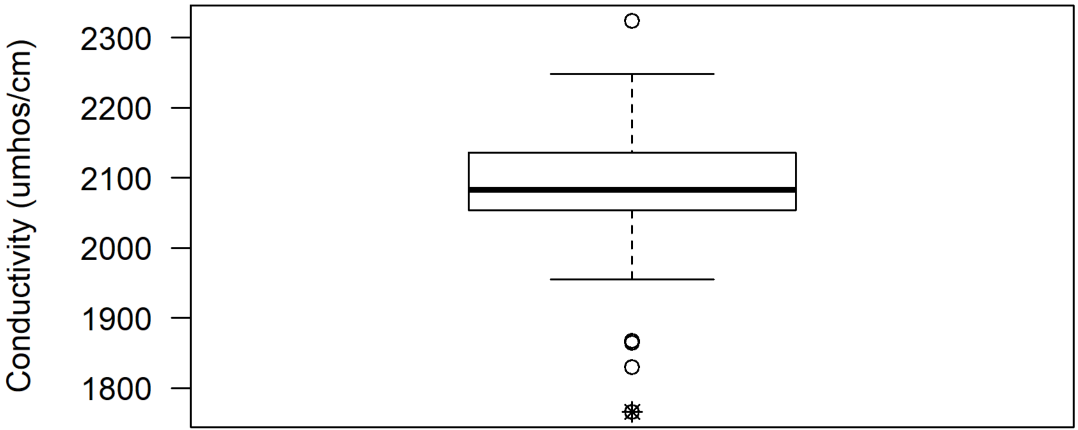


Percent nondetect: 98%
Min: 25, Mean: 29.53, Max: 299, Std Dev: 33.82
Upper extreme threshold (Q75 + 3xH): 25
Lower extreme threshold (Q25 - 3xH): 25

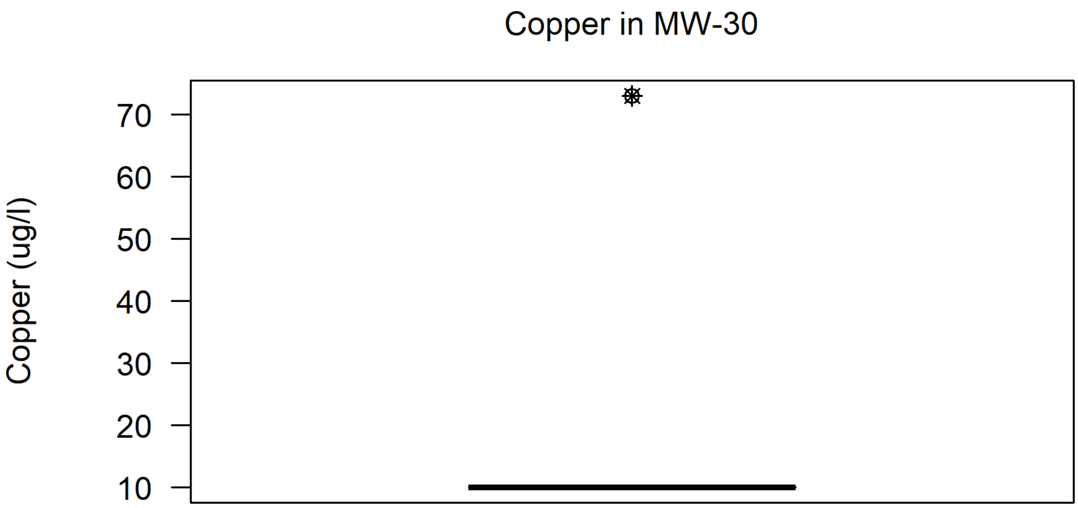


Percent nondetect: 98%
Min: 10, Mean: 10.24, Max: 26, Std Dev: 1.97
Upper extreme threshold (Q75 + 3xH): 10
Lower extreme threshold (Q25 - 3xH): 10

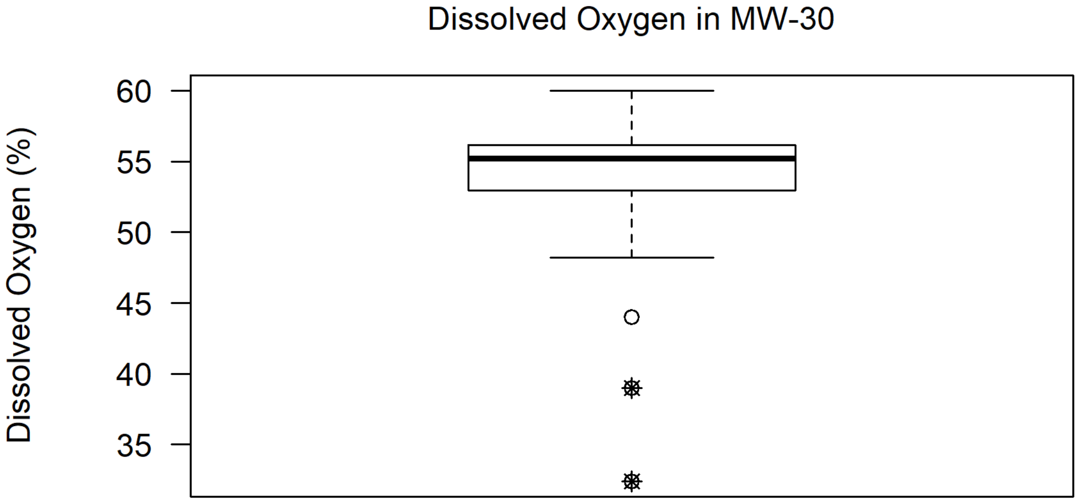
Conductivity in MW-30



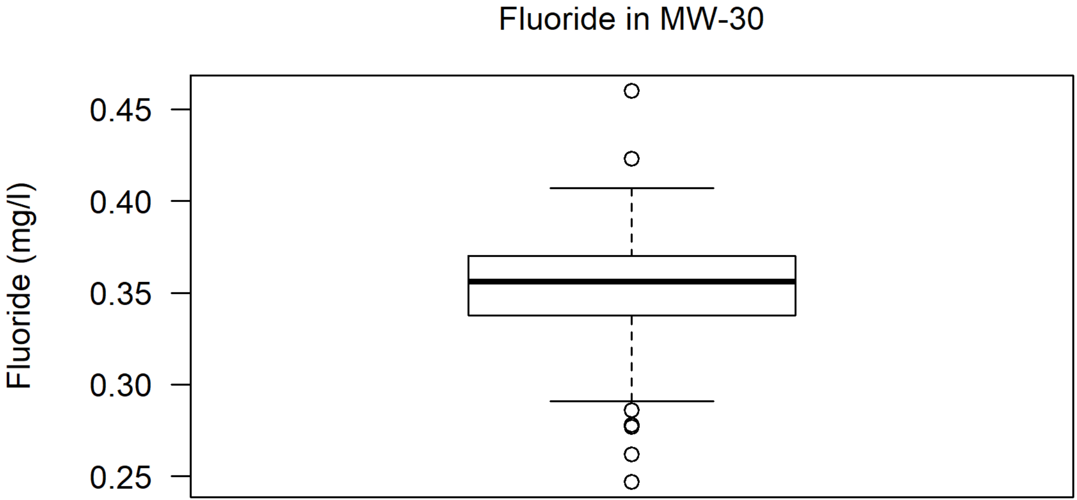
Percent nondetect: 0%
Min: 1766, Mean: 2091.95, Max: 2324, Std Dev: 70.93
Upper extreme threshold (Q75 + 3xH): 2382
Lower extreme threshold (Q25 - 3xH): 1808



Percent nondetect: 98%
Min: 10, Mean: 10.95, Max: 73, Std Dev: 7.75
Upper extreme threshold (Q75 + 3xH): 10
Lower extreme threshold (Q25 - 3xH): 10

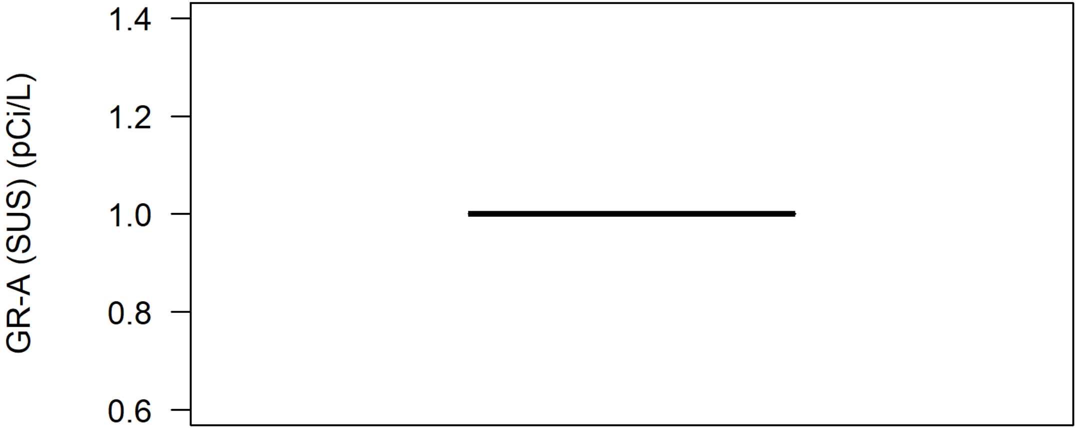


Percent nondetect: 0%
Min: 32.4, Mean: 53.36, Max: 60, Std Dev: 6
Upper extreme threshold (Q75 + 3xH): 65.575
Lower extreme threshold (Q25 - 3xH): 43.525

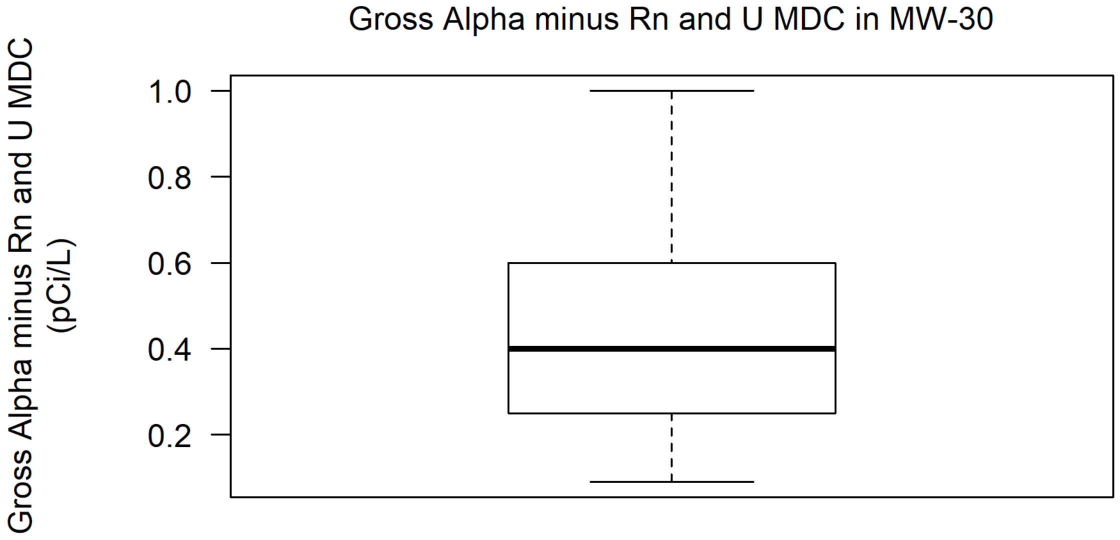


Percent nondetect: 0%
Min: 0.247, Mean: 0.35, Max: 0.46, Std Dev: 0.04
Upper extreme threshold (Q75 + 3xH): 0.46375
Lower extreme threshold (Q25 - 3xH): 0.245

GR-A (SUS) in MW-30

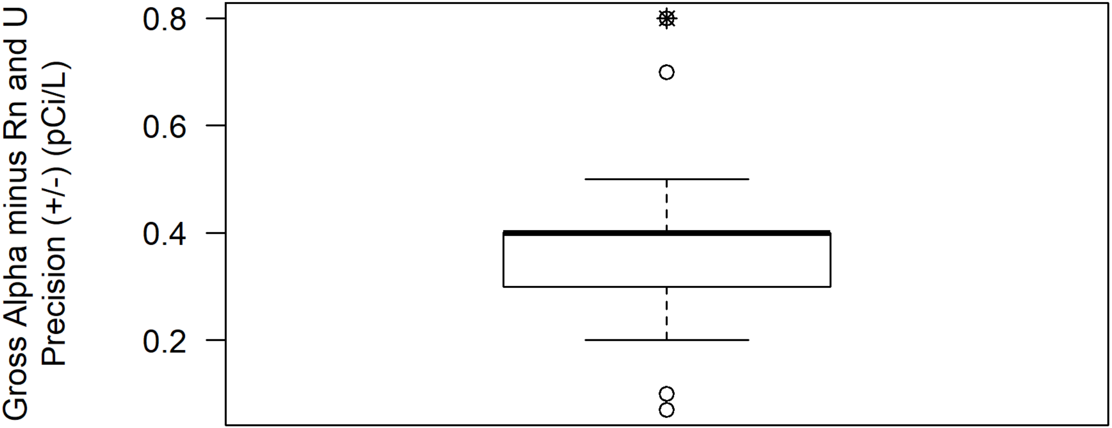


Percent nondetect: 0%
Min: 1, Mean: 1, Max: 1, Std Dev: NA
Upper extreme threshold (Q75 + 3xH): 1
Lower extreme threshold (Q25 - 3xH): 1



Percent nondetect: 0%
Min: 0.09, Mean: 0.47, Max: 1, Std Dev: 0.28
Upper extreme threshold (Q75 + 3xH): 1.65
Lower extreme threshold (Q25 - 3xH): -0.8

Gross Alpha minus Rn and U Precision (+/-) in MW-30

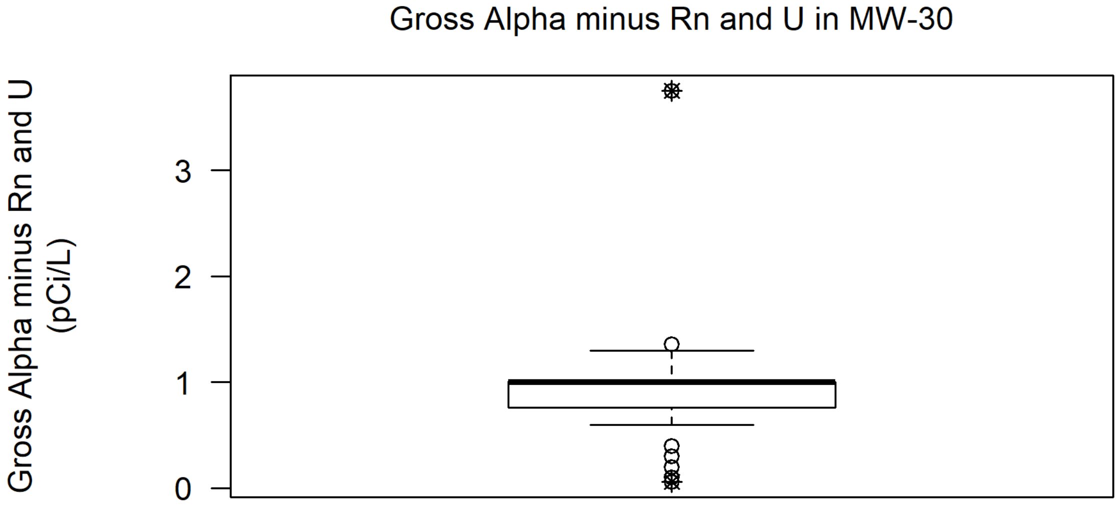


Percent nondetect: 0%

Min: 0.07, Mean: 0.37, Max: 0.8, Std Dev: 0.18

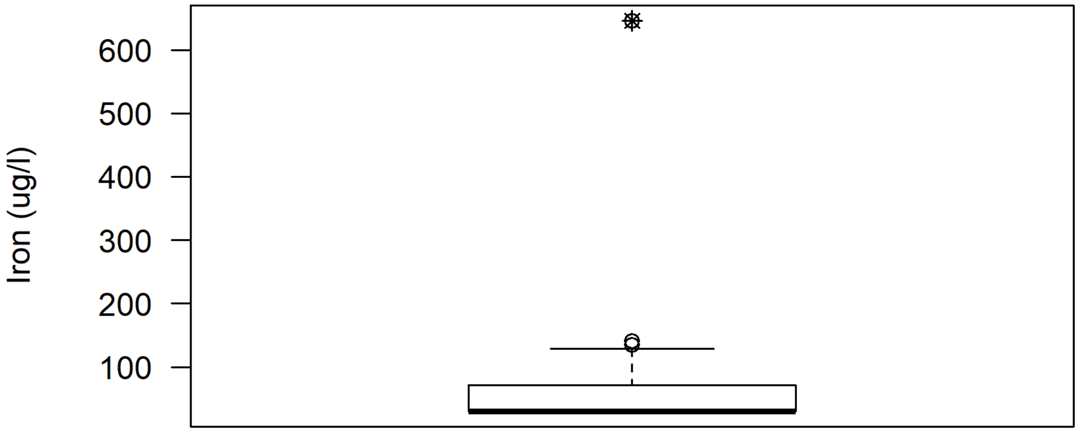
Upper extreme threshold (Q75 + 3xH): 0.7

Lower extreme threshold (Q25 - 3xH): -1.11022302462516e-16

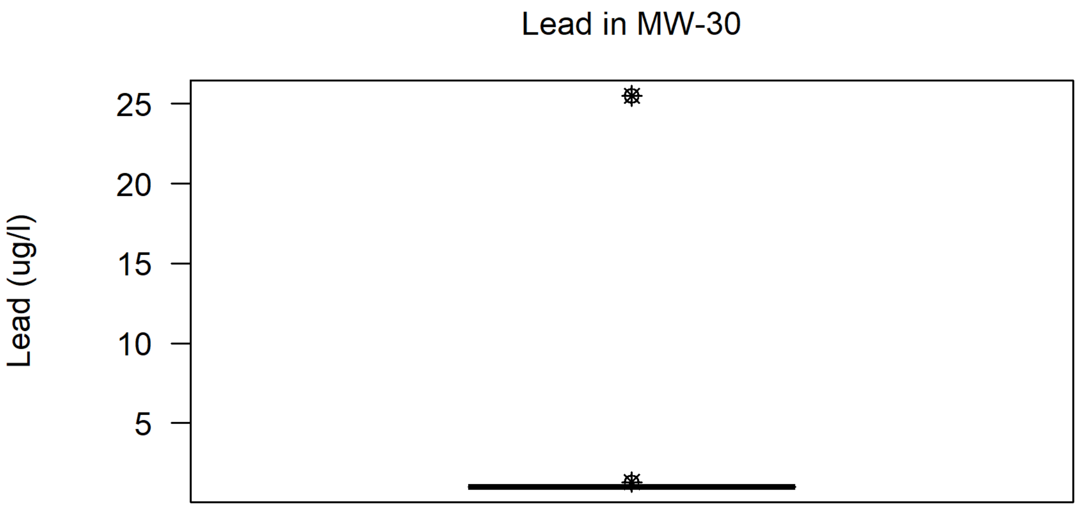


Percent nondetect: 61%
Min: 0.06, Mean: 0.92, Max: 3.75, Std Dev: 0.45
Upper extreme threshold (Q75 + 3xH): 1.68325
Lower extreme threshold (Q25 - 3xH): 0.0890000000000004

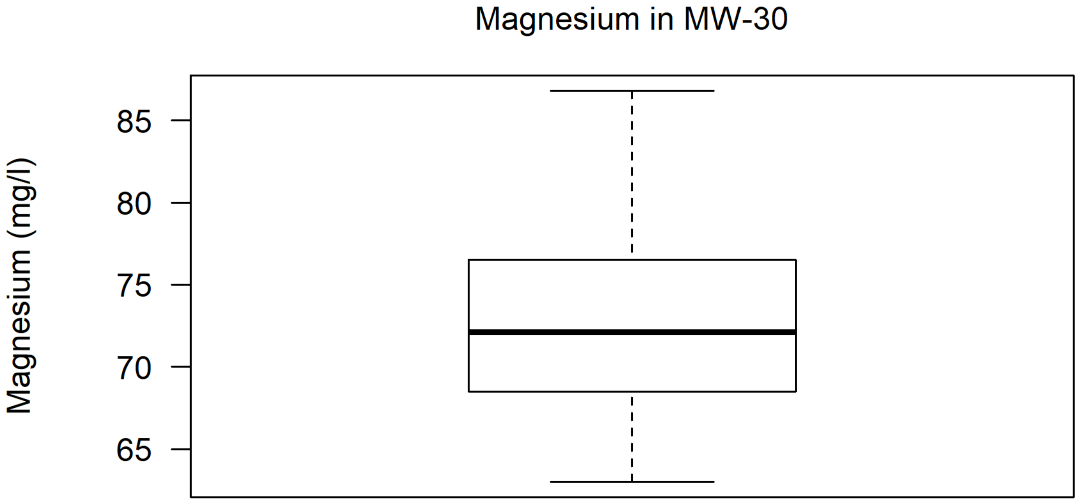
Iron in MW-30



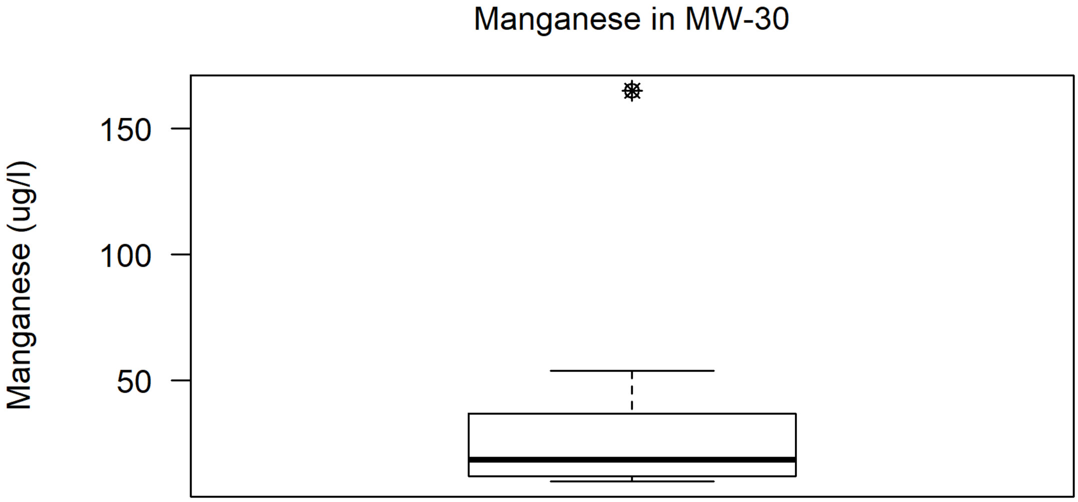
Percent nondetect: 54%
Min: 30, Mean: 62.67, Max: 646, Std Dev: 80.43
Upper extreme threshold (Q75 + 3xH): 196
Lower extreme threshold (Q25 - 3xH): -94.5



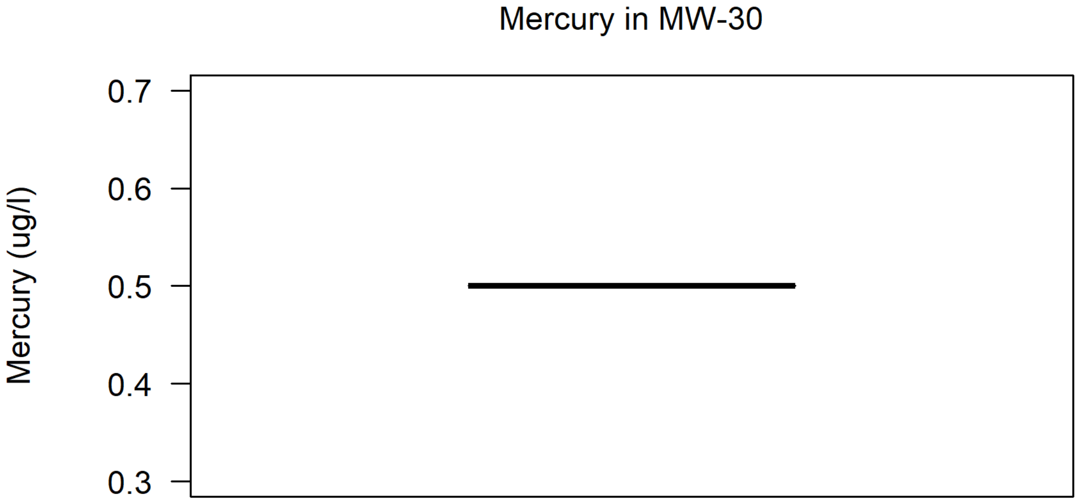
Percent nondetect: 97%
Min: 1, Mean: 1.38, Max: 25.5, Std Dev: 3.02
Upper extreme threshold (Q75 + 3xH): 1
Lower extreme threshold (Q25 - 3xH): 1



Percent nondetect: 0%
Min: 63, Mean: 72.83, Max: 86.8, Std Dev: 5.45
Upper extreme threshold (Q75 + 3xH): 99.7
Lower extreme threshold (Q25 - 3xH): 45.275



Percent nondetect: 12%
Min: 10, Mean: 26.34, Max: 165, Std Dev: 21.86
Upper extreme threshold (Q75 + 3xH): 112
Lower extreme threshold (Q25 - 3xH): -63

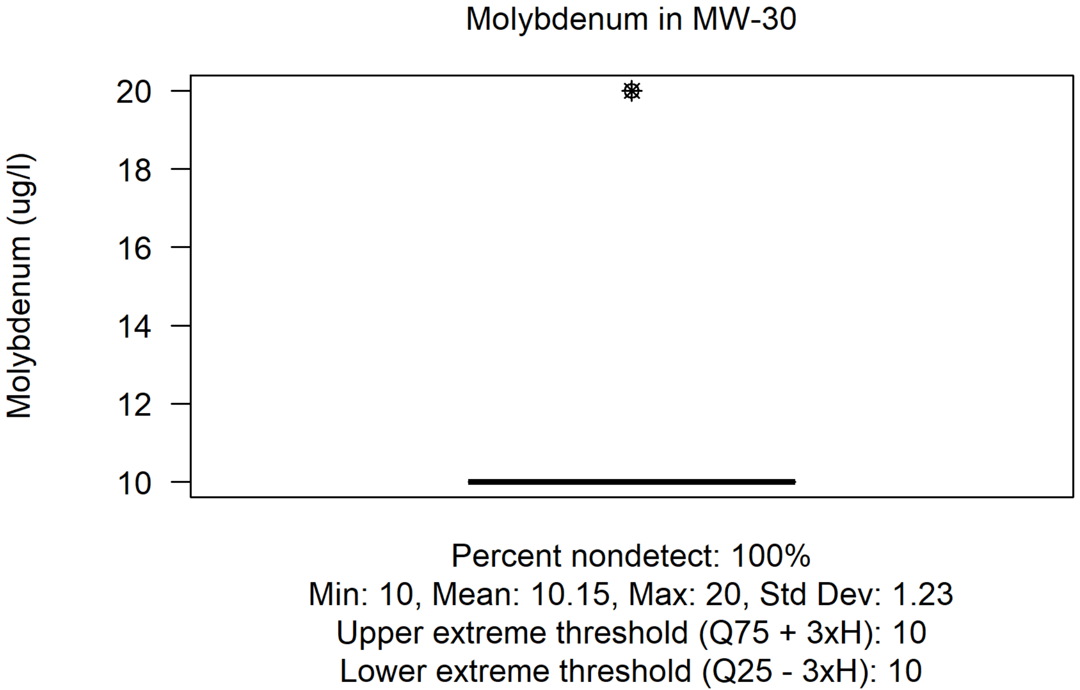


Percent nondetect: 100%

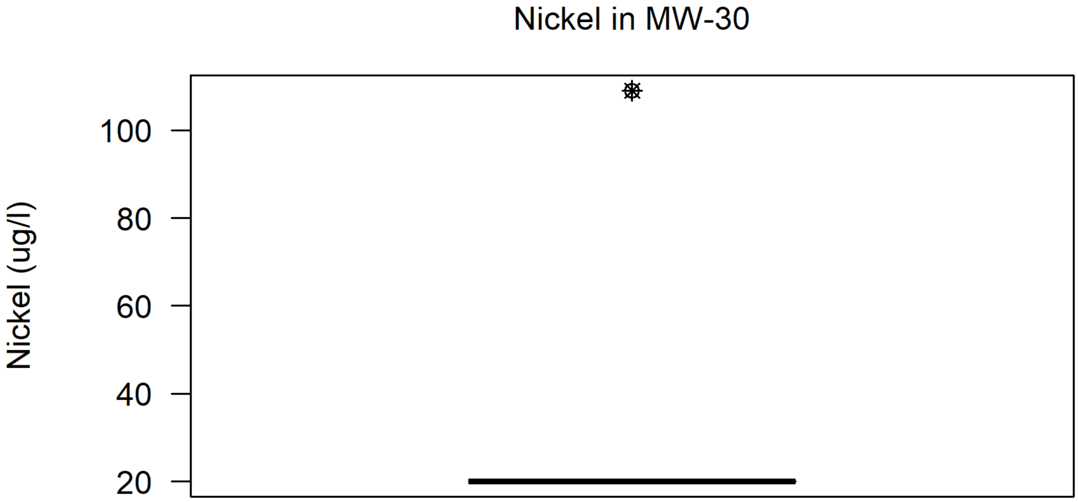
Min: 0.5, Mean: 0.5, Max: 0.5, Std Dev: 0

Upper extreme threshold (Q75 + 3xH): 0.5

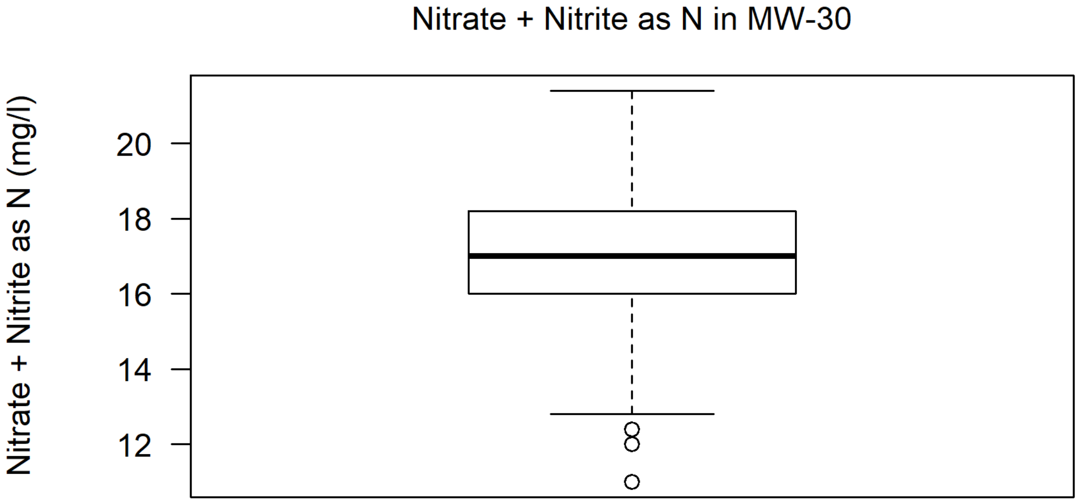
Lower extreme threshold (Q25 - 3xH): 0.5



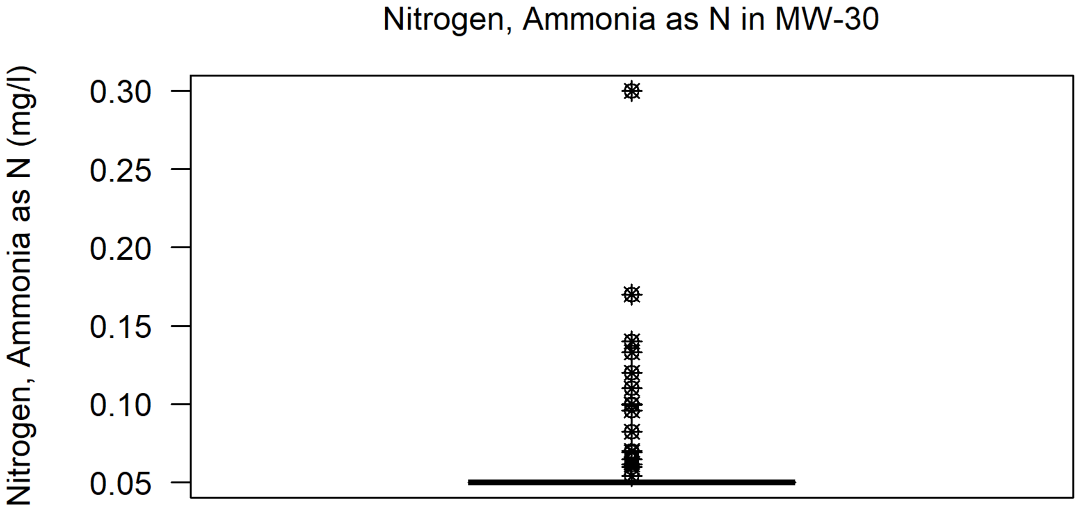
Molybdenum in MW-30
Molybdenum (ug/l)
20
18
16
14
12
10
Percent nondetect: 100%
Min: 10, Mean: 10.15, Max: 20, Std Dev: 1.23
Upper extreme threshold (Q75 + 3xH): 10
Lower extreme threshold (Q25 - 3xH): 10



Percent nondetect: 98%
Min: 20, Mean: 21.35, Max: 109, Std Dev: 10.96
Upper extreme threshold (Q75 + 3xH): 20
Lower extreme threshold (Q25 - 3xH): 20

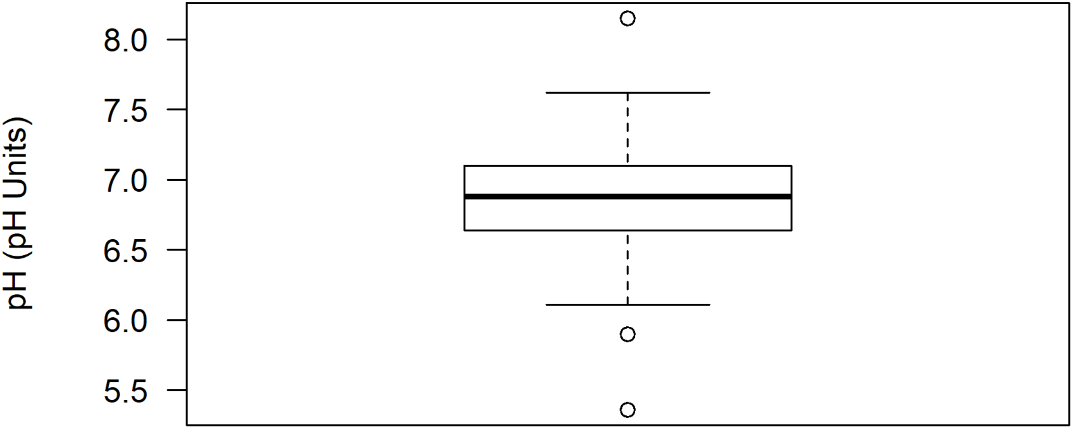


Percent nondetect: 0%
Min: 11, Mean: 16.95, Max: 21.4, Std Dev: 1.84
Upper extreme threshold (Q75 + 3xH): 24.8
Lower extreme threshold (Q25 - 3xH): 9.4

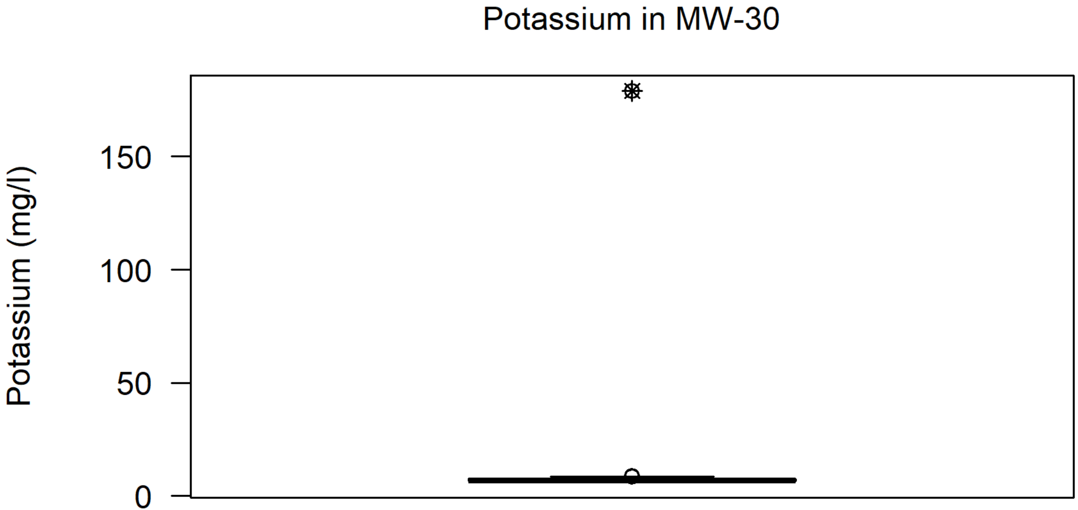


Percent nondetect: 74%
Min: 0.05, Mean: 0.06, Max: 0.3, Std Dev: 0.04
Upper extreme threshold (Q75 + 3xH): 0.05
Lower extreme threshold (Q25 - 3xH): 0.05

pH in MW-30



Percent nondetect: 0%
Min: 5.36, Mean: 6.85, Max: 8.15, Std Dev: 0.36
Upper extreme threshold (Q75 + 3xH): 8.4625
Lower extreme threshold (Q25 - 3xH): 5.2775

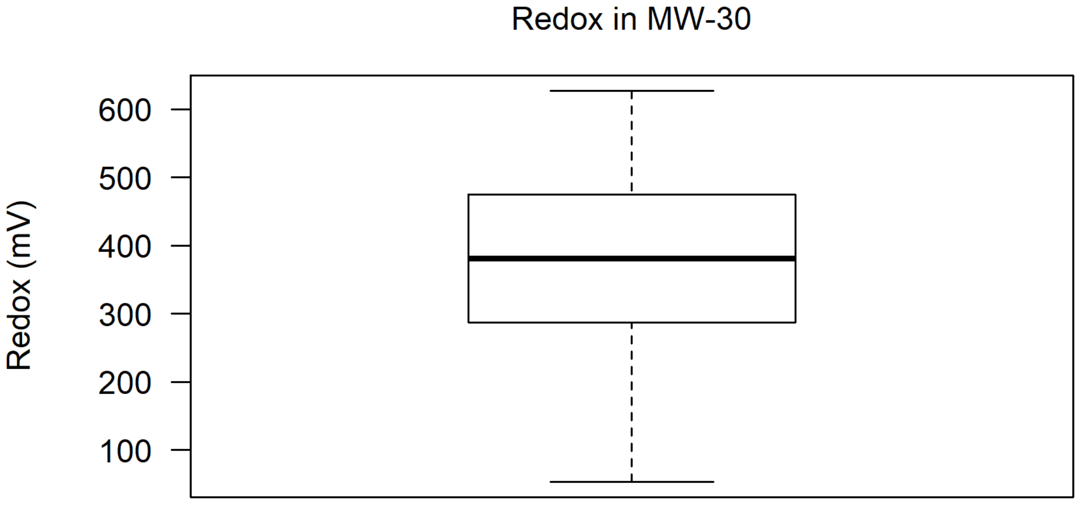


Percent nondetect: 0%

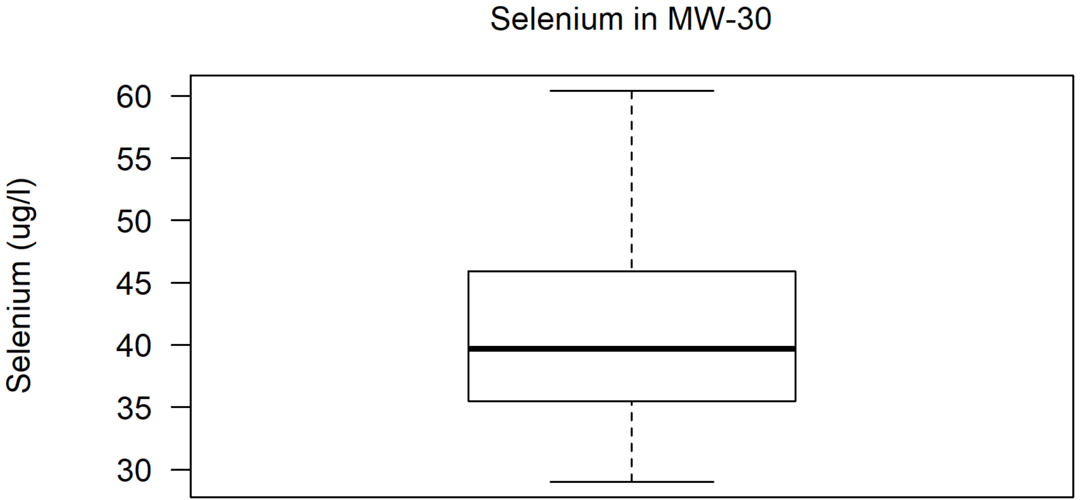
Min: 6.01, Mean: 9.63, Max: 179, Std Dev: 21.18

Upper extreme threshold (Q75 + 3xH): 9.9525

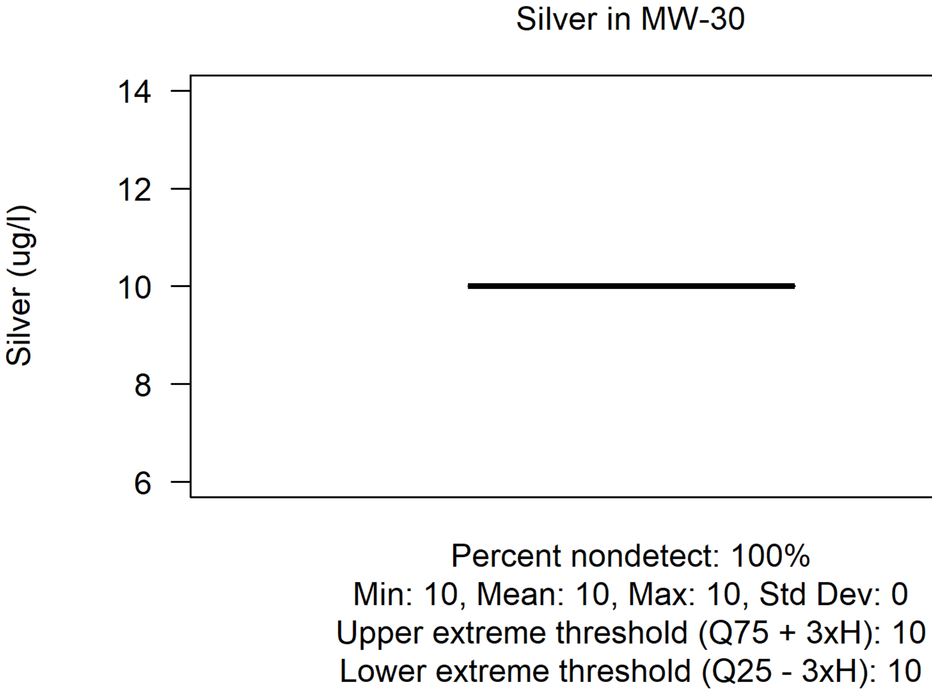
Lower extreme threshold (Q25 - 3xH): 3.9675

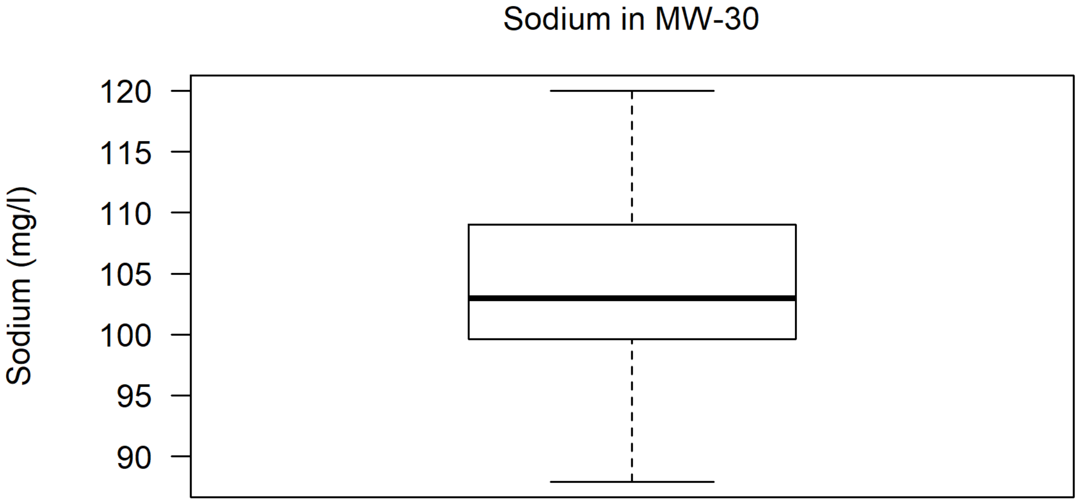


Percent nondetect: 0%
Min: 53, Mean: 377.02, Max: 627, Std Dev: 109.3
Upper extreme threshold (Q75 + 3xH): 1038.5
Lower extreme threshold (Q25 - 3xH): -277.5

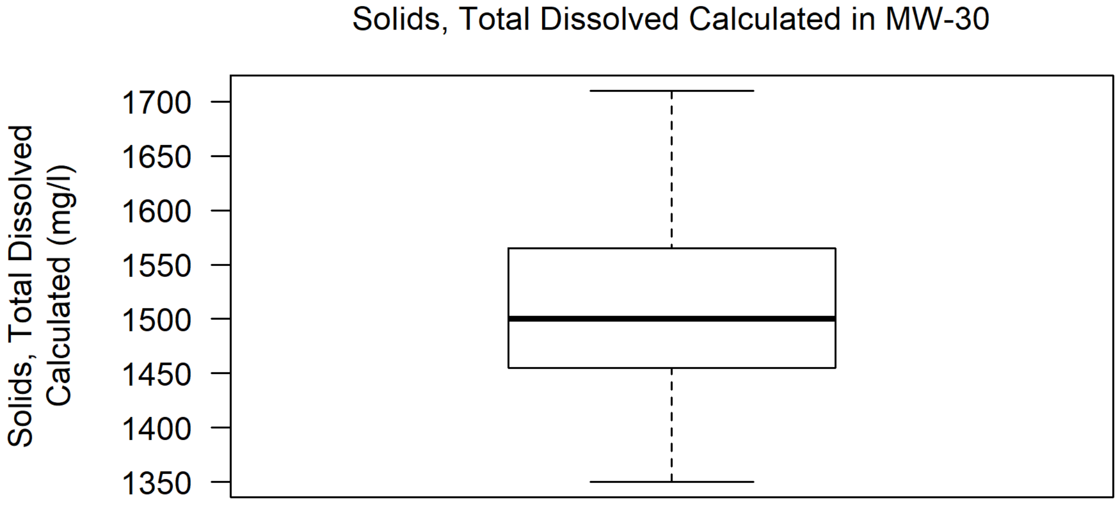


Percent nondetect: 0%
Min: 29, Mean: 41.22, Max: 60.4, Std Dev: 7.77
Upper extreme threshold (Q75 + 3xH): 77.1
Lower extreme threshold (Q25 - 3xH): 4.29999999999998

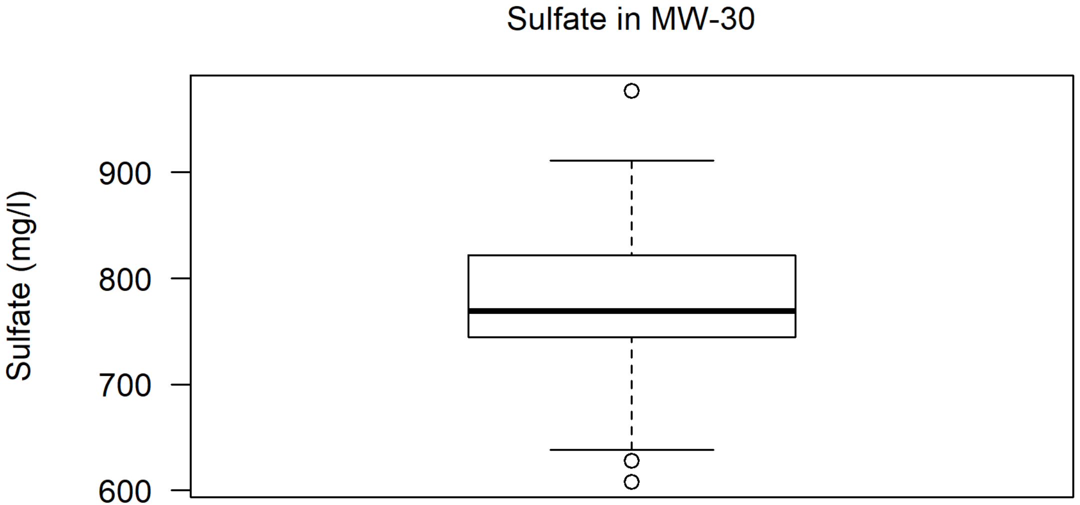

Silver in MW-30
Silver (ug/l)
14
12
10
8
6
Percent nondetect: 100%
Min: 10, Mean: 10, Max: 10, Std Dev: 0
Upper extreme threshold (Q75 + 3xH): 10
Lower extreme threshold (Q25 - 3xH): 10



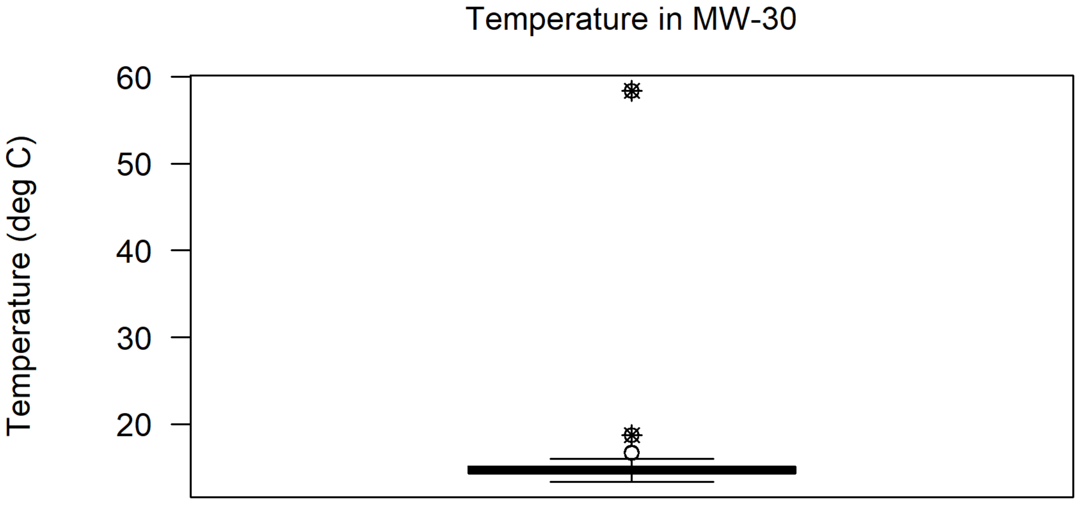
Percent nondetect: 0%
Min: 87.9, Mean: 103.79, Max: 120, Std Dev: 6.39
Upper extreme threshold (Q75 + 3xH): 137.125
Lower extreme threshold (Q25 - 3xH): 71.4999999999999



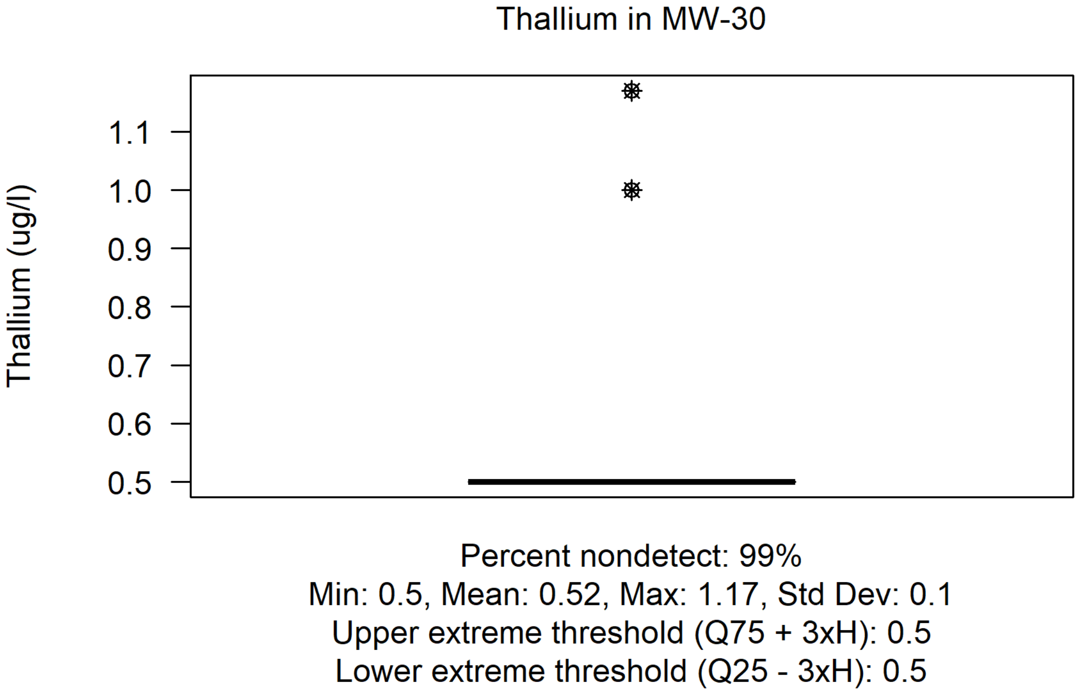
Percent nondetect: 0%
Min: 1350, Mean: 1510.18, Max: 1710, Std Dev: 80.5
Upper extreme threshold (Q75 + 3xH): 1895
Lower extreme threshold (Q25 - 3xH): 1125

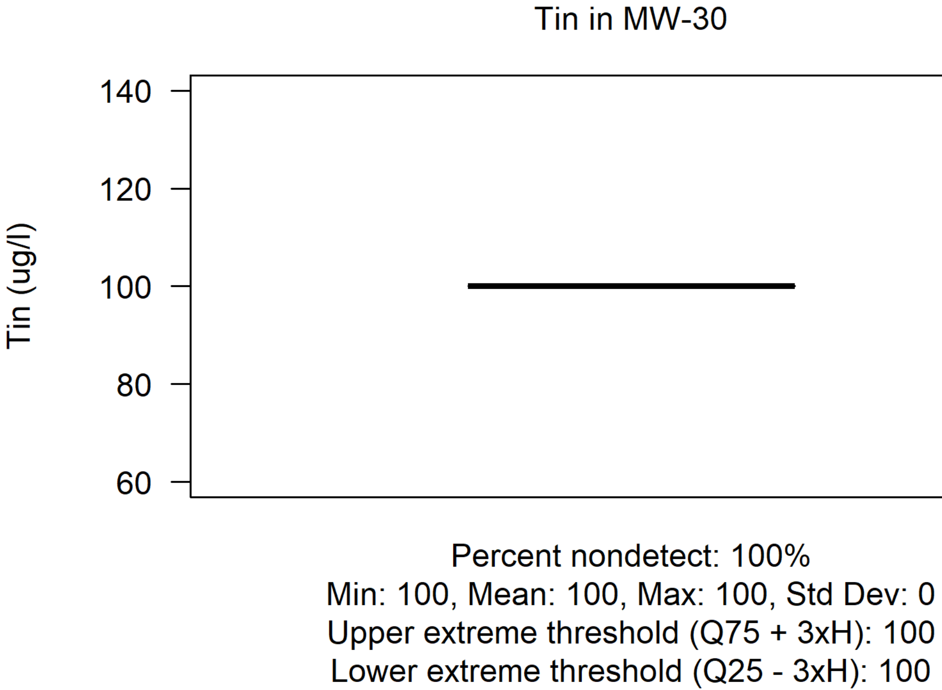


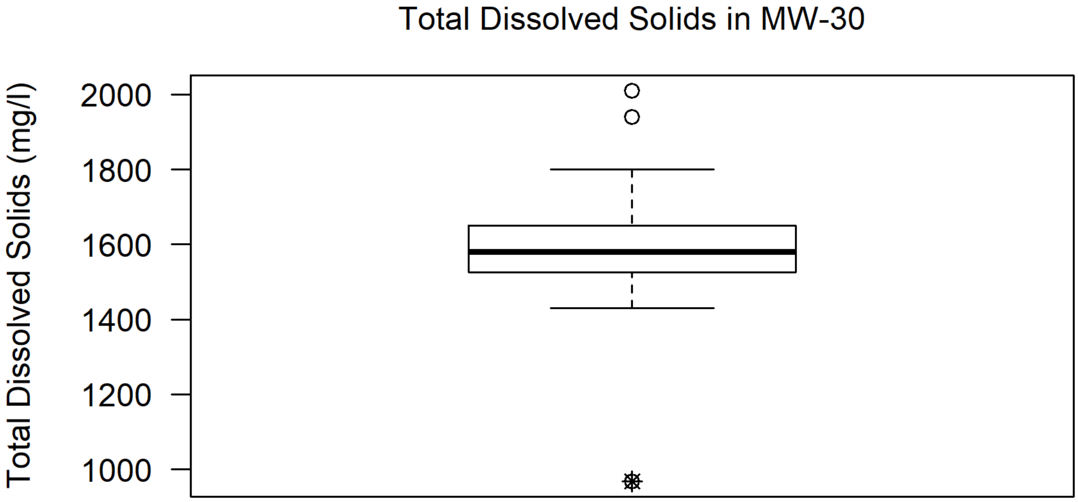
Percent nondetect: 0%
Min: 608, Mean: 778.69, Max: 977, Std Dev: 66.45
Upper extreme threshold (Q75 + 3xH): 1052.5
Lower extreme threshold (Q25 - 3xH): 513.5



Percent nondetect: 0%
Min: 13.34, Mean: 15, Max: 58.4, Std Dev: 3.49
Upper extreme threshold (Q75 + 3xH): 17.3275
Lower extreme threshold (Q25 - 3xH): 12.0775


Thallium in MW-30
Thallium (ug/l)
1.1
1.0
0.9
0.8
0.7
0.6
0.5
Percent nondetect: 99%
Min: 0.5, Mean: 0.52, Max: 1.17, Std Dev: 0.1
Upper extreme threshold (Q75 + 3xH): 0.5
Lower extreme threshold (Q25 - 3xH): 0.5


Tin in MW-30
Tin (ug/l)
140
120
100
80
60
Percent nondetect: 100%
Min: 100, Mean: 100, Max: 100, Std Dev: 0
Upper extreme threshold (Q75 + 3xH): 100
Lower extreme threshold (Q25 - 3xH): 100

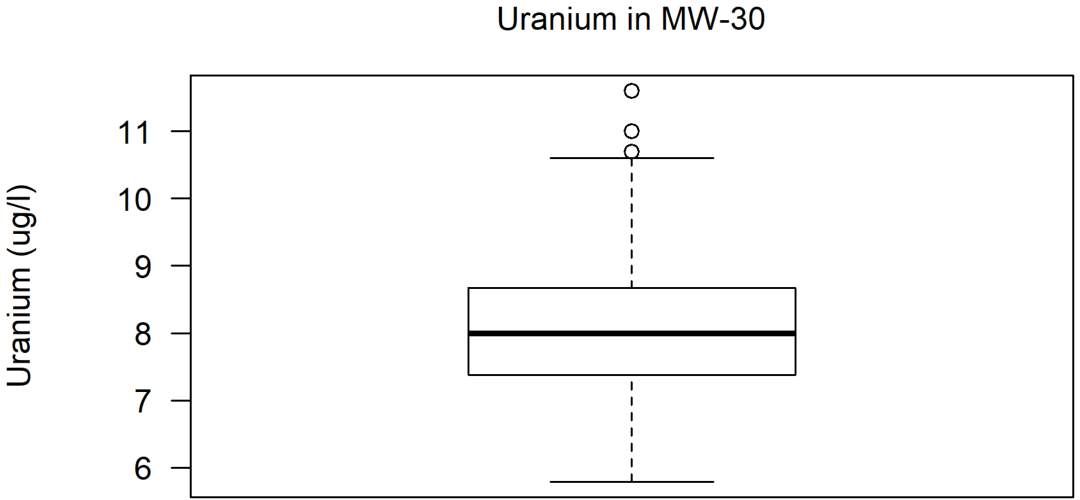


Percent nondetect: 0%

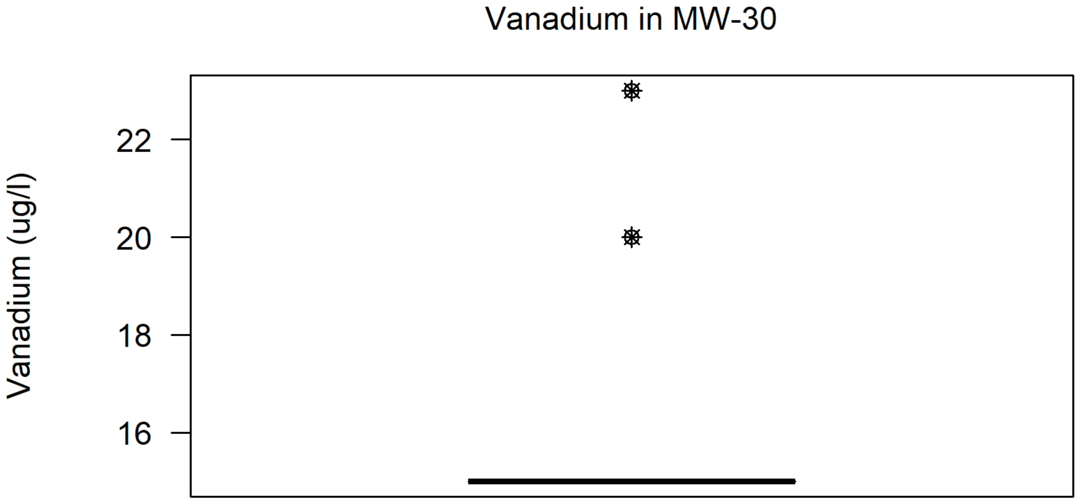
Min: 968, Mean: 1591.31, Max: 2010, Std Dev: 131.34

Upper extreme threshold (Q75 + 3xH): 2025

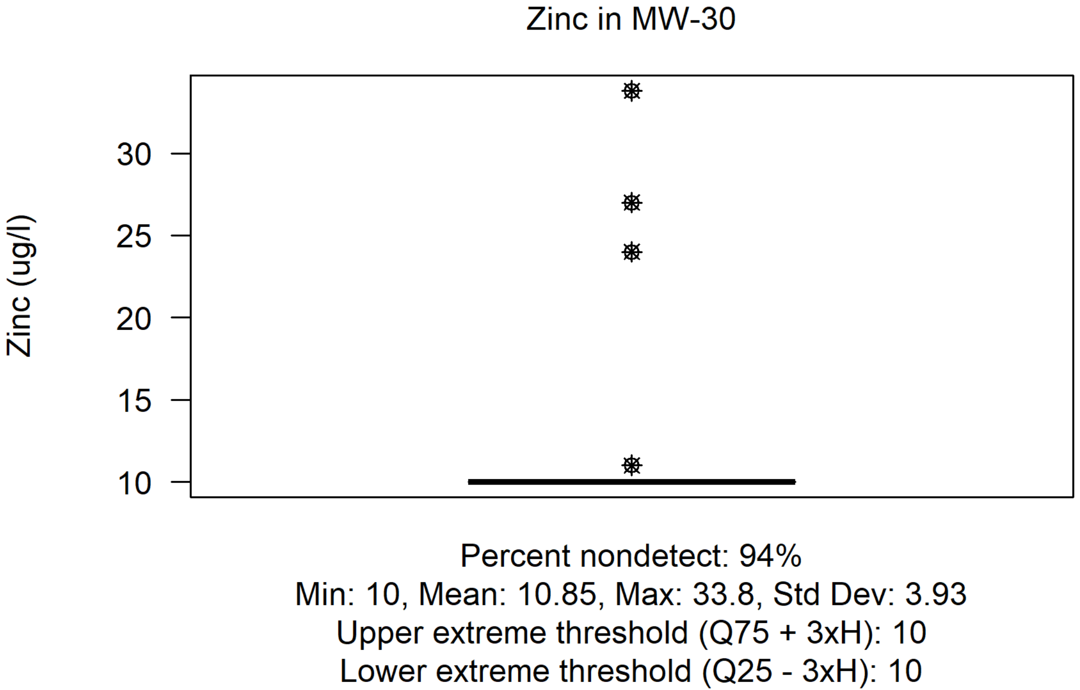
Lower extreme threshold (Q25 - 3xH): 1150



Percent nondetect: 0%
Min: 5.79, Mean: 8.09, Max: 11.6, Std Dev: 1.09
Upper extreme threshold (Q75 + 3xH): 12.5075
Lower extreme threshold (Q25 - 3xH): 3.5475



Percent nondetect: 98%
Min: 15, Mean: 15.2, Max: 23, Std Dev: 1.15
Upper extreme threshold (Q75 + 3xH): 15
Lower extreme threshold (Q25 - 3xH): 15



Zinc in MW-30
Zinc (ug/l)
30
25
20
15
10
Percent nondetect: 94%
Min: 10, Mean: 10.85, Max: 33.8, Std Dev: 3.93
Upper extreme threshold (Q75 + 3xH): 10
Lower extreme threshold (Q25 - 3xH): 10

MOST OF "APPENDIX F"

IS

Non-uploadable

CD

associated with this

document.

Please see the facility

file for the CD.