Div of Waste Management
and Radiation Control

APR 30 2021

ENERGY FUELS

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DRC-2021-006041

April 29, 2021

Sent VIA E-MAIL AND OVERNIGHT DELIVERY

Ms. Jalynn Knudsen
Interim Director
Division of Waste Management and Radiation Control
Utah Department of Environmental Quality
195 North 1950 West
Salt Lake City, UT 84116

Re: Transmittal of Source Assessment Report for MW-31 White Mesa Mill Groundwater Discharge Permit UGW370004

Dear Ms. Knudsen

Enclosed are two copies of Energy Fuels Resource (USA) Inc.'s ("EFRI's") Source Assessment Report ("SAR") for MW-31 at the White Mesa Mill. This SAR addresses the constituents that were identified as exceeding the GWCL in the 3rd Quarter 2020 as described in the Division of Waste Management and Radiation Control ("DWMRC")-approved Q3 2020 Plan and Time Schedule. EFRI submitted the Plan and Time Schedule for MW-31 on November 18, 2020. DWMRC approval of the Plan and Time Schedule was received by EFRI on February 1, 2021.

Each hardcopy report contains a CDs with 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: David Frydenlund
Garrin Palmer
Terry Slade
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-31 in the Third Quarter of 2020

Prepared by:

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

April 29, 2021

EXECUTIVE SUMMARY

This Source Assessment Report ("SAR") is an assessment of uranium in monitoring well MW-31 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 occurs naturally at the Mill (INTERA, 2008) and has exhibited exceedances of the applicable Groundwater Compliance Limits ("GWCLs") in MW-31 and other wells, both upgradient and downgradient of Mill facilities due to natural background and site-wide influences.

MW-31 has been included in multiple recent investigations and reports, including the New Wells Background Report (INTERA, 2008), an isotopic investigation (Hurst and Solomon, 2008), and five SAR reports (INTERA, 2012a, 2013, 2015, 2017, 2020). Sulfate and total dissolved solids ("TDS") in MW-31 were most recently assessed and included in the 2020 SAR. The 2020 SAR concluded that increasing concentrations of sulfate and TDS could be attributed to natural background and site-wide influences (oxidation of pyrite and decreasing pH) or to impacts at the Mill site that are already being addressed with an existing corrective action (nitrate/chloride plume capture). In a letter dated August 6, 2020, the State of Utah Division of Waste Management and Radiation Control ("DWMRC") stated, "it appears that Mill activities are not influencing SAR studied concentrations at monitoring well MW-31." The 2020 SAR and the associated modified GWCLs, as presented in the August 6, 2020 letter from DWMRC, were approved.

Increasing trends in concentrations have continued in groundwater at MW-31, prompting additional exceedances and out-of-compliance ("OOC") status and resulting in the need for this SAR. Because groundwater in MW-31 was recently evaluated, this SAR focuses on updated statistical analysis using newly available data since the 2020 SAR and a proposed revised GWCL for uranium.

Analytical results for constituents included in this SAR exhibit increases in concentrations over time, which are likely due to the location of this well within the nitrate/chloride plume and the result of oxidation of pyrite in the formation around and upgradient of this well. To a lesser extent, increased frequency of sampling and well redevelopment have also likely affected the behavior of constituents in MW-31. In addition, changes in analytical methods and/or changing the analytical laboratory may affect the concentrations of constituents reported for MW-31.

As with the results of the 2020 SAR, this analysis will demonstrate that concentrations of uranium in MW-31 are within the range of site-wide background. Mass balance calculations presented in Appendix E of the 2020 SAR demonstrate that concentrations in MW-31 are not consistent with impacts from potential tailings system seepage. Once again, this SAR concludes that the exceedances of uranium in MW-31 can be attributed to natural background and site-wide influences (oxidation of pyrite and decreasing pH) or to impacts at the Mill site that are already being addressed with an existing corrective action (nitrate/chloride plume capture). The conclusions of this analysis are consistent with conclusions presented in the Background Reports (INTERA 2007a, 2007b, 2008) and other recent analyses.

In accordance with the DWMRC-approved Flowsheet (from INTERA [2007a], included as **Appendix C**), increasing trends necessitate a modified approach for calculation of GWCLs. The modification in this approach uses a more recent dataset (collected after July 2020) and the greater of (1) mean concentration plus two standard deviations (“mean + 2σ”), (2) highest historical value, (3) background x 1.5, (4) the fractional approach, or (5) the upper tolerance limit 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’s Unified Guidance (USEPA, 2009). Such revisions account for the trends and minimize unwarranted OOC status in such wells.

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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
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
mean + 2σ	mean concentration plus two standard deviations
mg/L	milligrams per liter
Mill	White Mesa Uranium Mill
OOC	out of compliance
SAR	Source Assessment Report
TDS	Total Dissolved Solids
UAC	Utah Administrative Code
TMS	Tailings Management System
University of Utah Study	Hurst and Solomon, (2008)
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 1**). 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 in groundwater compliance monitoring well MW-31. Uranium exceedances have been addressed in previous SARs, and recent concentrations have exceeded the recalculated groundwater compliance limits ("GWCLs") specified in those SARs due to statistically significant trends noted in those previous studies.

Part I.G.2 of the GWDP provides that an out-of-compliance ("OOC") status exists when the concentration of a constituent in two consecutive samples from a compliance monitoring point exceeds a 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, and March 19, 2019, 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.

On October 20, 2020, EFRI submitted a notice (the "Q3 2020 Exceedance Notice") to the Director under Part I.G.1(a) of the GWDP; providing notice that the concentrations of specific constituents in the monitoring wells at the Mill exceeded their respective GWCLs for the third quarter of 2020 and indicating which of those constituents had two consecutive exceedances as of that quarter. A plan and time schedule for the third quarter of 2020 ("Q3 2020 Plan and Time Schedule") covered new dual exceedances of uranium in MW-31. The MW-31 Q3 2020 Plan and Time Schedule was submitted on November 18, 2020, and was approved by the DWMRC in correspondence dated February 1, 2021 (DWMRC, 2021).

Uranium concentrations in MW-31 exhibit a statistically significant upward trend first identified during the 2015 SAR (INTERA, 2015). Uranium was also addressed in the 2017 SAR and has exceeded the revised GWCL due to statistically significant trends noted in these previous studies. A comprehensive assessment of MW-31 was completed in June 2020. Since the June 2020 assessment was completed, only a few data points have been collected and the 2020 assessment remains current with no changes required. This SAR for the uranium exceedance will rely on the geochemical, pH, indicator parameter, and plume assessments included in the June 2020 SAR. This SAR will not repeat or reproduce the June 2020 assessments and will only include the relevant statistics and a recalculation of the GWCLs for uranium in MW-31.

1.1 Source Assessment Report Organization

A description of the approach used for analysis is provided in Section 2, the results of the analysis are presented in Section 3, the calculation of GWCLs is provided in Section 4, and conclusions and recommendations are presented in Section 5. Section 6 lists references cited in the SAR.

The appendices comprise the analyses performed for this Report and are organized in the following manner: **Appendix A** contains statistical analysis for uranium and other indicator parameters in MW-31. **Appendix B** contains the statistical analysis performed on modified uranium datasets in MW-31 to address revising GWCLs for constituents with increasing trends. **Appendix C** 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, 1989, 1992, 2009). This Flowsheet was approved by DWMRC prior to completion of the Background Reports. **Appendix D** 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 D** can be imported into either R or Statistica to replicate the results presented in this SAR.

2.0 CATEGORIES AND APPROACH 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 in MW-31. This constituent falls into the third category: Constituents in Wells with Previously Identified Rising Trends. Additionally, uranium can fall within the first category when downward pH trends are noted.

2.1 Approach for Analysis

The first step in the analysis is to perform an assessment of 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 caused by background 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, a revised GWCL is proposed to reflect changes in background conditions at the Mill site.

The primary focus of a source assessment for uranium in MW-31 is to determine whether or not there is any new information that would suggest that the previous analysis conducted in the New Wells Background Report, SARs, pH Report (INTERA, 2012b), and Pyrite Report (HGC, 2012a) has changed since the date of those Reports. This assessment has been recently completed in June of 2020 and again as part of the Q3 2020 Plan and Time Schedule. In light of the conclusions and the lack of contradictory data, this assessment is considered complete. Based on those recent studies the evaluation contained within this SAR is focused on updated statistical analysis and recalculation of the GWCL for uranium per the DWMRC letter dated February 1, 2021 (DWMRC, 2021). The analysis performed in this SAR considers all available data to date.

The evaluation of SAR parameters and indicator parameters in MW-31 was supported by a statistical analysis that followed the process outlined in the Flowsheet (INTERA, 2007a) attached as **Appendix C.** As discussed in Section 1.1, the Flowsheet was designed based on USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (USEPA, 1989, 1992, 2009), and was approved by DWMRC prior to completion of the Background Reports (INTERA, 2007a, 2007b, 2008).

2.2 Approach for Setting Revised GWCLs

Since the recent assessments indicate that the previous analysis in the Background Reports has not changed, and that the OOC status of uranium in MW-31 is due to natural or other site-wide influences that are already being addressed by corrective action, then new GWCLs are being proposed for uranium. The revised GWCLs use the DWMRC-approved Flowsheet (**Appendix C**), including the last decision of the process that directs the analyst to consider a modified approach to determining a GWCL if an increasing trend (decreasing in the case of pH) is present.

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 water 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 (INTERA, 2007a, 2007b, 2008), may indicate that potential seepage from the Tailings Management System ("TMS") is occurring.

The overall results and conclusions of this study, as well as the specific results related to MW-31, are included in Section 2.3 of the 2020 SAR.

3.0 RESULTS OF ANALYSIS

This section describes the potential geochemical influences on groundwater in MW-31 and results of the analysis, summaries of which are provided in **Appendix A-1** and **Appendix B-1.** Supporting analyses are also presented in **Appendices A-2**, **A-5**, **A-6**, **A-7**, **and A-8** as well as **Appendices B-3**, **B-4**, and **B-5**.

3.1 Site-Wide Decreasing pH

A general discussion of the site-wide pH trend is included in Section 3.1 of the 2020 SAR. Although pH in MW-31 has an overall significantly decreasing trend when considering the entire historical dataset, more recent data show that pH is stable to increasing at near-neutral values. Statistical analysis of pH in MW-31 is included in **Appendix A** of this report.

3.2 Changes in Groundwater in MW-31

The behavior of groundwater has changed since the time of the Background Reports, but to a lesser extent since recent SAR evaluations. Section 3.1 of the 2015 SAR describes in detail the changes, events, and other factors that may be influencing the behavior of constituents in this well, including:

- Sampling frequency (monthly monitoring commenced in 2010).
- Well redevelopment in 2011.
- Hydraulic influences.
- Geochemical influences.
- Analytical changes.

3.3 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 impacted by the chloride plume (EFRI, 2020a). 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 chloride, sulfate, fluoride, and uranium, among other constituents. While uranium can be the most mobile of trace metals under certain conditions, it is typically retarded behind chloride, fluoride, and sulfate due to possible sorption and precipitation and would likely not show increasing concentrations in groundwater until sometime after chloride, fluoride, and sulfate concentrations had begun to increase (INTERA, 2007a). 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).

Concentrations of parameters monitored in well MW-31 vary from concentrations observed at the time of the Background Reports. The changes in concentrations are most likely attributable to a combination of the influences discussed in Section 3.1 of the 2015 SAR: the proximity to the chloride/nitrate plume and changing hydrologic and geochemical conditions due to pumping wells, increased sample frequency, removal of recharge from the wildlife ponds, well rehabilitation, and the oxidation of pyrite leading to decreasing pH and increasing concentrations. For these reasons, the typical suite of indicator parameters of potential tailings system seepage may be impacted by other processes. A summary of geochemical analysis of indicator parameters is included in **Appendix A-1**. **Appendix A-2** presents a descriptive statistics comparison for indicator parameters from the New Wells Background Report and the 2012, 2013, 2015, 2017, and 2020 SARs. Data used in the analysis and data removed prior to analysis are presented in **Appendices A-3** and **A-4**, respectively.

The distribution and identification of outliers and extreme outliers in indicator parameter concentration data sets are demonstrated in the box plots included in **Appendix A-5.** Data from additional monitoring wells were plotted alongside indicator parameters for MW-31 in Appendix C-6 of the 2020 SAR. This comparison illustrates that fluoride, sulfate, and uranium concentrations in MW-31 are well within the range of site-wide background concentrations. Chloride concentrations are above the range for site-wide background, consistent with the location of MW-31 within the nitrate/chloride plume. As the mass balance evaluation included in Section 3.5 of the 2020 SAR demonstrates, the concentrations of constituents that are increasing and/or exceeding GWCLs in MW-31 are not the result of potential tailings system seepage.

Chloride concentrations in MW-31 exhibit a statistically significant increasing trend (see **Appendix A-7** for a time series). Fluoride concentrations are decreasing significantly in MW-31. Sulfate and uranium concentrations in MW-31 are relatively low for the Mill site as described below but show significant increasing trends at the time of this SAR. Time series plots with vertical lines to indicate events that may have contributed to observed changes in indicator parameters are included in **Appendix A-8**.

Current sulfate concentrations in MW-31 are among the lowest at the Mill site. A box plot showing sulfate concentrations in all monitoring wells at the Mill site is included in Appendix B-8 of the 2020 SAR. Other monitoring wells show sulfate concentrations that are three to seven times higher than those in MW-31 (see Table 7 of the 2012 SAR). Sulfate is also significantly increasing in a number of wells at the Mill site, including upgradient and far downgradient wells. See, for example, the indicator parameter analyses for MW-18 included in the 2012 SAR, which show a significantly increasing trend in sulfate and suggest that there are natural influences at the site that can influence sulfate concentrations. Increased concentrations in MW-31 are expected due to site-wide pyrite oxidation and the location of MW-31 within the nitrate/chloride plume.

Uranium concentration trends are highly variable site wide. An evaluation of uranium concentrations over time was included for all groundwater monitoring wells at the Mill site in Appendix F of the 2017 SAR (INTERA, 2017). Uranium concentrations in MW-31 are relatively low for the site and exhibit a statistically significant upward trend first identified during the 2015 SAR (INTERA, 2015). Box plots showing uranium in all of the groundwater monitoring wells at the Site are plotted in Appendix B-9 of the SAR for MW-28 (EFRI, 2020b). These box plots illustrate that uranium concentrations in MW-31 are within the range of background concentrations.

With the exception of chloride, and despite any increasing trends, indicator parameters in MW-31 remain amongst the lowest at the Mill site (Appendix C-6 of the 2020 SAR) and are not present in concentrations that would be expected if they were due to potential tailings system seepage (Section 3.5 of the 2020 SAR).

3.4 Mass Balance Analyses

The 2020 SAR for MW-31 (INTERA, 2020), included a mass balance analysis. In light of the lack of contradictory data, the conclusions in the 2020 SAR are consistent with previous mass balance analyses that were based on nitrate concentrations within the nitrate/chloride plume as described in the December 2009 *Nitrate Groundwater Contamination Investigation Report* (INTERA, 2009).

3.5 Summary of Results

As the results of the analysis of uranium and indicator parameters in MW-31 demonstrate, increasing trends in MW-31 are not consistent with potential TMS seepage.

As noted in Section 3.3 above, uranium concentrations are relatively low for the site, and as shown in **Appendix A** are exhibiting a statistically significant increasing trend.

Notable changes in uranium concentration trends occur in 2014 at the time of the wellhead impact and repair, in 2017, and in 2020. The subset of data post-2020 that were analyzed alongside the complete data set and other selected data sets presented in **Appendix B** are normally distributed and exhibit an increasing trend.

Furthermore, the mass balance analysis discussed in the 2020 SAR indicates that the MW-31 uranium concentrations are inconsistent with a potential TMS impact.

4.0 CALCULATIONS OF GROUNDWATER COMPLIANCE LIMITS

The findings of analyses discussed above support the conclusions that (1) MW-31 is not being impacted by potential tailings system seepage, and (2) increasing concentrations of constituents in MW-31 are the result of background and/or site-wide influences, such as the nitrate/chloride plume and a site-wide decline in pH. Therefore, revision of the GWCL for uranium in MW-31 is proposed.

4.1 Evaluation of Modified Approaches to Calculation of GWCLs for Trending Constituents

According to the DWMRC-approved Flowsheet (**Appendix C**), if an increasing trend is present, a modified approach should be considered for determining GWCLs. Constituents included in this SAR are exhibiting significantly increasing trends that can be attributed to one or more of the following: (1) natural background conditions; (2) pyrite oxidation in the aquifer, which can decrease pH, increase mobility of metals, and increase sulfate and total dissolved solids ("TDS") concentrations; (3) the location of this well within the nitrate/chloride plume, which is actively being remediated according to the CAP (HGC, 2012b); and/or (4) effects of recent events on groundwater in MW-31; such as well redevelopment, increased sampling frequency, change in water levels, and analytical method/laboratory change, as described in Section 3.1 of the 2015 SAR (INTERA, 2015).

Therefore, the following alternative approaches to calculating GWCLs have been considered for constituents in MW-31:

1. 95% Upper Tolerance Limit ("95-UTL").

The 95-UTL is one of several options for representing the upper bounds of a given dataset (USEPA, 2009). The 95-UTL gives a 95% confidence that the UTL will contain at least 95% of the distribution of observations in background. UTLs were calculated in USEPA's free software ProUCL. The ProUCL Version 5.0 Technical Guidance (USEPA, 2015) Chapter 3 describes how the UTL is calculated based on distribution of the data.

2. 1.5 times background concentration as defined in Utah Administrative Code ("UAC") R317-6-4.3.

The UAC R317-6-4.3 recognizes that "contaminants" may be present as part of naturally occurring background conditions:

When a contaminant is present in a detectable amount as a background concentration, the concentration of the pollutant may not exceed the greater of 1.5 times the background concentration or 0.5 times the ground water quality standard or background plus two standard deviations…

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 intrawell basis, as defined in the Background Reports. Therefore, to be conservative, the mean concentration is proposed to be used as background for the purposes of this calculation. The mean concentration would assume all data to date (or a data subset as described below), after following the data quality steps of the Flowsheet.

3. Using recent data to calculate GWCLs.

This approach follows the DWMRC-approved Flowsheet (**Appendix C**) by taking into account increasing trends and processing the data consistently with previously determined GWCLs. In this approach, the complete data set, which exhibits an increasing trend for uranium over the history of the well record, is divided into a subset of data based on identification of points of inflection where the results have shifted. This approach is appropriate in wells, such as MW-31, that have been thoroughly investigated and where the causes of increasing trends are not due to any potential TMS seepage or other Mill-related impacts that are not already being addressed. For purposes of this modified approach and to be consistent with previous SARs, three points of inflection were identified and evaluated in the uranium data sets, (**Appendix B**) in addition to the full data set. The post-July 2020 data set is normally distributed and exhibits an increasing trend.

These modified approaches have been considered for an achievable GWCL for parameters that are increasing in concentration for reasons other than potential tailings system impact. MW-31 has been thoroughly evaluated multiple times in recent years due to unachievable GWCLs. The most appropriate GWCL that is achievable considering increasing trends is the highest of the following: (1) mean + 2σ; (2) highest historical value; (3) fractional approach; (4) 1.5 times background; or (5) the 95-UTL. This approach of choosing the highest value combines elements from the Flowsheet and from previously approved GWCLs in MW-31 (DWMRC, 2020).

4.2 Proposed Revised GWCLs

In accordance with the Flowsheet, the increasing trend identified for uranium warrants a modified approach to the calculation of GWCLs. The complete uranium data set exhibits a significantly increasing trend with a non-parametric distribution. Post July-2020 data are increasing with a normal distribution. Considering the increasing trends, a modified approach of choosing the highest of the following: (1) fractional approach; (2) highest historical value; (3) mean + 2σ, calculated using either the full data set or a post inflection data set; (4) 1.5 times background, calculated using either the full data set or a post inflection data set: or (5) the 95-UTL, calculated using either the full data set or a post inflection data set would be appropriate. Flowsheet analysis has been performed for these data subsets and the complete datasets and is summarized in **Appendix A-1** and **Appendix B-1.**

GWCLs determined according to the Flowsheet using all data to date and the post inflection data sets including the post July-2020 data are presented in **Appendix B-1.** The modified approach of 1.5 times background using the post-2020 data set is selected as the most appropriate GWCL (**Table 1),** because it is the greater of the approached listed above.

As a result of this analysis, the proposed revised GWCL for uranium is set out in **Table 1** below.

Table 1. Proposed GWCL

Parameter	Current GWCL[a]	Flowsheet Revised GWCL	Rationale
Uranium (µg/L)	15	29.03	1.5 x background of post-July 2020 data set

Notes:
a = 2021 GWDP No.UGW370004.
µg/L = micrograms per liter

5.0 CONCLUSIONS AND RECOMMENDATIONS

Background groundwater quality at the Mill site was thoroughly studied as described in the Background Reports (INTERA, 2007a, 2007b, 2008) 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. These studies also acknowledged that there are natural influences operating at the Mill site that have caused increasing trends and general variability in background groundwater quality.

Consistent with the conclusions of the Background Reports, the University of Utah Study, the conclusion of the 2020 SAR, and this SAR is that groundwater in MW-31 is not impacted by potential TMS seepage. Mass balance calculations have demonstrated that concentrations of uranium and indicator parameters are consistent with background groundwater concentrations, and not the result of potential TMS seepage. Constituents in MW-31 exhibit significant increasing trends that can be attributed to one or more of the following: (1) natural background conditions; (2) pyrite oxidation in the aquifer, which can decrease pH, increase mobility of metals, and increase concentrations; (3) the location of this well within the nitrate/chloride plume, which is actively being remediated according to the CAP (HGC, 2012b); and/or (4) effects of recent events on groundwater in MW-31 such as well redevelopment, increased sampling frequency, changes in water levels, analytical method/laboratory change, and changes in the CAP pumping, as described in Section 3.1 of the 2015 SAR (INTERA, 2015) and the 2020 SAR (INTERA, 2020).

In addition to the above factors, a site-wide comparison of constituent concentrations in MW-31 shows that even though many constituents have significant increasing long-term trends, their concentrations are less than or within the range of site-wide background concentrations. This constitutes further evidence that increasing concentrations in MW-31 are likely due to background influences and the location of this well within the existing nitrate/chloride plume, and not to potential TMS seepage.

6.0 REFERENCES

Division of Waste Management and Radiation Control (DWMRC), 2020. Letter RE: Energy Fuels Resources (USA) Inc. June 24, 2020 Source Assessment Report for MW-31, White Mesa Uranium Mill Utah Groundwater Discharge Permit No. UGW370004 (Permit)

———, 2021. Letter RE: Energy Fuels Resources (USA) Inc. November 18, 2020, Transmittal of Plan and Time Schedule, Groundwater Discharge Permit No. UGW370004 (Permit)

Energy Fuels Resources (USA) Inc. (EFRI), 2020a. First Quarter Nitrate Monitoring Report, White Mesa Uranium Mill

———, 2020b. White Mesa Uranium Mill State of Utah Groundwater Discharge Permit No. UGW370004 Source Assessment Report under Part I.G.4 For Exceedances in MW-28 in the First Quarter of 2020.

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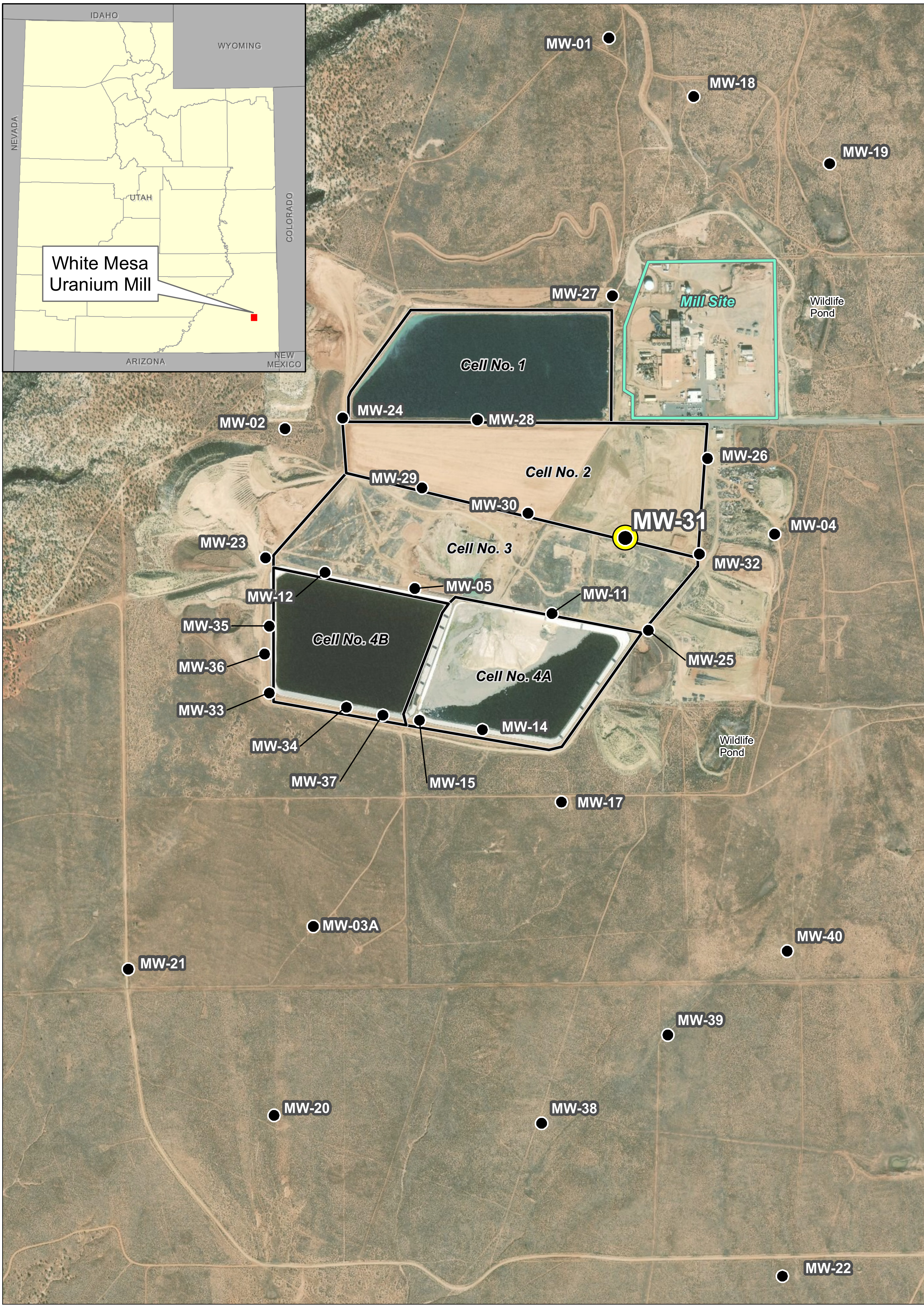
FIGURES



N

900 0 900

Feet

● Groundwater Monitoring Well

INTERA

Source(s): Aerial – ESRI ArcGIS online;
Wells – HGC, Inc., May 2008 report.

Figure 1
Location of White Mesa Mill Site and Groundwater Monitoring Wells
White Mesa Uranium Mill

S:\ABQ\IUC-001-01-001 Denison Mines\GIS\mapdocs\2020_SARs\MW-31\01_SARMW31_LocationMap.mxd Date: 6/2/2020

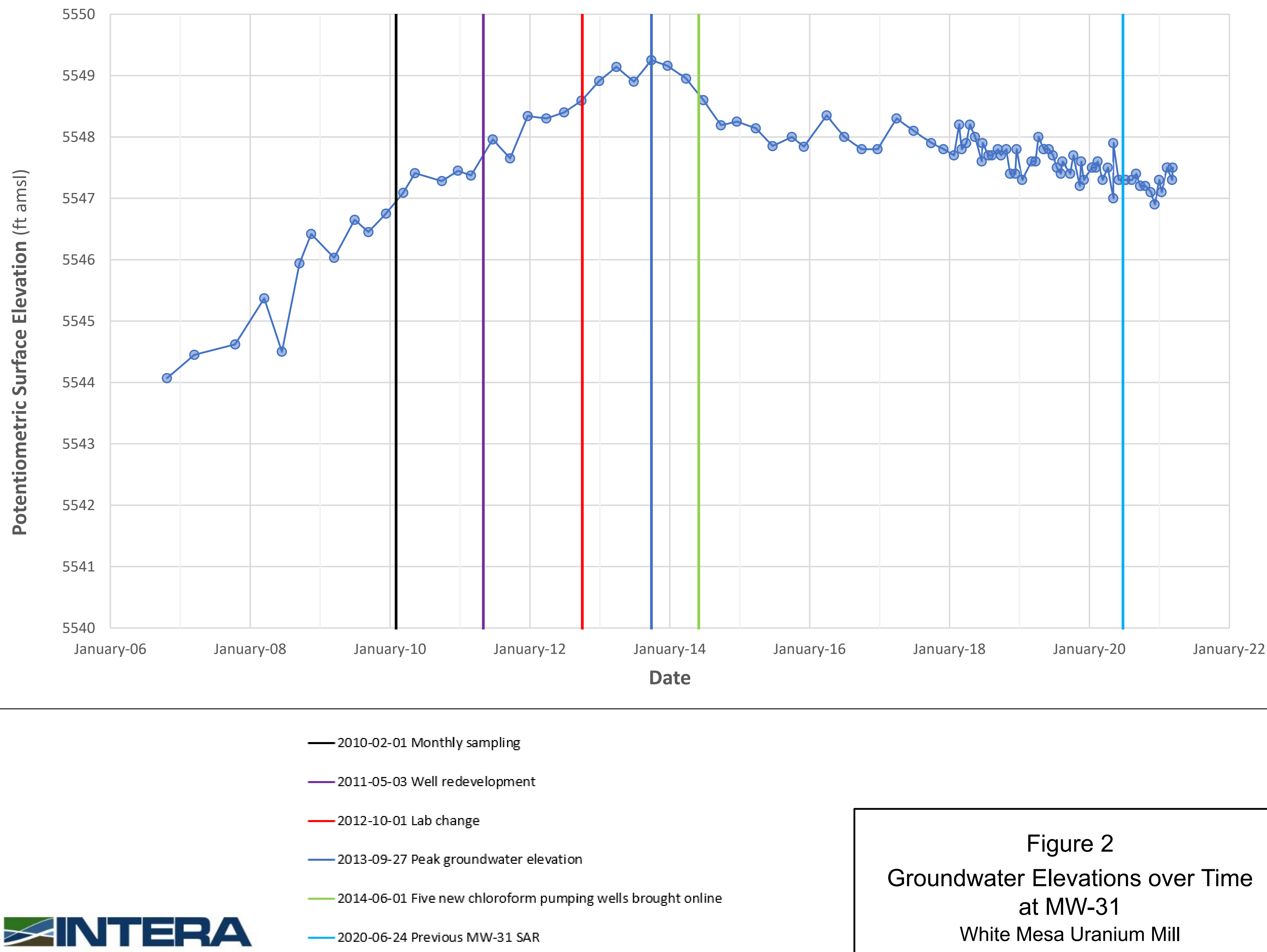


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Figure 2

Groundwater Elevations over Time at MW-31

White Mesa Uranium Mill

APPENDIX A

Statistical Analysis for SAR and Indicator Parameters in MW-31

A-1 Summary of Statistical Analysis for SAR and Indicator Parameters in MW-31
A-2 Descriptive Statistics of SAR and Indicator Parameters in MW-31
A-3 Data Used for Statistical Analysis
A-4 Data Removed from Analysis
A-5 Box Plots for SAR and Indicator Parameters in MW-31
A-6 Histograms for SAR and Indicator Parameters in MW-31
A-7 Time Series Plots and Linear Regressions for SAR and Indicator Parameters in MW-31
A-8 Time Series Plots for SAR and Indicator Parameters in MW-31 with Events/Inflection Points

Appendix A-1: Summary of Statistical Analysis for SAR and Indicator Parameters in MW-31

Well	Constituent	Data Set	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]		Significant Trend	Previously Identified Increasing Trend?	Highest Historical Value (HHV)
							W	p		r^2	p	S	p			
MW-31	Uranium	Complete	88	0	10.227386	3.6784765	0.9274888	0.0001044	No	N/A	N/A	3039	0	Increasing	Yes	22.20
MW-31	Chloride (mg/L)	Complete	142	0	229.80282	79.890017	0.9451017	2.195E-05	No	N/A	N/A	8669	0	Increasing	Yes	381.00
MW-31	Fluoride (mg/L)	EO Removed	63	0	0.8012179	0.1060507	0.9769008	0.2820837	Yes			-1198	6.12727E-13	Decreasing	No	1.18
MW-31	Sulfate (mg/L)	Complete	137	0	699.81022	190.49813	0.9333576	4.363E-06	No	N/A	N/A	7564	0	Increasing	Yes	1150.00
MW-31	pH (S.U.)	Complete	153	0	7.0129412	0.3424887	0.9671726	0.0010354	No	N/A	N/A	-1487	0.009523551	Decreasing	N/A	8.23

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.
NA= not applicable.
p = probability.
S = Mann-Kendall statistic.
s.u. = standard units of pH.
W = Shapiro-Wilk test value.

a = A regression test was performed on data that was determined to have normal or lognormal distribution.
b = The Mann-Kendall test was performed on data that are not normally or lognormally distributed.
Distribution = Distribution as determined by the Shapiro-Wilk distribution test for constituents with % Detect > 50% and N>8.
Mean = The arithmetic mean as determined for normally or lognormally distributed constituents with % Detect > 50%.
Standard Deviation = The standard deviation as determined for normally or lognormally distributed constituents with % Detect > 85%.
Highest Historical Value = The highest observed value for constituents with % Detect < 50%.
r^2 = The measure of how well the trendline fits the data where r^2=1 represents a perfect fit.

Appendix A-2: Descriptive Statistics of SAR and Indicator Parameters in MW-31

Data Set	2021 SAR					2020 SAR				2017 SAR				2015 SAR				2013 SAR				2008 Background Report			
Analyte	Chloride	Fluoride	Sulfate	Uranium	pH	Chloride	Fluoride	Sulfate	Uranium	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	S.U.	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	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
N	142	63	137	88	153	131	59	126	79	98	47	99	54	76	41	77	42	50	31	47	32	10	10	10	10
Normally or Lognormallly Distributed?	No	Yes	No	No	No	No	Yes	No	No	No	Yes	No	Yes	No	No	No	Yes	Yes	No	No	Yes	Yes	No	No	Yes
Mean	229.80	0.80	699.81	10.23	7.01	219.63	0.81	668.86	9.24	186	0.818	601	7.96	167	0.84	567	7.5	146	0.86	527	7.3	133	0.91	504	7.6
Min. Conc.	115	0.526	436	5.77	6.16	115	0.53	436	5.77	115	0.605	436	5.77	115	0.61	436	5.8	115	0.73	436	5.8	122	0.80	436	6.6
Max. Conc.	381	1.1832	1150	22.2	8.23	381	1.18	1150	14.80	287	0.99	809	10.3	264	1.2	691	9.3	189	1.0	630	9.3	139	1.2	532	9.3
Std. Dev.	79.89	0.1061	190.5	3.6785	0.3425	73.92	0.10	160.92	2.24	47.7	0.080	87.9	1.08	35	0.09	65	0.8	18.1	0.06	34.5	0.74	5	0.12	28	0.75
Range	266	0.6572	714	16.43	2.07	266.0	0.66	714	9.03	172	0.385	373	4.53	149	0.60	255	3.6	74.0	0.26	194	3.6	17	0.40	96	2.8
Geometric Mean	216.11	0.7943	676.74	9.694	7.0046	207.60	0.80	651.61	8.99	180	0.814	594	7.89	163	0.84	564	7.5	145	0.86	526	7.3	133	0.90	504	7.6
Skewness	0.3606	0.3539	0.9409	1.4194	-0.126	0.45	0.40	1.04	0.76	0.37	-0.27	0.41	0.43	0.56	0.96	0.40	0.31	0.50	-0.17	0.56	0.73	-1.1	1.9	-1.9	1.2
Q25	152.75	0.735	539	7.6225	6.83	149	0.74	537.25	7.34	144	0.763	528	7.14	138	0.78	521	7.0	132	0.83	507	6.9	131	0.85	497	7.2
Median	222	0.806	655	9.04	7.04	210	0.81	639.50	8.73	176	0.830	600	7.72	159	0.84	541	7.5	144	0.86	529	7.2	134	0.90	513	7.4
Q75	290.75	0.86	813	11.525	7.23	276	0.87	750.25	10.70	225.75	0.89	665.00	8.75	195	0.90	630	8.0	157	0.90	540	7.7	136	0.90	522	8.0

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	6/22/2005	Uranium	6.56	µg/L
MW-31	9/22/2005	Uranium	7.25	µg/L
MW-31	12/14/2005	Uranium	7.27	µg/L
MW-31	3/22/2006	Uranium	8.04	µg/L
MW-31	6/21/2006	Uranium	9.32	µg/L
MW-31	9/13/2006	Uranium	8.03	µg/L
MW-31	10/25/2006	Uranium	7.71	µg/L
MW-31	3/15/2007	Uranium	7.60	µg/L
MW-31	8/27/2007	Uranium	7.18	µg/L
MW-31	10/24/2007	Uranium	7.20	µg/L
MW-31	3/19/2008	Uranium	7.02	µg/L
MW-31	6/3/2008	Uranium	6.95	µg/L
MW-31	8/4/2008	Uranium	6.77	µg/L
MW-31	11/11/2008	Uranium	6.35	µg/L
MW-31	2/3/2009	Uranium	7.08	µg/L
MW-31	5/13/2009	Uranium	6.76	µg/L
MW-31	8/24/2009	Uranium	6.97	µg/L
MW-31	10/14/2009	Uranium	6.97	µg/L
MW-31	2/9/2010	Uranium	7.12	µg/L
MW-31	4/20/2010	Uranium	6.74	µg/L
MW-31	9/13/2010	Uranium	7.23	µg/L
MW-31	11/9/2010	Uranium	6.72	µg/L
MW-31	2/1/2011	Uranium	5.77	µg/L
MW-31	4/1/2011	Uranium	6.81	µg/L
MW-31	8/2/2011	Uranium	7.68	µg/L
MW-31	10/3/2011	Uranium	8.87	µg/L
MW-31	2/13/2012	Uranium	7.96	µg/L
MW-31	5/2/2012	Uranium	7.34	µg/L
MW-31	7/9/2012	Uranium	8.17	µg/L
MW-31	11/6/2012	Uranium	8.73	µg/L
MW-31	2/19/2013	Uranium	7.33	µg/L
MW-31	5/13/2013	Uranium	7.63	µg/L
MW-31	7/9/2013	Uranium	7.90	µg/L
MW-31	11/18/2013	Uranium	9.03	µg/L
MW-31	2/17/2014	Uranium	7.65	µg/L
MW-31	3/10/2014	Uranium	7.96	µg/L
MW-31	6/2/2014	Uranium	7.72	µg/L
MW-31	9/3/2014	Uranium	8.40	µg/L
MW-31	11/4/2014	Uranium	7.71	µg/L
MW-31	2/2/2015	Uranium	8.00	µg/L
MW-31	4/7/2015	Uranium	8.07	µg/L
MW-31	8/10/2015	Uranium	8.76	µg/L
MW-31	11/9/2015	Uranium	8.72	µg/L
MW-31	2/15/2016	Uranium	8.41	µg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	5/3/2016	Uranium	9.05	µg/L
MW-31	8/16/2016	Uranium	9.41	µg/L
MW-31	11/1/2016	Uranium	9.56	µg/L
MW-31	12/5/2016	Uranium	10.30	µg/L
MW-31	1/17/2017	Uranium	9.03	µg/L
MW-31	2/7/2017	Uranium	9.92	µg/L
MW-31	3/6/2017	Uranium	9.62	µg/L
MW-31	4/4/2017	Uranium	10.10	µg/L
MW-31	5/1/2017	Uranium	9.62	µg/L
MW-31	6/5/2017	Uranium	9.89	µg/L
MW-31	7/11/2017	Uranium	10.50	µg/L
MW-31	8/14/2017	Uranium	10.10	µg/L
MW-31	9/11/2017	Uranium	9.74	µg/L
MW-31	10/2/2017	Uranium	10.90	µg/L
MW-31	11/1/2017	Uranium	9.31	µg/L
MW-31	12/4/2017	Uranium	10.40	µg/L
MW-31	1/24/2018	Uranium	11.40	µg/L
MW-31	2/20/2018	Uranium	11.20	µg/L
MW-31	3/5/2018	Uranium	11.40	µg/L
MW-31	4/17/2018	Uranium	11.50	µg/L
MW-31	5/14/2018	Uranium	11.50	µg/L
MW-31	6/18/2018	Uranium	12.90	µg/L
MW-31	7/23/2018	Uranium	12.30	µg/L
MW-31	8/10/2018	Uranium	11.70	µg/L
MW-31	9/10/2018	Uranium	11.00	µg/L
MW-31	10/24/2018	Uranium	11.60	µg/L
MW-31	11/13/2018	Uranium	13.20	µg/L
MW-31	12/10/2018	Uranium	12.70	µg/L
MW-31	1/15/2019	Uranium	13.20	µg/L
MW-31	2/12/2019	Uranium	13.60	µg/L
MW-31	3/5/2019	Uranium	12.50	µg/L
MW-31	4/10/2019	Uranium	13.60	µg/L
MW-31	7/15/2019	Uranium	14.30	µg/L
MW-31	10/9/2019	Uranium	14.40	µg/L
MW-31	1/14/2020	Uranium	14.80	µg/L
MW-31	4/6/2020	Uranium	15.50	µg/L
MW-31	7/7/2020	Uranium	18.10	µg/L
MW-31	8/10/2020	Uranium	19.70	µg/L
MW-31	9/1/2020	Uranium	18.50	µg/L
MW-31	10/19/2020	Uranium	19.30	µg/L
MW-31	11/16/2020	Uranium	17.80	µg/L
MW-31	12/7/2020	Uranium	19.50	µg/L
MW-31	1/12/2021	Uranium	19.70	µg/L
MW-31	2/9/2021	Uranium	22.20	µg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	6/22/2005	Chloride	139	mg/L
MW-31	9/22/2005	Chloride	136	mg/L
MW-31	12/14/2005	Chloride	135	mg/L
MW-31	3/22/2006	Chloride	133	mg/L
MW-31	6/21/2006	Chloride	138	mg/L
MW-31	9/13/2006	Chloride	131	mg/L
MW-31	10/25/2006	Chloride	127	mg/L
MW-31	3/15/2007	Chloride	132	mg/L
MW-31	8/27/2007	Chloride	136	mg/L
MW-31	10/24/2007	Chloride	122	mg/L
MW-31	3/19/2008	Chloride	124	mg/L
MW-31	6/3/2008	Chloride	128	mg/L
MW-31	8/4/2008	Chloride	124	mg/L
MW-31	11/11/2008	Chloride	119	mg/L
MW-31	2/3/2009	Chloride	115	mg/L
MW-31	5/13/2009	Chloride	124	mg/L
MW-31	8/24/2009	Chloride	122	mg/L
MW-31	10/14/2009	Chloride	138	mg/L
MW-31	2/9/2010	Chloride	128	mg/L
MW-31	4/20/2010	Chloride	128	mg/L
MW-31	9/13/2010	Chloride	139	mg/L
MW-31	11/9/2010	Chloride	138	mg/L
MW-31	2/1/2011	Chloride	145	mg/L
MW-31	4/1/2011	Chloride	143	mg/L
MW-31	5/10/2011	Chloride	143	mg/L
MW-31	6/20/2011	Chloride	145	mg/L
MW-31	7/5/2011	Chloride	148	mg/L
MW-31	8/2/2011	Chloride	148	mg/L
MW-31	9/6/2011	Chloride	148	mg/L
MW-31	10/3/2011	Chloride	145	mg/L
MW-31	11/8/2011	Chloride	145	mg/L
MW-31	12/12/2011	Chloride	148	mg/L
MW-31	1/24/2012	Chloride	155	mg/L
MW-31	2/13/2012	Chloride	150	mg/L
MW-31	3/13/2012	Chloride	152	mg/L
MW-31	4/9/2012	Chloride	160	mg/L
MW-31	5/2/2012	Chloride	151	mg/L
MW-31	6/18/2012	Chloride	138	mg/L
MW-31	7/9/2012	Chloride	161	mg/L
MW-31	8/6/2012	Chloride	175	mg/L
MW-31	9/18/2012	Chloride	172	mg/L
MW-31	10/22/2012	Chloride	157	mg/L
MW-31	11/6/2012	Chloride	189	mg/L
MW-31	12/18/2012	Chloride	170	mg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	1/22/2013	Chloride	176	mg/L
MW-31	2/19/2013	Chloride	174	mg/L
MW-31	3/19/2013	Chloride	168	mg/L
MW-31	4/16/2013	Chloride	171	mg/L
MW-31	5/13/2013	Chloride	169	mg/L
MW-31	6/24/2013	Chloride	179	mg/L
MW-31	7/9/2013	Chloride	182	mg/L
MW-31	8/19/2013	Chloride	183	mg/L
MW-31	9/17/2013	Chloride	193	mg/L
MW-31	10/23/2013	Chloride	188	mg/L
MW-31	11/18/2013	Chloride	174	mg/L
MW-31	12/17/2013	Chloride	203	mg/L
MW-31	1/7/2014	Chloride	194	mg/L
MW-31	2/17/2014	Chloride	197	mg/L
MW-31	3/10/2014	Chloride	230	mg/L
MW-31	4/28/2014	Chloride	230	mg/L
MW-31	5/13/2014	Chloride	200	mg/L
MW-31	6/2/2014	Chloride	173	mg/L
MW-31	7/28/2014	Chloride	200	mg/L
MW-31	8/18/2014	Chloride	210	mg/L
MW-31	9/3/2014	Chloride	210	mg/L
MW-31	10/6/2014	Chloride	205	mg/L
MW-31	11/4/2014	Chloride	204	mg/L
MW-31	12/9/2014	Chloride	215	mg/L
MW-31	1/20/2015	Chloride	226	mg/L
MW-31	2/2/2015	Chloride	211	mg/L
MW-31	3/3/2015	Chloride	209	mg/L
MW-31	4/7/2015	Chloride	211	mg/L
MW-31	5/11/2015	Chloride	225	mg/L
MW-31	6/23/2015	Chloride	228	mg/L
MW-31	7/6/2015	Chloride	222	mg/L
MW-31	8/10/2015	Chloride	264	mg/L
MW-31	9/15/2015	Chloride	231	mg/L
MW-31	10/6/2015	Chloride	222	mg/L
MW-31	11/9/2015	Chloride	215	mg/L
MW-31	12/8/2015	Chloride	231	mg/L
MW-31	1/19/2016	Chloride	228	mg/L
MW-31	2/15/2016	Chloride	246	mg/L
MW-31	3/2/2016	Chloride	228	mg/L
MW-31	4/12/2016	Chloride	254	mg/L
MW-31	5/3/2016	Chloride	243	mg/L
MW-31	6/15/2016	Chloride	252	mg/L
MW-31	7/12/2016	Chloride	241	mg/L
MW-31	8/16/2016	Chloride	272	mg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	9/13/2016	Chloride	254	mg/L
MW-31	10/4/2016	Chloride	260	mg/L
MW-31	11/1/2016	Chloride	267	mg/L
MW-31	12/5/2016	Chloride	274	mg/L
MW-31	1/17/2017	Chloride	287	mg/L
MW-31	2/7/2017	Chloride	266	mg/L
MW-31	3/6/2017	Chloride	250	mg/L
MW-31	4/4/2017	Chloride	263	mg/L
MW-31	5/1/2017	Chloride	263	mg/L
MW-31	6/5/2017	Chloride	278	mg/L
MW-31	7/11/2017	Chloride	254	mg/L
MW-31	8/14/2017	Chloride	310	mg/L
MW-31	9/11/2017	Chloride	248	mg/L
MW-31	10/2/2017	Chloride	287	mg/L
MW-31	11/1/2017	Chloride	292	mg/L
MW-31	12/4/2017	Chloride	285	mg/L
MW-31	1/24/2018	Chloride	323	mg/L
MW-31	2/20/2018	Chloride	292	mg/L
MW-31	3/5/2018	Chloride	311	mg/L
MW-31	4/17/2018	Chloride	308	mg/L
MW-31	5/14/2018	Chloride	326	mg/L
MW-31	6/18/2018	Chloride	359	mg/L
MW-31	7/23/2018	Chloride	351	mg/L
MW-31	8/10/2018	Chloride	336	mg/L
MW-31	9/10/2018	Chloride	333	mg/L
MW-31	10/24/2018	Chloride	286	mg/L
MW-31	11/13/2018	Chloride	281	mg/L
MW-31	12/10/2018	Chloride	302	mg/L
MW-31	1/15/2019	Chloride	283	mg/L
MW-31	2/12/2019	Chloride	296	mg/L
MW-31	3/5/2019	Chloride	322	mg/L
MW-31	4/10/2019	Chloride	294	mg/L
MW-31	5/7/2019	Chloride	346	mg/L
MW-31	6/3/2019	Chloride	325	mg/L
MW-31	7/15/2019	Chloride	374	mg/L
MW-31	8/5/2019	Chloride	372	mg/L
MW-31	9/23/2019	Chloride	365	mg/L
MW-31	10/9/2019	Chloride	318	mg/L
MW-31	11/12/2019	Chloride	338	mg/L
MW-31	12/3/2019	Chloride	343	mg/L
MW-31	1/14/2020	Chloride	381	mg/L
MW-31	2/4/2020	Chloride	370	mg/L
MW-31	3/10/2020	Chloride	368	mg/L
MW-31	4/6/2020	Chloride	376	mg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	5/5/2020	Chloride	361	mg/L
MW-31	6/2/2020	Chloride	377	mg/L
MW-31	7/7/2020	Chloride	370	mg/L
MW-31	8/10/2020	Chloride	368	mg/L
MW-31	9/1/2020	Chloride	367	mg/L
MW-31	10/19/2020	Chloride	345	mg/L
MW-31	11/16/2020	Chloride	251	mg/L
MW-31	12/7/2020	Chloride	311	mg/L
MW-31	1/12/2021	Chloride	354	mg/L
MW-31	2/9/2021	Chloride	380	mg/L
MW-31	6/22/2005	Fluoride	0.83	mg/L
MW-31	9/22/2005	Fluoride	0.91	mg/L
MW-31	12/14/2005	Fluoride	0.85	mg/L
MW-31	3/22/2006	Fluoride	0.90	mg/L
MW-31	6/21/2006	Fluoride	0.86	mg/L
MW-31	9/13/2006	Fluoride	0.94	mg/L
MW-31	10/25/2006	Fluoride	1.18	mg/L
MW-31	3/15/2007	Fluoride	0.94	mg/L
MW-31	8/27/2007	Fluoride	0.99	mg/L
MW-31	10/24/2007	Fluoride	0.85	mg/L
MW-31	3/19/2008	Fluoride	0.92	mg/L
MW-31	6/3/2008	Fluoride	0.94	mg/L
MW-31	8/4/2008	Fluoride	0.85	mg/L
MW-31	2/3/2009	Fluoride	0.91	mg/L
MW-31	5/13/2009	Fluoride	0.90	mg/L
MW-31	8/24/2009	Fluoride	0.89	mg/L
MW-31	10/14/2009	Fluoride	0.90	mg/L
MW-31	2/9/2010	Fluoride	0.88	mg/L
MW-31	4/20/2010	Fluoride	0.84	mg/L
MW-31	9/13/2010	Fluoride	0.89	mg/L
MW-31	11/9/2010	Fluoride	0.84	mg/L
MW-31	2/1/2011	Fluoride	0.83	mg/L
MW-31	4/1/2011	Fluoride	0.83	mg/L
MW-31	8/2/2011	Fluoride	0.80	mg/L
MW-31	10/3/2011	Fluoride	0.84	mg/L
MW-31	2/13/2012	Fluoride	0.86	mg/L
MW-31	5/2/2012	Fluoride	0.78	mg/L
MW-31	7/9/2012	Fluoride	0.78	mg/L
MW-31	11/6/2012	Fluoride	0.76	mg/L
MW-31	2/19/2013	Fluoride	0.73	mg/L
MW-31	5/13/2013	Fluoride	0.76	mg/L
MW-31	7/9/2013	Fluoride	0.84	mg/L
MW-31	11/18/2013	Fluoride	0.76	mg/L
MW-31	2/17/2014	Fluoride	0.81	mg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	3/10/2014	Fluoride	0.82	mg/L
MW-31	6/2/2014	Fluoride	0.74	mg/L
MW-31	9/3/2014	Fluoride	0.80	mg/L
MW-31	11/4/2014	Fluoride	0.61	mg/L
MW-31	2/2/2015	Fluoride	0.76	mg/L
MW-31	4/7/2015	Fluoride	0.75	mg/L
MW-31	8/10/2015	Fluoride	0.72	mg/L
MW-31	11/9/2015	Fluoride	0.68	mg/L
MW-31	2/15/2016	Fluoride	0.72	mg/L
MW-31	5/3/2016	Fluoride	0.76	mg/L
MW-31	8/16/2016	Fluoride	0.77	mg/L
MW-31	11/1/2016	Fluoride	0.74	mg/L
MW-31	2/7/2017	Fluoride	0.71	mg/L
MW-31	5/1/2017	Fluoride	0.69	mg/L
MW-31	8/14/2017	Fluoride	0.73	mg/L
MW-31	11/1/2017	Fluoride	0.79	mg/L
MW-31	2/20/2018	Fluoride	0.81	mg/L
MW-31	4/17/2018	Fluoride	0.81	mg/L
MW-31	9/10/2018	Fluoride	0.66	mg/L
MW-31	10/24/2018	Fluoride	0.69	mg/L
MW-31	1/15/2019	Fluoride	0.70	mg/L
MW-31	4/10/2019	Fluoride	0.67	mg/L
MW-31	7/15/2019	Fluoride	0.89	mg/L
MW-31	10/9/2019	Fluoride	0.53	mg/L
MW-31	1/14/2020	Fluoride	0.78	mg/L
MW-31	4/6/2020	Fluoride	0.63	mg/L
MW-31	7/7/2020	Fluoride	0.63	mg/L
MW-31	10/19/2020	Fluoride	0.83	mg/L
MW-31	1/12/2021	Fluoride	0.65	mg/L
MW-31	6/22/2005	Sulfate	504	mg/L
MW-31	9/22/2005	Sulfate	436	mg/L
MW-31	12/14/2005	Sulfate	509	mg/L
MW-31	3/22/2006	Sulfate	485	mg/L
MW-31	6/21/2006	Sulfate	522	mg/L
MW-31	9/13/2006	Sulfate	516	mg/L
MW-31	10/25/2006	Sulfate	526	mg/L
MW-31	3/15/2007	Sulfate	516	mg/L
MW-31	8/27/2007	Sulfate	532	mg/L
MW-31	10/24/2007	Sulfate	497	mg/L
MW-31	3/19/2008	Sulfate	521	mg/L
MW-31	6/3/2008	Sulfate	514	mg/L
MW-31	8/4/2008	Sulfate	499	mg/L
MW-31	11/11/2008	Sulfate	541	mg/L
MW-31	2/3/2009	Sulfate	488	mg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	5/13/2009	Sulfate	493	mg/L
MW-31	8/24/2009	Sulfate	460	mg/L
MW-31	10/14/2009	Sulfate	497	mg/L
MW-31	2/9/2010	Sulfate	507	mg/L
MW-31	4/20/2010	Sulfate	522	mg/L
MW-31	9/13/2010	Sulfate	527	mg/L
MW-31	11/9/2010	Sulfate	539	mg/L
MW-31	2/1/2011	Sulfate	538	mg/L
MW-31	3/14/2011	Sulfate	531	mg/L
MW-31	4/1/2011	Sulfate	503	mg/L
MW-31	5/10/2011	Sulfate	512	mg/L
MW-31	6/20/2011	Sulfate	540	mg/L
MW-31	7/5/2011	Sulfate	532	mg/L
MW-31	8/2/2011	Sulfate	537	mg/L
MW-31	9/6/2011	Sulfate	541	mg/L
MW-31	10/3/2011	Sulfate	539	mg/L
MW-31	11/8/2011	Sulfate	552	mg/L
MW-31	12/12/2011	Sulfate	530	mg/L
MW-31	1/24/2012	Sulfate	539	mg/L
MW-31	2/13/2012	Sulfate	538	mg/L
MW-31	3/13/2012	Sulfate	517	mg/L
MW-31	4/9/2012	Sulfate	547	mg/L
MW-31	5/2/2012	Sulfate	532	mg/L
MW-31	6/18/2012	Sulfate	497	mg/L
MW-31	7/9/2012	Sulfate	529	mg/L
MW-31	8/6/2012	Sulfate	571	mg/L
MW-31	9/18/2012	Sulfate	561	mg/L
MW-31	10/22/2012	Sulfate	545	mg/L
MW-31	11/6/2012	Sulfate	557	mg/L
MW-31	12/18/2012	Sulfate	664	mg/L
MW-31	1/22/2013	Sulfate	611	mg/L
MW-31	2/19/2013	Sulfate	644	mg/L
MW-31	3/19/2013	Sulfate	611	mg/L
MW-31	4/16/2013	Sulfate	668	mg/L
MW-31	5/13/2013	Sulfate	630	mg/L
MW-31	6/24/2013	Sulfate	659	mg/L
MW-31	7/9/2013	Sulfate	659	mg/L
MW-31	8/19/2013	Sulfate	656	mg/L
MW-31	9/17/2013	Sulfate	666	mg/L
MW-31	10/23/2013	Sulfate	637	mg/L
MW-31	11/18/2013	Sulfate	609	mg/L
MW-31	12/17/2013	Sulfate	656	mg/L
MW-31	1/7/2014	Sulfate	558	mg/L
MW-31	2/17/2014	Sulfate	480	mg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	3/10/2014	Sulfate	681	mg/L
MW-31	4/28/2014	Sulfate	527	mg/L
MW-31	5/13/2014	Sulfate	639	mg/L
MW-31	6/2/2014	Sulfate	555	mg/L
MW-31	7/28/2014	Sulfate	600	mg/L
MW-31	8/18/2014	Sulfate	620	mg/L
MW-31	9/3/2014	Sulfate	560	mg/L
MW-31	10/6/2014	Sulfate	606	mg/L
MW-31	11/4/2014	Sulfate	639	mg/L
MW-31	12/9/2014	Sulfate	687	mg/L
MW-31	1/20/2015	Sulfate	669	mg/L
MW-31	2/2/2015	Sulfate	623	mg/L
MW-31	3/3/2015	Sulfate	616	mg/L
MW-31	4/7/2015	Sulfate	642	mg/L
MW-31	5/11/2015	Sulfate	668	mg/L
MW-31	6/23/2015	Sulfate	691	mg/L
MW-31	7/6/2015	Sulfate	684	mg/L
MW-31	8/10/2015	Sulfate	640	mg/L
MW-31	9/15/2015	Sulfate	638	mg/L
MW-31	10/6/2015	Sulfate	655	mg/L
MW-31	11/9/2015	Sulfate	646	mg/L
MW-31	12/8/2015	Sulfate	690	mg/L
MW-31	1/19/2016	Sulfate	675	mg/L
MW-31	2/15/2016	Sulfate	631	mg/L
MW-31	3/2/2016	Sulfate	654	mg/L
MW-31	4/12/2016	Sulfate	715	mg/L
MW-31	5/3/2016	Sulfate	699	mg/L
MW-31	6/15/2016	Sulfate	748	mg/L
MW-31	7/12/2016	Sulfate	712	mg/L
MW-31	8/16/2016	Sulfate	766	mg/L
MW-31	9/13/2016	Sulfate	703	mg/L
MW-31	10/4/2016	Sulfate	720	mg/L
MW-31	11/1/2016	Sulfate	752	mg/L
MW-31	12/5/2016	Sulfate	748	mg/L
MW-31	1/17/2017	Sulfate	809	mg/L
MW-31	2/7/2017	Sulfate	751	mg/L
MW-31	3/6/2017	Sulfate	741	mg/L
MW-31	4/4/2017	Sulfate	758	mg/L
MW-31	5/1/2017	Sulfate	741	mg/L
MW-31	6/5/2017	Sulfate	808	mg/L
MW-31	7/11/2017	Sulfate	747	mg/L
MW-31	8/14/2017	Sulfate	916	mg/L
MW-31	9/11/2017	Sulfate	762	mg/L
MW-31	10/2/2017	Sulfate	823	mg/L

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	11/1/2017	Sulfate	847	mg/L
MW-31	12/4/2017	Sulfate	825	mg/L
MW-31	1/24/2018	Sulfate	813	mg/L
MW-31	2/20/2018	Sulfate	835	mg/L
MW-31	4/17/2018	Sulfate	857	mg/L
MW-31	6/18/2018	Sulfate	976	mg/L
MW-31	7/23/2018	Sulfate	857	mg/L
MW-31	8/10/2018	Sulfate	841	mg/L
MW-31	9/10/2018	Sulfate	893	mg/L
MW-31	10/24/2018	Sulfate	950	mg/L
MW-31	11/13/2018	Sulfate	841	mg/L
MW-31	12/10/2018	Sulfate	905	mg/L
MW-31	1/15/2019	Sulfate	851	mg/L
MW-31	2/12/2019	Sulfate	893	mg/L
MW-31	3/5/2019	Sulfate	953	mg/L
MW-31	4/10/2019	Sulfate	917	mg/L
MW-31	7/15/2019	Sulfate	1150	mg/L
MW-31	10/9/2019	Sulfate	1010	mg/L
MW-31	11/12/2019	Sulfate	990	mg/L
MW-31	12/3/2019	Sulfate	1020	mg/L
MW-31	1/14/2020	Sulfate	1120	mg/L
MW-31	2/4/2020	Sulfate	1150	mg/L
MW-31	3/10/2020	Sulfate	1080	mg/L
MW-31	4/6/2020	Sulfate	1130	mg/L
MW-31	5/5/2020	Sulfate	1080	mg/L
MW-31	6/2/2020	Sulfate	1130	mg/L
MW-31	7/7/2020	Sulfate	1150	mg/L
MW-31	8/10/2020	Sulfate	1100	mg/L
MW-31	9/1/2020	Sulfate	1110	mg/L
MW-31	10/19/2020	Sulfate	1100	mg/L
MW-31	11/16/2020	Sulfate	676	mg/L
MW-31	12/7/2020	Sulfate	922	mg/L
MW-31	1/12/2021	Sulfate	1070	mg/L
MW-31	2/9/2021	Sulfate	1130	mg/L
MW-31	6/22/2005	pH	7.27	s.u.
MW-31	9/22/2005	pH	7.19	s.u.
MW-31	12/14/2005	pH	7.30	s.u.
MW-31	3/22/2006	pH	7.33	s.u.
MW-31	6/21/2006	pH	7.15	s.u.
MW-31	9/13/2006	pH	7.31	s.u.
MW-31	10/25/2006	pH	7.26	s.u.
MW-31	3/15/2007	pH	7.41	s.u.
MW-31	8/27/2007	pH	7.08	s.u.
MW-31	10/24/2007	pH	6.97	s.u.

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	3/19/2008	pH	6.95	s.u.
MW-31	6/3/2008	pH	7.20	s.u.
MW-31	8/4/2008	pH	7.20	s.u.
MW-31	11/10/2008	pH	7.42	s.u.
MW-31	2/3/2009	pH	7.30	s.u.
MW-31	5/13/2009	pH	7.12	s.u.
MW-31	8/10/2009	pH	7.34	s.u.
MW-31	8/24/2009	pH	7.18	s.u.
MW-31	10/14/2009	pH	7.05	s.u.
MW-31	12/2/2009	pH	7.17	s.u.
MW-31	2/9/2010	pH	6.96	s.u.
MW-31	4/20/2010	pH	7.38	s.u.
MW-31	5/21/2010	pH	6.95	s.u.
MW-31	6/15/2010	pH	7.01	s.u.
MW-31	7/21/2010	pH	7.80	s.u.
MW-31	8/24/2010	pH	7.10	s.u.
MW-31	9/13/2010	pH	7.66	s.u.
MW-31	9/21/2010	pH	7.13	s.u.
MW-31	10/19/2010	pH	6.92	s.u.
MW-31	11/9/2010	pH	6.98	s.u.
MW-31	12/14/2010	pH	6.95	s.u.
MW-31	1/10/2011	pH	6.65	s.u.
MW-31	2/1/2011	pH	7.21	s.u.
MW-31	3/14/2011	pH	7.43	s.u.
MW-31	4/1/2011	pH	7.01	s.u.
MW-31	5/10/2011	pH	6.73	s.u.
MW-31	6/20/2011	pH	6.16	s.u.
MW-31	7/5/2011	pH	6.64	s.u.
MW-31	8/2/2011	pH	6.67	s.u.
MW-31	9/6/2011	pH	7.03	s.u.
MW-31	10/3/2011	pH	7.28	s.u.
MW-31	11/8/2011	pH	7.01	s.u.
MW-31	11/29/2011	pH	7.34	s.u.
MW-31	12/12/2011	pH	7.46	s.u.
MW-31	1/24/2012	pH	6.78	s.u.
MW-31	2/13/2012	pH	7.37	s.u.
MW-31	4/9/2012	pH	7.15	s.u.
MW-31	5/2/2012	pH	7.19	s.u.
MW-31	7/9/2012	pH	7.53	s.u.
MW-31	8/6/2012	pH	6.96	s.u.
MW-31	9/18/2012	pH	7.10	s.u.
MW-31	10/22/2012	pH	7.05	s.u.
MW-31	11/6/2012	pH	7.04	s.u.
MW-31	12/18/2012	pH	7.10	s.u.

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	1/22/2013	pH	6.94	s.u.
MW-31	2/19/2013	pH	7.32	s.u.
MW-31	3/19/2013	pH	7.28	s.u.
MW-31	4/16/2013	pH	6.37	s.u.
MW-31	5/13/2013	pH	7.92	s.u.
MW-31	6/24/2013	pH	7.10	s.u.
MW-31	7/9/2013	pH	6.98	s.u.
MW-31	8/19/2013	pH	7.36	s.u.
MW-31	9/17/2013	pH	7.06	s.u.
MW-31	10/23/2013	pH	7.35	s.u.
MW-31	11/18/2013	pH	6.99	s.u.
MW-31	12/17/2013	pH	7.23	s.u.
MW-31	1/7/2014	pH	7.13	s.u.
MW-31	2/17/2014	pH	6.45	s.u.
MW-31	3/10/2014	pH	6.53	s.u.
MW-31	4/28/2014	pH	7.45	s.u.
MW-31	5/13/2014	pH	6.83	s.u.
MW-31	6/2/2014	pH	8.23	s.u.
MW-31	7/28/2014	pH	6.88	s.u.
MW-31	8/18/2014	pH	7.60	s.u.
MW-31	9/3/2014	pH	6.94	s.u.
MW-31	10/6/2014	pH	6.97	s.u.
MW-31	11/4/2014	pH	6.69	s.u.
MW-31	12/9/2014	pH	6.73	s.u.
MW-31	1/20/2015	pH	6.49	s.u.
MW-31	2/2/2015	pH	6.42	s.u.
MW-31	3/3/2015	pH	6.40	s.u.
MW-31	4/7/2015	pH	6.80	s.u.
MW-31	5/11/2015	pH	6.74	s.u.
MW-31	6/1/2015	pH	7.14	s.u.
MW-31	6/23/2015	pH	7.08	s.u.
MW-31	7/6/2015	pH	7.22	s.u.
MW-31	8/10/2015	pH	6.80	s.u.
MW-31	9/15/2015	pH	6.73	s.u.
MW-31	10/6/2015	pH	6.47	s.u.
MW-31	11/9/2015	pH	6.36	s.u.
MW-31	12/8/2015	pH	6.70	s.u.
MW-31	1/19/2016	pH	7.04	s.u.
MW-31	2/15/2016	pH	7.21	s.u.
MW-31	3/2/2016	pH	6.83	s.u.
MW-31	4/12/2016	pH	6.93	s.u.
MW-31	5/3/2016	pH	6.48	s.u.
MW-31	6/15/2016	pH	7.01	s.u.
MW-31	7/12/2016	pH	6.49	s.u.

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	8/16/2016	pH	6.92	s.u.
MW-31	9/13/2016	pH	6.35	s.u.
MW-31	10/4/2016	pH	6.99	s.u.
MW-31	11/1/2016	pH	6.92	s.u.
MW-31	12/5/2016	pH	6.79	s.u.
MW-31	1/17/2017	pH	6.75	s.u.
MW-31	2/7/2017	pH	6.30	s.u.
MW-31	3/6/2017	pH	6.39	s.u.
MW-31	4/4/2017	pH	6.26	s.u.
MW-31	5/1/2017	pH	6.87	s.u.
MW-31	6/5/2017	pH	6.90	s.u.
MW-31	7/11/2017	pH	6.94	s.u.
MW-31	8/14/2017	pH	6.29	s.u.
MW-31	9/11/2017	pH	6.32	s.u.
MW-31	10/2/2017	pH	7.01	s.u.
MW-31	11/1/2017	pH	7.04	s.u.
MW-31	12/4/2017	pH	7.31	s.u.
MW-31	1/24/2018	pH	6.46	s.u.
MW-31	2/20/2018	pH	7.25	s.u.
MW-31	3/5/2018	pH	6.92	s.u.
MW-31	4/17/2018	pH	6.75	s.u.
MW-31	5/14/2018	pH	7.05	s.u.
MW-31	6/18/2018	pH	7.18	s.u.
MW-31	7/23/2018	pH	7.17	s.u.
MW-31	8/10/2018	pH	7.00	s.u.
MW-31	9/10/2018	pH	7.13	s.u.
MW-31	10/24/2018	pH	6.59	s.u.
MW-31	11/13/2018	pH	7.08	s.u.
MW-31	12/10/2018	pH	7.03	s.u.
MW-31	1/15/2019	pH	6.89	s.u.
MW-31	2/12/2019	pH	6.24	s.u.
MW-31	3/5/2019	pH	7.15	s.u.
MW-31	4/10/2019	pH	7.29	s.u.
MW-31	5/7/2019	pH	7.02	s.u.
MW-31	6/3/2019	pH	7.02	s.u.
MW-31	7/15/2019	pH	6.79	s.u.
MW-31	8/5/2019	pH	7.44	s.u.
MW-31	9/23/2019	pH	7.13	s.u.
MW-31	10/9/2019	pH	7.23	s.u.
MW-31	11/12/2019	pH	7.33	s.u.
MW-31	12/3/2019	pH	7.29	s.u.
MW-31	1/14/2020	pH	6.97	s.u.
MW-31	2/4/2020	pH	7.26	s.u.
MW-31	3/10/2020	pH	7.15	s.u.

Appendix A-3: Data Used for Statistical Analysis

Well	Sample Date	Parameter	Result	Units
MW-31	4/6/2020	pH	7.25	s.u.
MW-31	5/5/2020	pH	6.60	s.u.
MW-31	6/2/2020	pH	6.84	s.u.
MW-31	7/7/2020	pH	7.44	s.u.
MW-31	8/10/2020	pH	7.40	s.u.
MW-31	9/1/2020	pH	7.12	s.u.
MW-31	10/19/2020	pH	6.79	s.u.
MW-31	11/16/2020	pH	7.12	s.u.
MW-31	12/7/2020	pH	7.21	s.u.
MW-31	1/12/2021	pH	7.20	s.u.
MW-31	2/9/2021	pH	7.25	s.u.

Notes:

µg/L = micrograms per liter.

mg/L = milligrams per liter.

s.u. = standard units of pH.

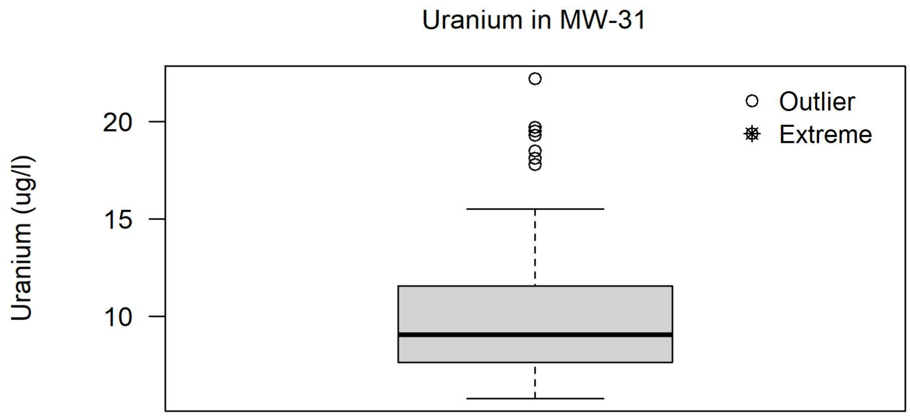
Appendix A-4: Data Removed from Analysis

Reason	Location ID	Date Sampled	Parameter Name	Report Result	Report Units
Extreme (Low)	MW-31	11/11/2008	Fluoride	0.32	mg/L

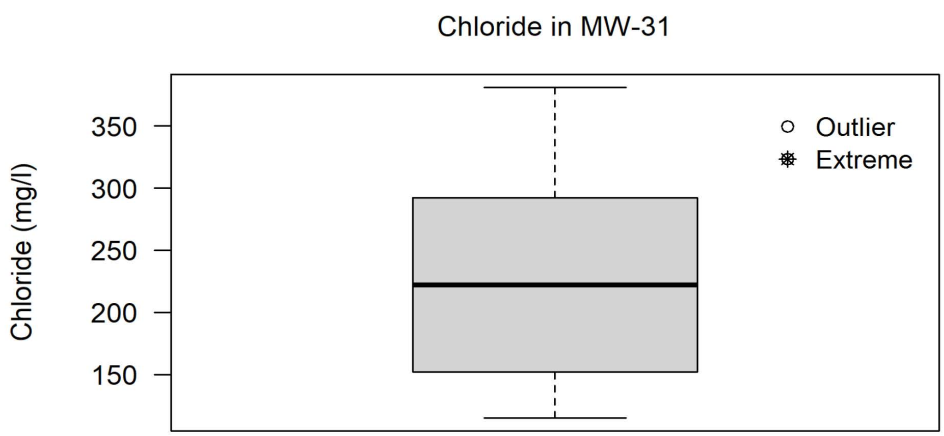
Note:

mg/L = milligrams per liter.

Appendix A-5: Box Plots for SAR and Indicator Parameters in MW-31

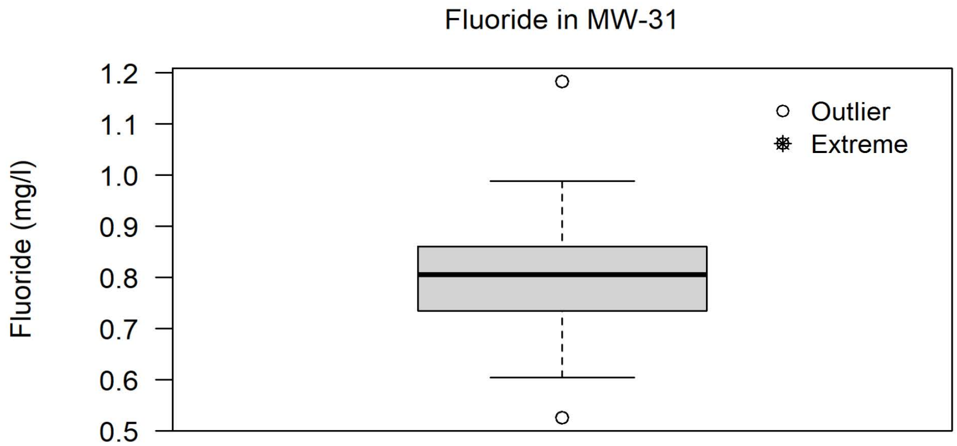


Percent nondetect: 0%
Min: 5.77, Mean: 10.23, Max: 22.2, Std Dev: 3.68
Upper extreme threshold (Q75 + 3xH): 23.2325
Lower extreme threshold (Q25 - 3xH): -4.085

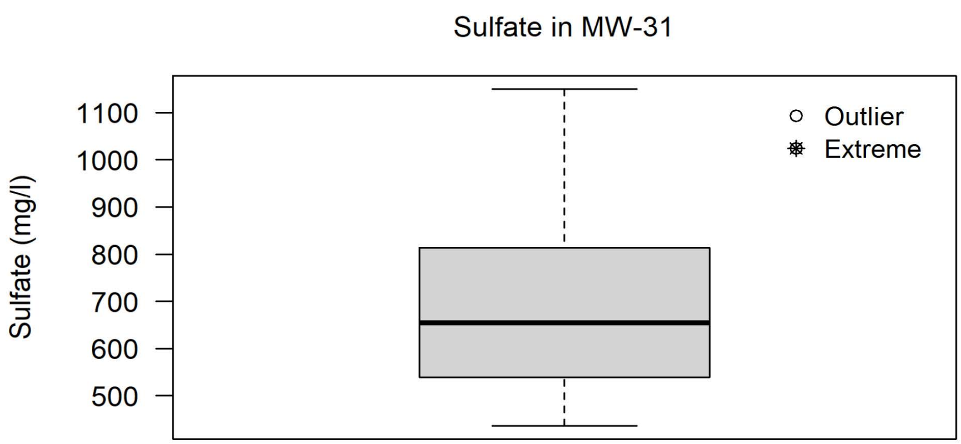


Percent nondetect: 0%
Min: 115, Mean: 229.8, Max: 381, Std Dev: 79.89
Upper extreme threshold (Q75 + 3xH): 704.75
Lower extreme threshold (Q25 - 3xH): -261.25

Appendix A-5: Box Plots for SAR and Indicator Parameters in MW-31

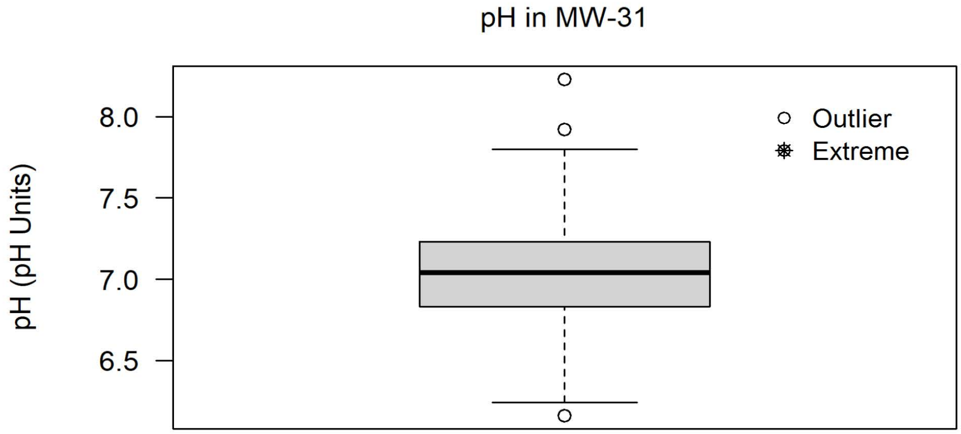


Percent nondetect: 0%
Min: 0.526, Mean: 0.8, Max: 1.183244, Std Dev: 0.11
Upper extreme threshold (Q75 + 3xH): 1.235
Lower extreme threshold (Q25 - 3xH): 0.36



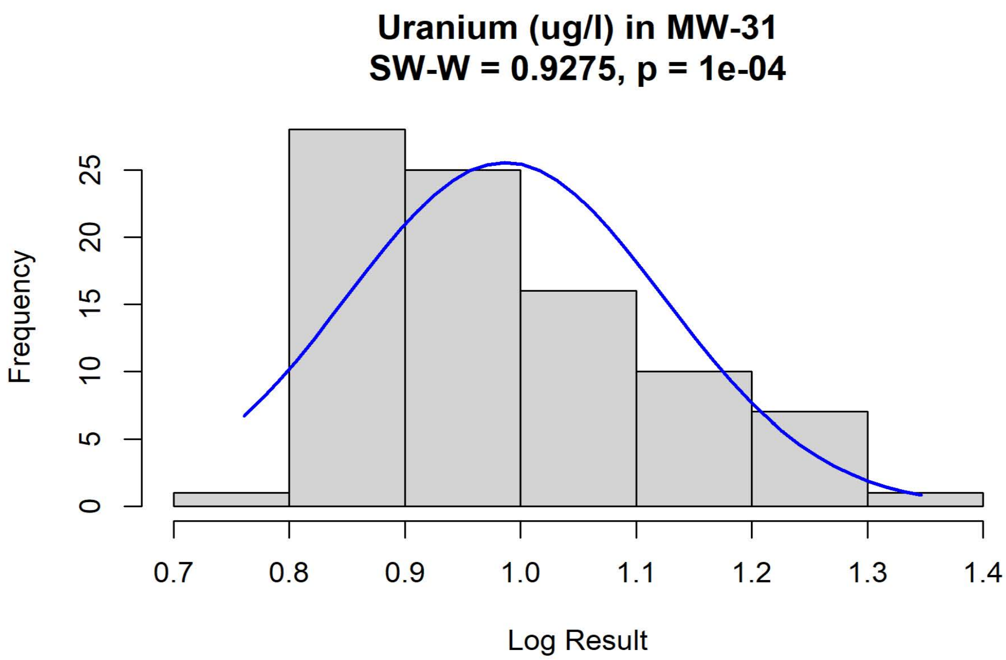
Percent nondetect: 0%
Min: 436, Mean: 699.81, Max: 1150, Std Dev: 190.5
Upper extreme threshold (Q75 + 3xH): 1635
Lower extreme threshold (Q25 - 3xH): -283

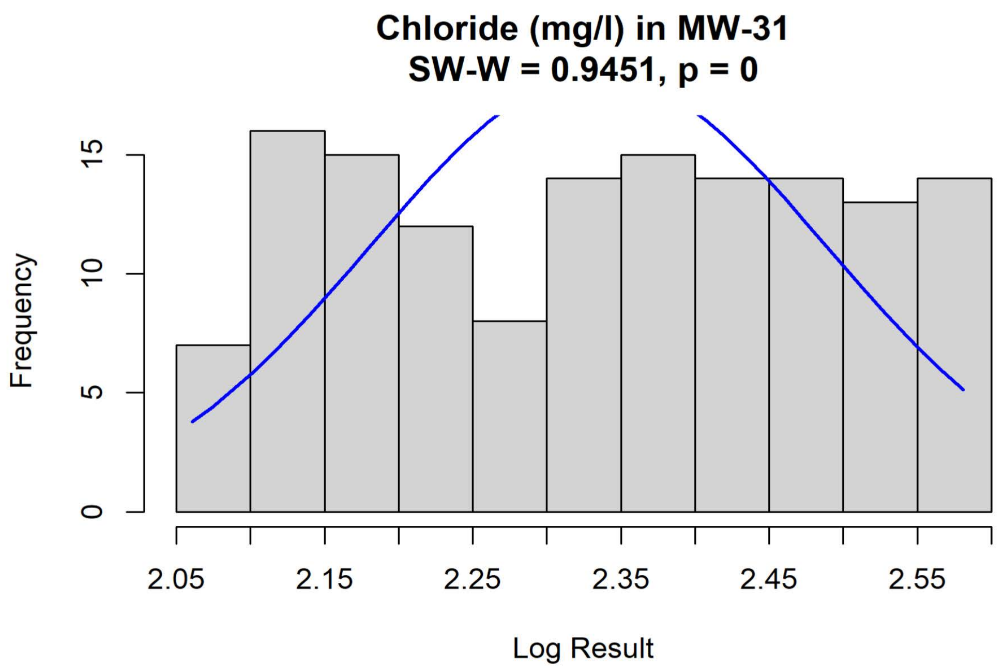
Appendix A-5: Box Plots for SAR and Indicator Parameters in MW-31



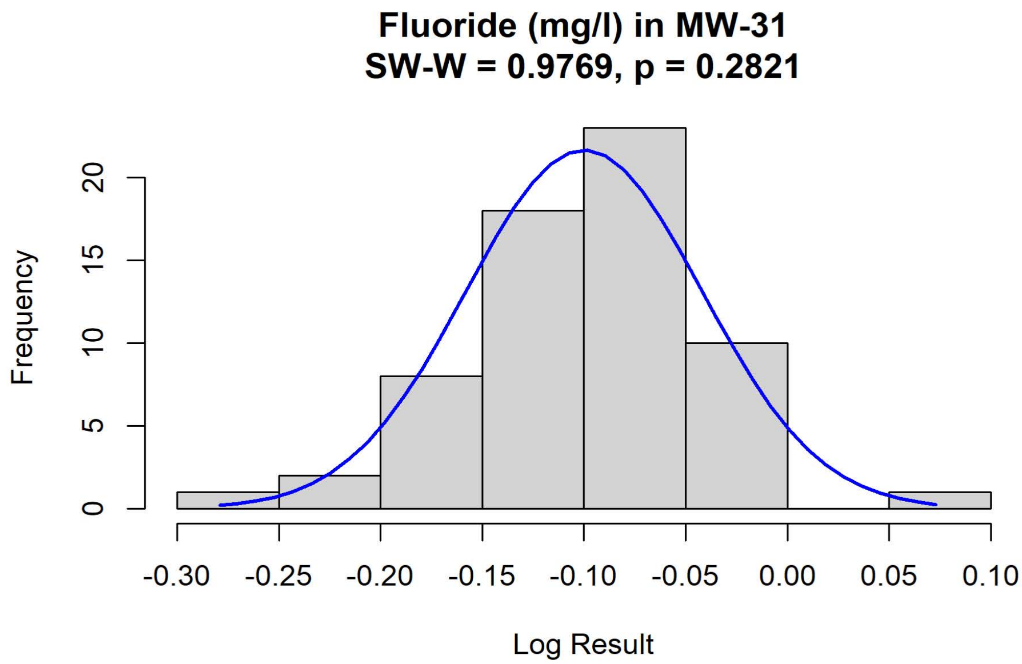
Percent nondetect: 0%
Min: 6.16, Mean: 7.01, Max: 8.23, Std Dev: 0.34
Upper extreme threshold (Q75 + 3xH): 8.43
Lower extreme threshold (Q25 - 3xH): 5.63

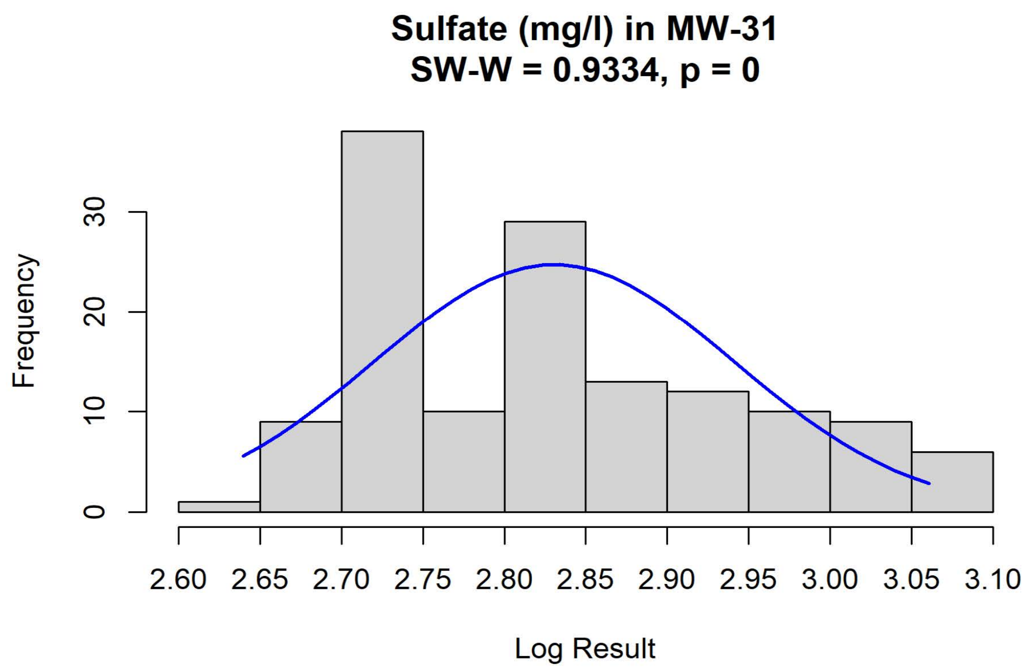
Appendix A-6: Histograms for SAR and Indicator Parameters in MW-31



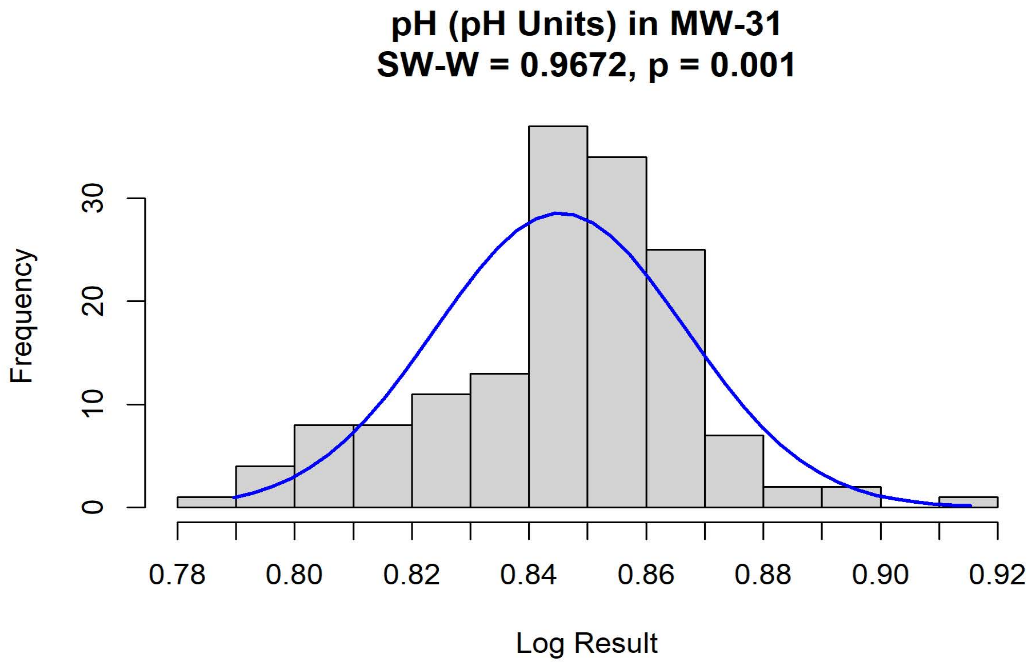


Appendix A-6: Histograms for SAR and Indicator Parameters in MW-31

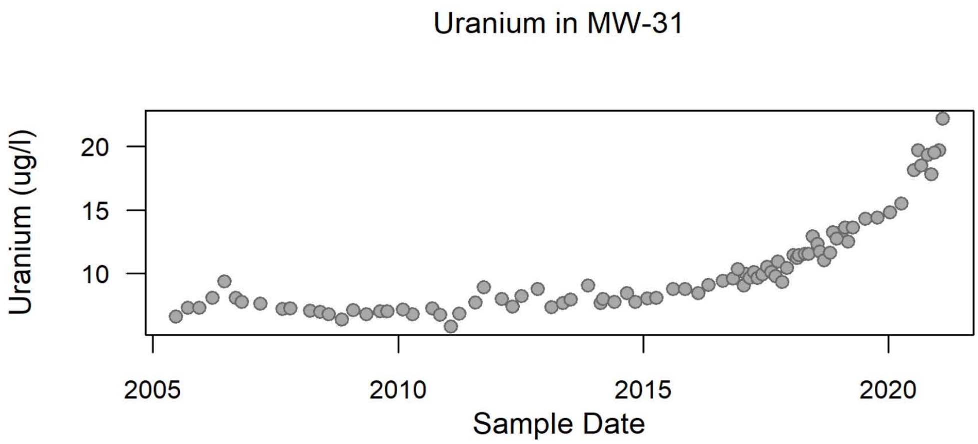


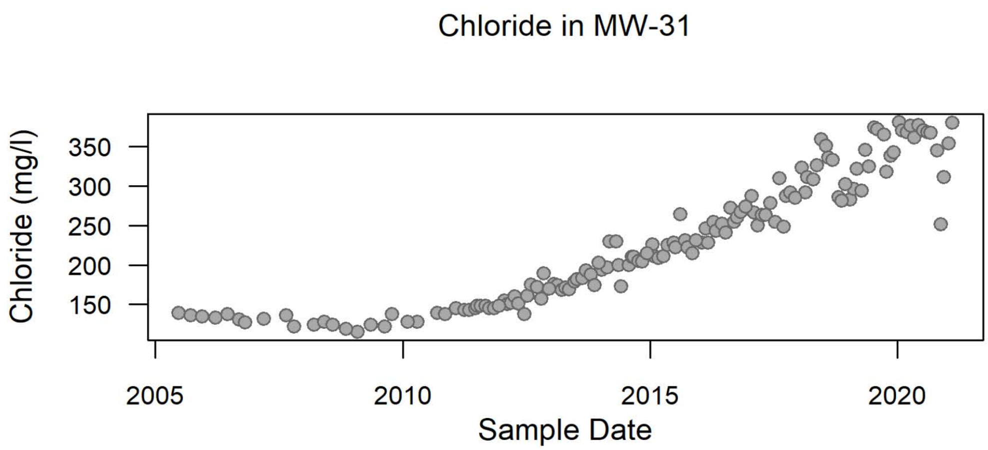


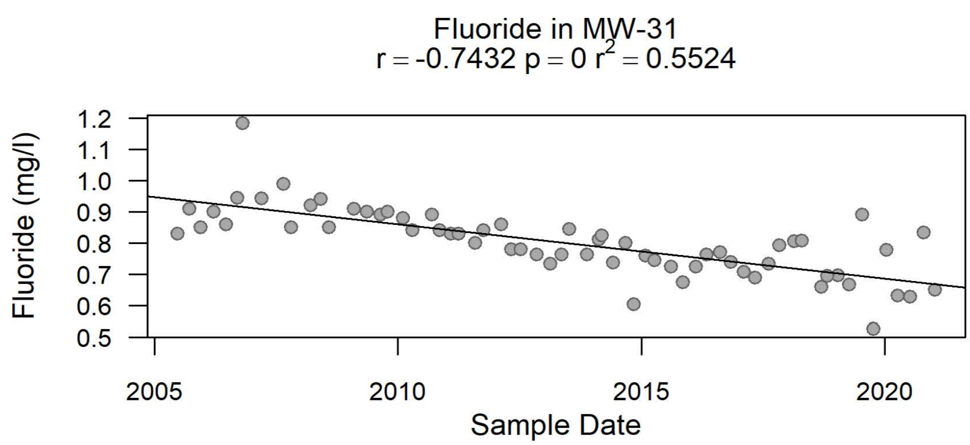
Appendix A-6: Histograms for SAR and Indicator Parameters in MW-31



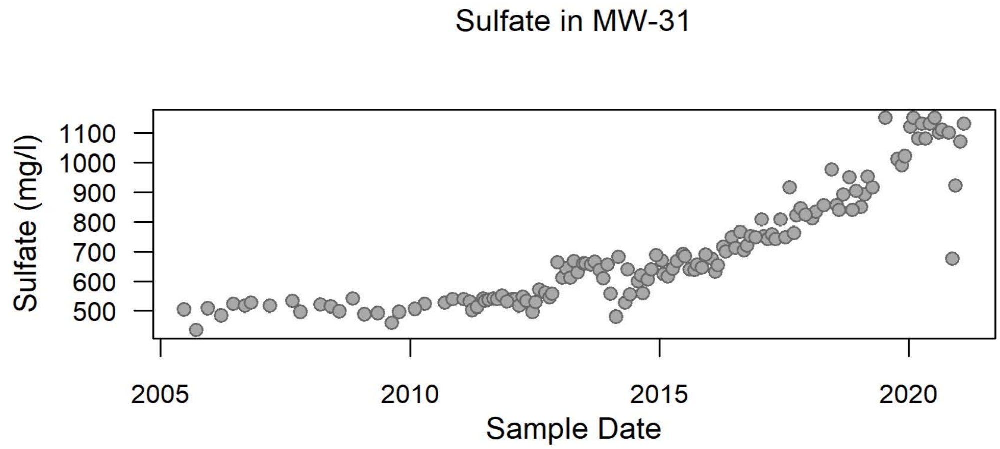
Appendix A-7: Time Series Plots and Linear Regressions for SAR and Indicator Parameters in MW-31

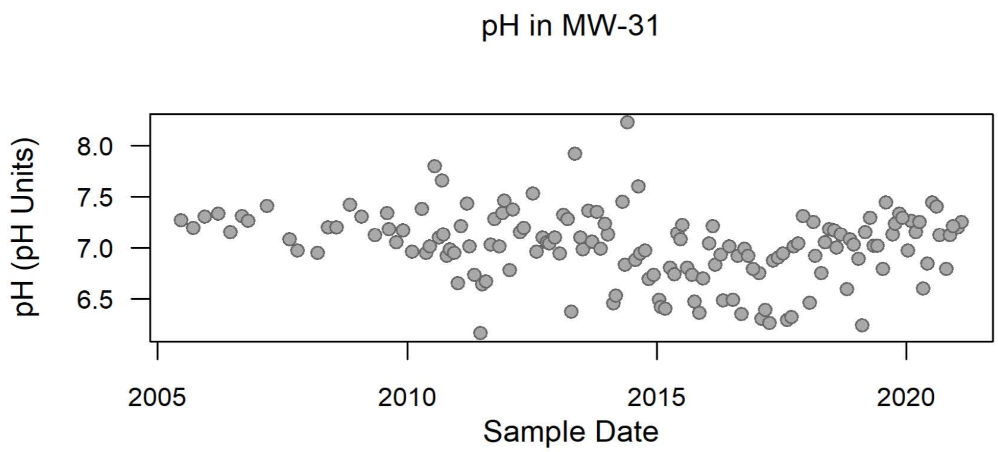




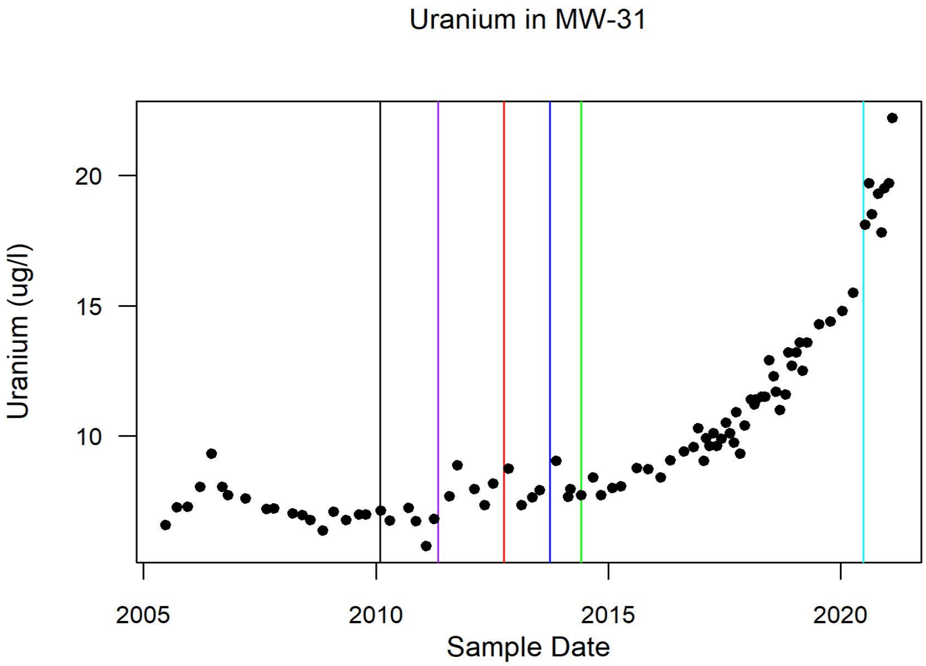


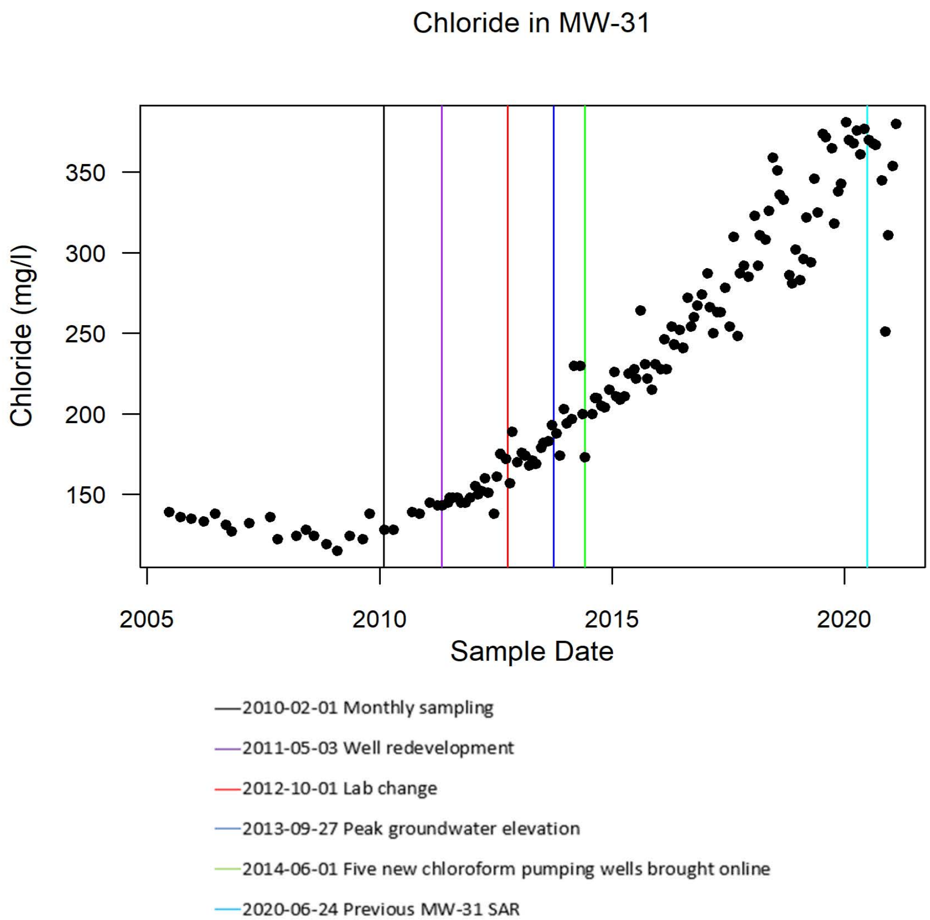
Appendix A-7: Time Series Plots and Linear Regressions for SAR and Indicator Parameters in MW-31



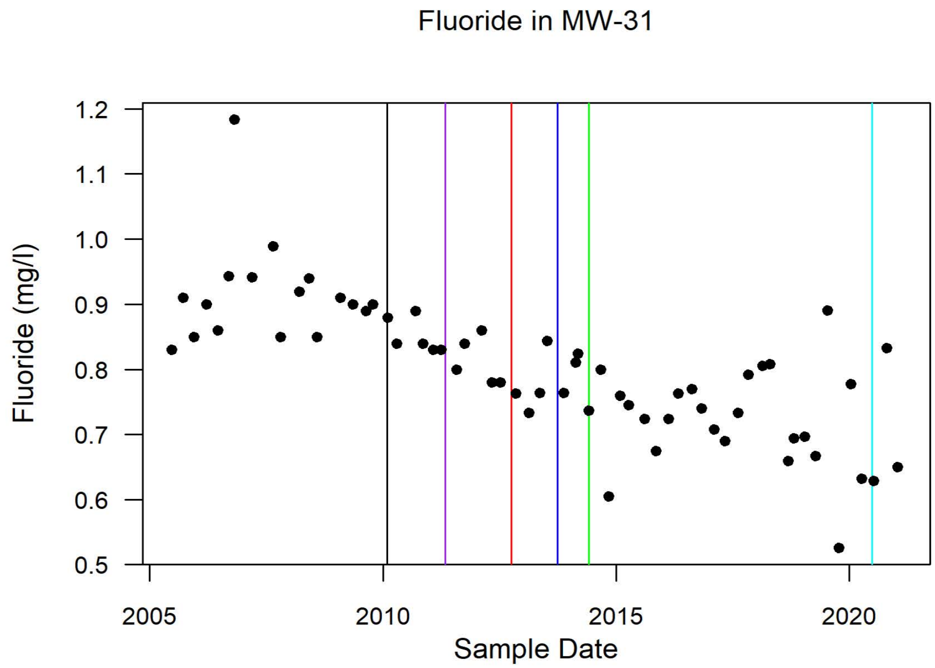


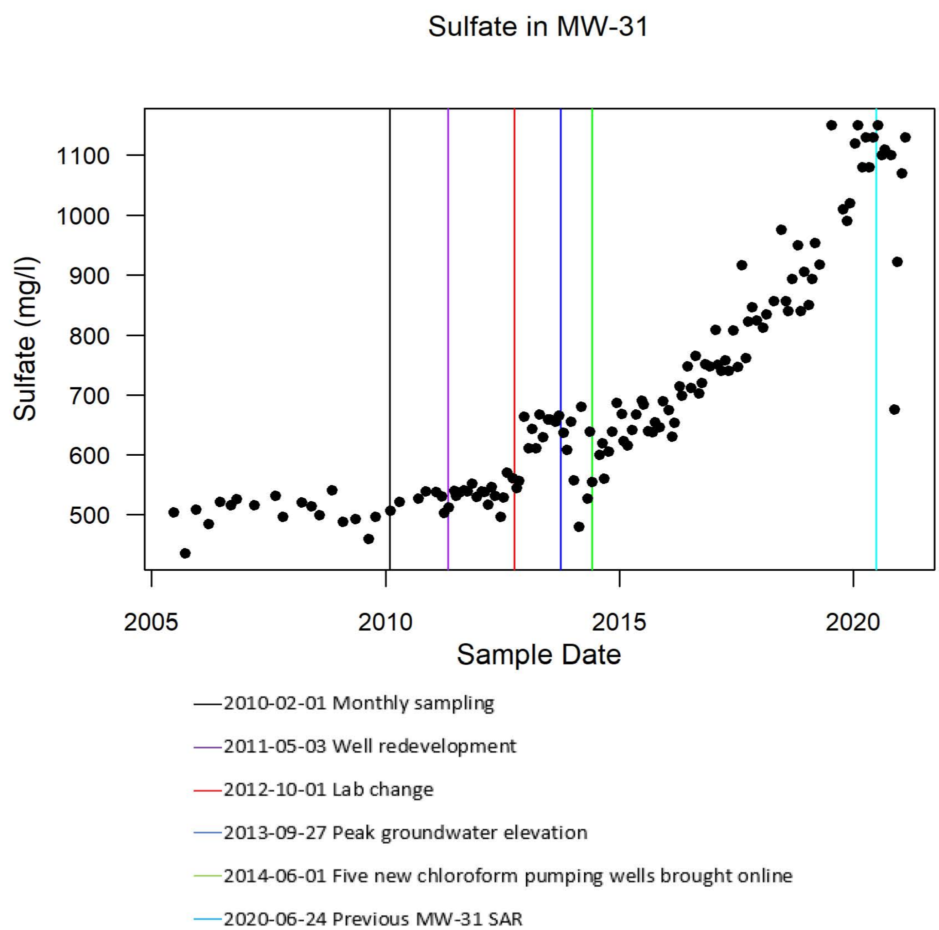
Appendix A-8: Time Series Plots for SAR and Indicator Parameters in MW-31 with Events/Inflection Points



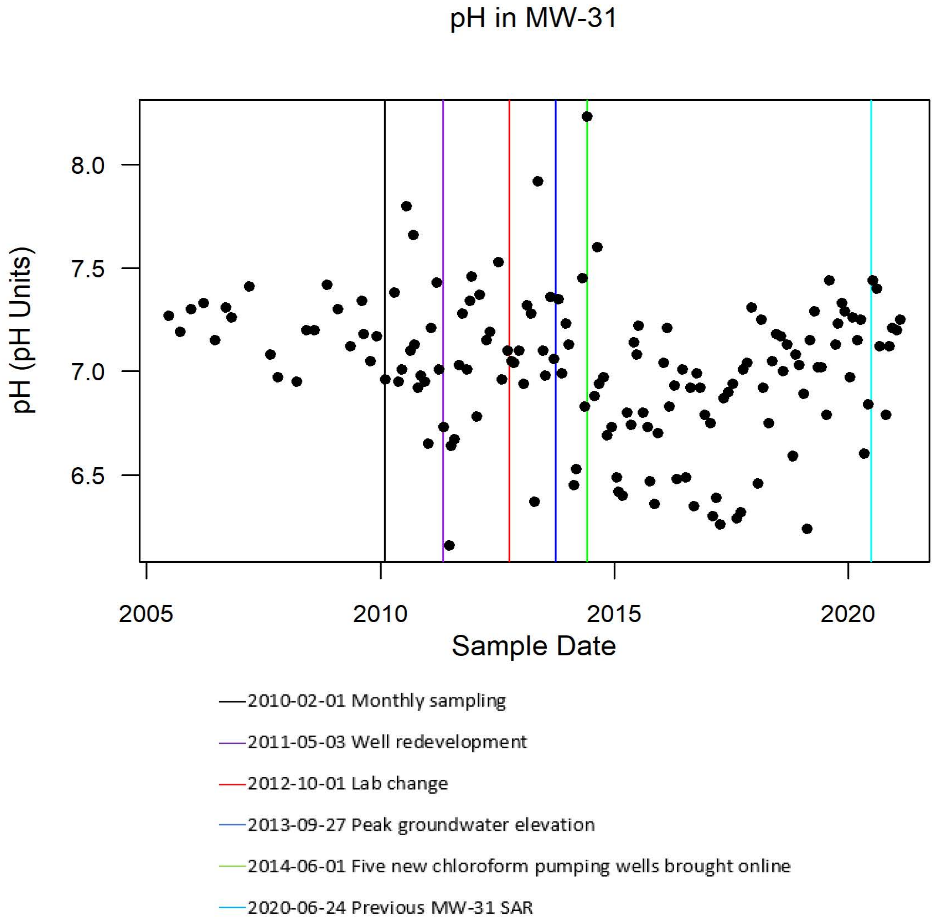


Appendix A-8: Time Series Plots for SAR and Indicator Parameters in MW-31 with Events/Inflection Points





Appendix A-8: Time Series Plots for SAR and Indicator Parameters in MW-31 with Events/Inflection Points



APPENDIX B

Statistical Analysis for Select Post-Inflection Uranium Datasets (Modified Approach) for Purposes of Calculating GWCL

Appendix B-1: Summary of Statistical Analysis and GWCL Calculation for Data Subsets (Modified Approach)

Well	Constituent	Data Set	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]		Significant Trend	Previously Identified Increasing Trend?	Mean + 2σ	Mean x 1.5	Upper Tolerance Limit (UTL)	Highest Historical Value (HHV)	Fractional Approach GWCL	Current GWCL §	Flowsheet GWCL	Rationale	Modified Approach GWCL*	Modified Approach GWCL Rationale
							W	p		r^2	p	S	p												
MW-31	Uranium	Complete	88	0	10.23	3.68	0.9275	0.0001	No	N/A	N/A	3039.00	0.00E+00	Increasing	Yes	17.58	15.34	19.7	22.20	15	15	22.2	HHV		
MW-31	Uranium	Post Sep 2012	59	0	11.67	3.69	0.9384	0.0050	No	N/A	N/A	1505.00	0.00E+00	Increasing	Yes	19.05	17.51	19.7	22.20	15	15	22.2	HHV		
MW-31	Uranium	Post May 2014	52	0	12.16	3.66	0.9427	0.0144	No	N/A	N/A	1175.00	0.00E+00	Increasing	Yes	19.47	18.24	19.7	22.20	15	15	22.2	HHV		
MW-31	Uranium	Post July 2020	8	0	19.35	1.37	0.8968	0.2704	Yes	0.3996	0.0927	13.00	6.73E-02	No	Yes	22.09	29.03	23.71	22.20	15	15	22.2	HHV	29.03	Mean x 1.5

Notes:

σ = sigma.
%ND = percent of non-detected values.
μg/L = micrograms per liter.
FA= Fraction of GWQS as defined in UAC R317-6.
GWCL = Groundwater Compliance Limit.
HHV = Highest Historical Value.
mg/L = milligrams per liter.
N = number of valid data points.
NA= not applicable.
p = probability.
S = Mann-Kendall statistic.
s.u. = standard units of pH.
W = Shapiro-Wilk test value.

a = A regression test was performed on data that was determined to have normal or lognormal distribution.
b = The Mann-Kendall test was performed on data that are not normally or lognormally distributed.
Distribution = Distribution as determined by the Shapiro-Wilk distribution test for constituents with % Detect > 50% and N>8.
Mean = The arithmetic mean as determined for normally or lognormally distributed constituents with % Detect > 50%.
Standard Deviation = The standard deviation as determined for normally or lognormally 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.
§ = GWCL is based on the March 2019 Groundwater Discharge Permit or most recent Source Assessment Reports, where applicable.
r^2 = The measure of how well the trendline fits the data where r2=1 represents a perfect fit.

Appendix B-2: MW-31 Data Used for Analysis

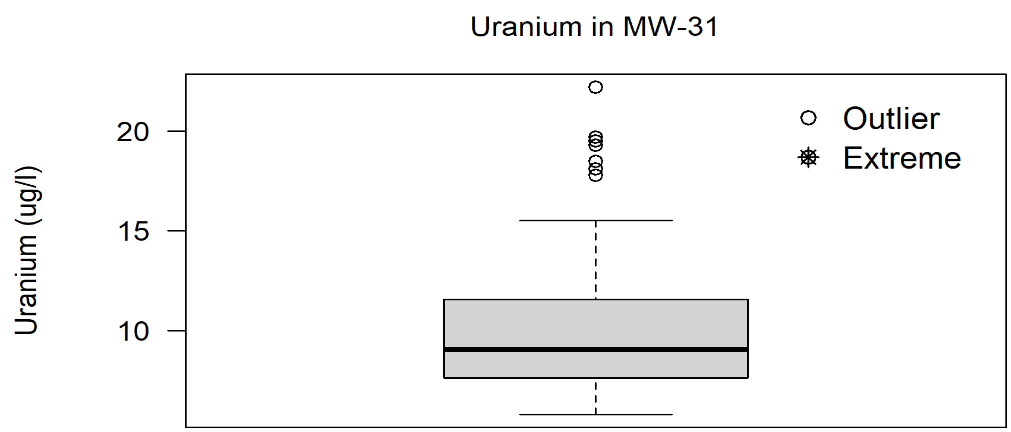
Well	Date Sampled	Parameter Name	Report Result	Report Units
MW-31	1/12/2021	Uranium	19.70	µg/L
MW-31	1/14/2020	Uranium	14.80	µg/L
MW-31	1/15/2019	Uranium	13.20	µg/L
MW-31	1/17/2017	Uranium	9.03	µg/L
MW-31	1/24/2018	Uranium	11.40	µg/L
MW-31	10/14/2009	Uranium	6.97	µg/L
MW-31	10/19/2020	Uranium	19.30	µg/L
MW-31	10/2/2017	Uranium	10.90	µg/L
MW-31	10/24/2007	Uranium	7.20	µg/L
MW-31	10/24/2018	Uranium	11.60	µg/L
MW-31	10/25/2006	Uranium	7.71	µg/L
MW-31	10/3/2011	Uranium	8.87	µg/L
MW-31	10/9/2019	Uranium	14.40	µg/L
MW-31	11/1/2016	Uranium	9.56	µg/L
MW-31	11/1/2017	Uranium	9.31	µg/L
MW-31	11/11/2008	Uranium	6.35	µg/L
MW-31	11/13/2018	Uranium	13.20	µg/L
MW-31	11/16/2020	Uranium	17.80	µg/L
MW-31	11/18/2013	Uranium	9.03	µg/L
MW-31	11/4/2014	Uranium	7.71	µg/L
MW-31	11/6/2012	Uranium	8.73	µg/L
MW-31	11/9/2010	Uranium	6.72	µg/L
MW-31	11/9/2015	Uranium	8.72	µg/L
MW-31	12/10/2018	Uranium	12.70	µg/L
MW-31	12/14/2005	Uranium	7.27	µg/L
MW-31	12/4/2017	Uranium	10.40	µg/L
MW-31	12/5/2016	Uranium	10.30	µg/L
MW-31	12/7/2020	Uranium	19.50	µg/L
MW-31	2/1/2011	Uranium	5.77	µg/L
MW-31	2/12/2019	Uranium	13.60	µg/L
MW-31	2/13/2012	Uranium	7.96	µg/L
MW-31	2/15/2016	Uranium	8.41	µg/L
MW-31	2/17/2014	Uranium	7.65	µg/L
MW-31	2/19/2013	Uranium	7.33	µg/L
MW-31	2/2/2015	Uranium	8.00	µg/L
MW-31	2/20/2018	Uranium	11.20	µg/L
MW-31	2/3/2009	Uranium	7.08	µg/L
MW-31	2/7/2017	Uranium	9.92	µg/L
MW-31	2/9/2010	Uranium	7.12	µg/L
MW-31	2/9/2021	Uranium	22.20	µg/L
MW-31	3/10/2014	Uranium	7.96	µg/L
MW-31	3/15/2007	Uranium	7.60	µg/L
MW-31	3/19/2008	Uranium	7.02	µg/L
MW-31	3/22/2006	Uranium	8.04	µg/L
MW-31	3/5/2018	Uranium	11.40	µg/L

Appendix B-2: MW-31 Data Used for Analysis

Well	Date Sampled	Parameter Name	Report Result	Report Units
MW-31	3/5/2019	Uranium	12.50	µg/L
MW-31	3/6/2017	Uranium	9.62	µg/L
MW-31	4/1/2011	Uranium	6.81	µg/L
MW-31	4/10/2019	Uranium	13.60	µg/L
MW-31	4/17/2018	Uranium	11.50	µg/L
MW-31	4/20/2010	Uranium	6.74	µg/L
MW-31	4/4/2017	Uranium	10.10	µg/L
MW-31	4/6/2020	Uranium	15.50	µg/L
MW-31	4/7/2015	Uranium	8.07	µg/L
MW-31	5/1/2017	Uranium	9.62	µg/L
MW-31	5/13/2009	Uranium	6.76	µg/L
MW-31	5/13/2013	Uranium	7.63	µg/L
MW-31	5/14/2018	Uranium	11.50	µg/L
MW-31	5/2/2012	Uranium	7.34	µg/L
MW-31	5/3/2016	Uranium	9.05	µg/L
MW-31	6/18/2018	Uranium	12.90	µg/L
MW-31	6/2/2014	Uranium	7.72	µg/L
MW-31	6/21/2006	Uranium	9.32	µg/L
MW-31	6/22/2005	Uranium	6.56	µg/L
MW-31	6/3/2008	Uranium	6.95	µg/L
MW-31	6/5/2017	Uranium	9.89	µg/L
MW-31	7/11/2017	Uranium	10.50	µg/L
MW-31	7/15/2019	Uranium	14.30	µg/L
MW-31	7/23/2018	Uranium	12.30	µg/L
MW-31	7/7/2020	Uranium	18.10	µg/L
MW-31	7/9/2012	Uranium	8.17	µg/L
MW-31	7/9/2013	Uranium	7.90	µg/L
MW-31	8/10/2015	Uranium	8.76	µg/L
MW-31	8/10/2018	Uranium	11.70	µg/L
MW-31	8/10/2020	Uranium	19.70	µg/L
MW-31	8/14/2017	Uranium	10.10	µg/L
MW-31	8/16/2016	Uranium	9.41	µg/L
MW-31	8/2/2011	Uranium	7.68	µg/L
MW-31	8/24/2009	Uranium	6.97	µg/L
MW-31	8/27/2007	Uranium	7.18	µg/L
MW-31	8/4/2008	Uranium	6.77	µg/L
MW-31	9/1/2020	Uranium	18.50	µg/L
MW-31	9/10/2018	Uranium	11.00	µg/L
MW-31	9/11/2017	Uranium	9.74	µg/L
MW-31	9/13/2006	Uranium	8.03	µg/L
MW-31	9/13/2010	Uranium	7.23	µg/L
MW-31	9/22/2005	Uranium	7.25	µg/L
MW-31	9/3/2014	Uranium	8.40	µg/L

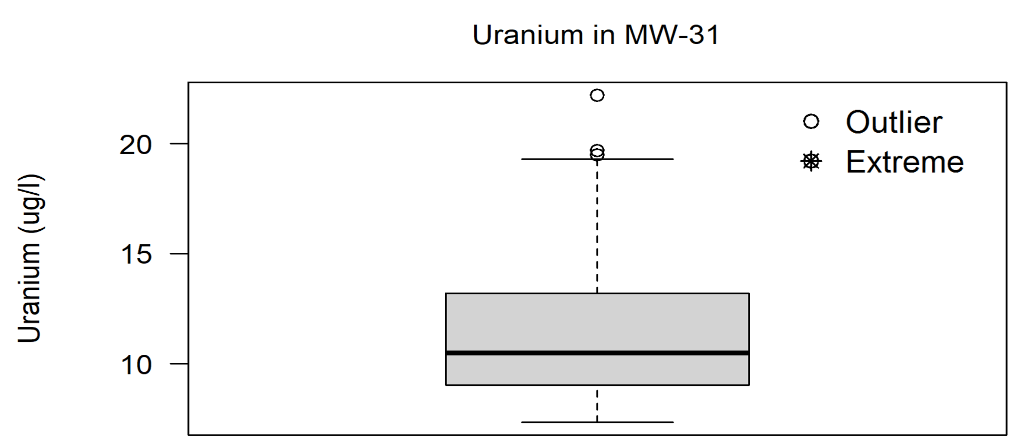
Appendix B-3: Box Plots for Select Uranium Datasets in MW-31

Uranium in MW-31 All Data



Percent nondetect: 0%
Min: 5.77, Mean: 10.23, Max: 22.2, Std Dev: 3.68
Upper extreme threshold (Q75 + 3xH): 23.2325
Lower extreme threshold (Q25 - 3xH): -4.085

Uranium in MW-31 Post September 2012

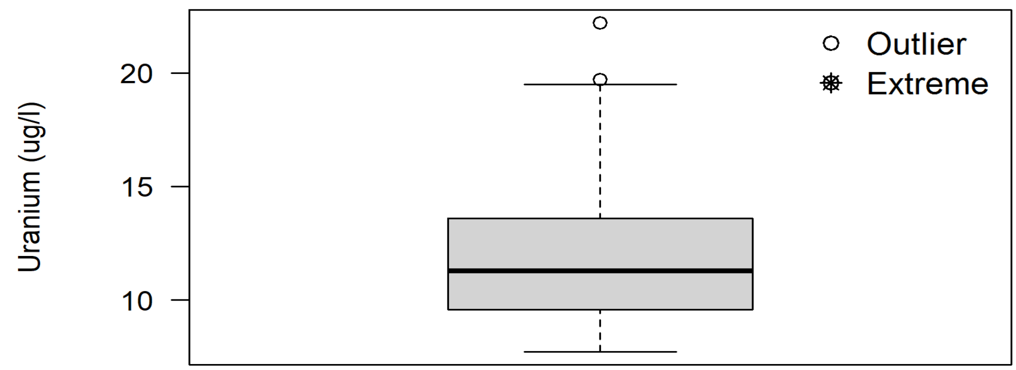


Percent nondetect: 0%
Min: 7.33, Mean: 11.67, Max: 22.2, Std Dev: 3.69
Upper extreme threshold (Q75 + 3xH): 25.71
Lower extreme threshold (Q25 - 3xH): -3.48

Appendix B-3: Box Plots for Select Uranium Datasets in MW-31

Uranium in MW-31 Post May 2014

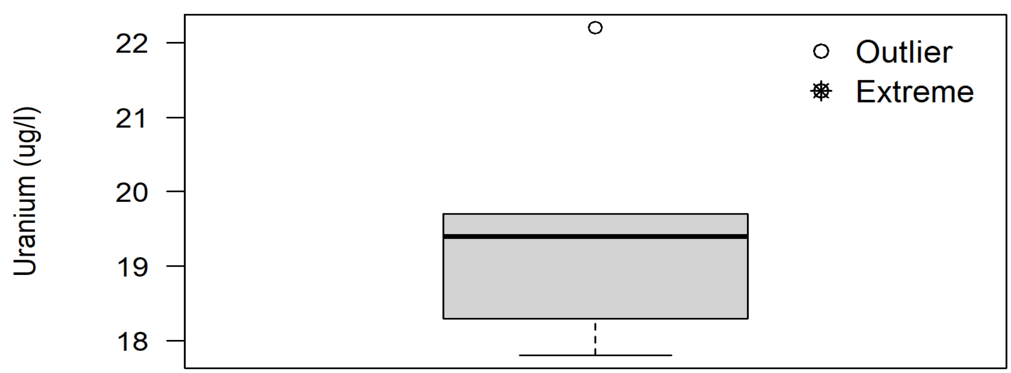
Uranium in MW-31



Percent nondetect: 0%
Min: 7.71, Mean: 12.16, Max: 22.2, Std Dev: 3.66
Upper extreme threshold (Q75 + 3xH): 25.585
Lower extreme threshold (Q25 - 3xH): -2.38

Uranium in MW-31 Post July 2020

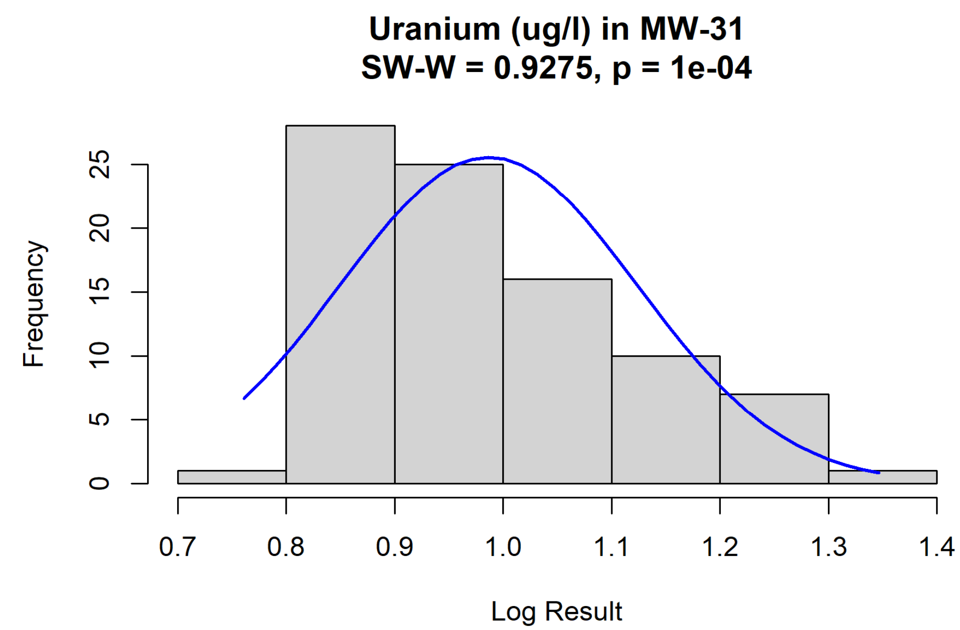
Uranium in MW-31



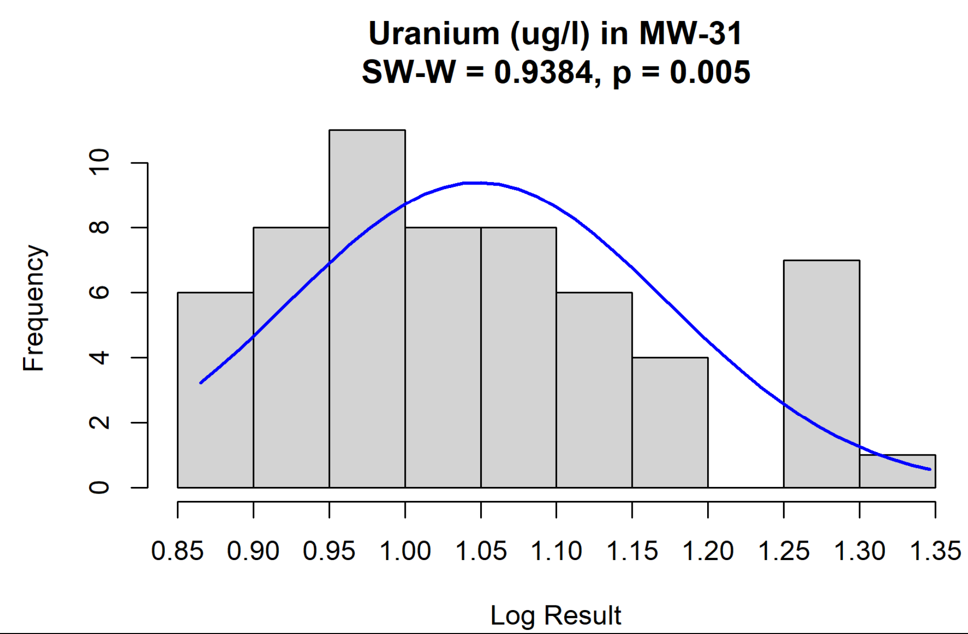
Percent nondetect: 0%
Min: 17.8, Mean: 19.35, Max: 22.2, Std Dev: 1.37
Upper extreme threshold (Q75 + 3xH): 23.6
Lower extreme threshold (Q25 - 3xH): 14.5

Appendix B-4: Histograms for Select Datasets in MW-31

Uranium in MW-31 All Data

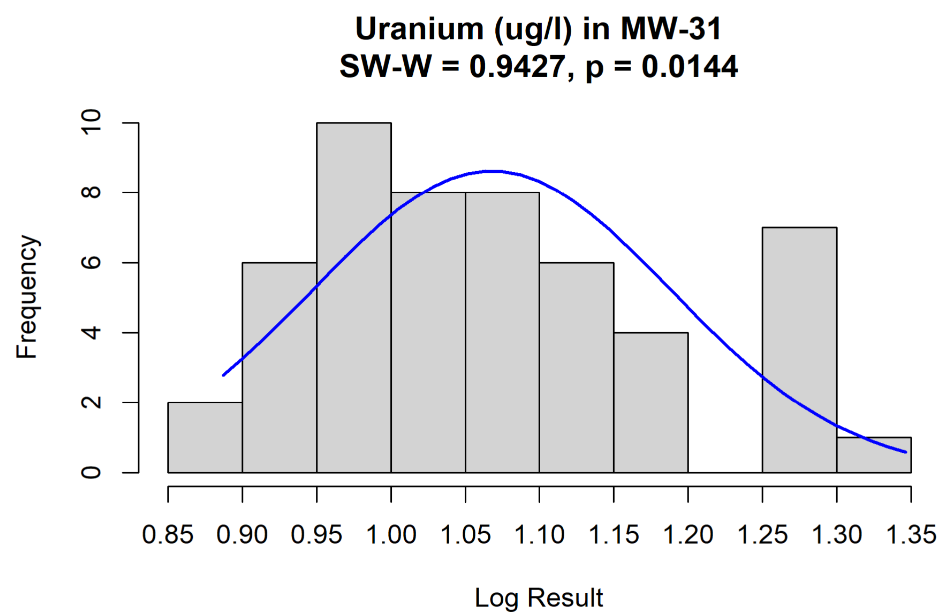


Uranium in MW-31 Post September 2012

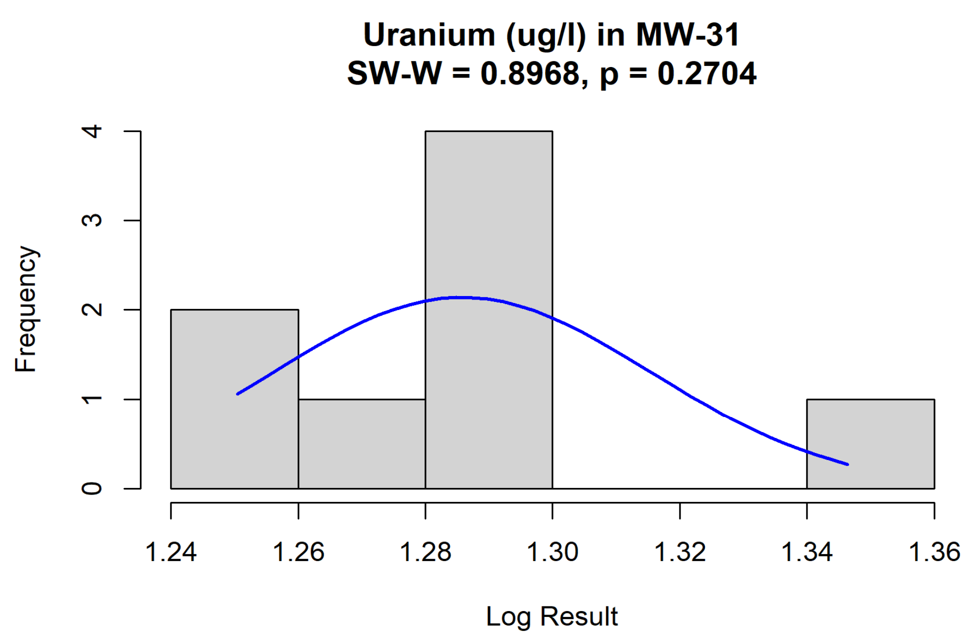


Appendix B-4: Histograms for Select Datasets in MW-31

Uranium in MW-31 Post May 2014

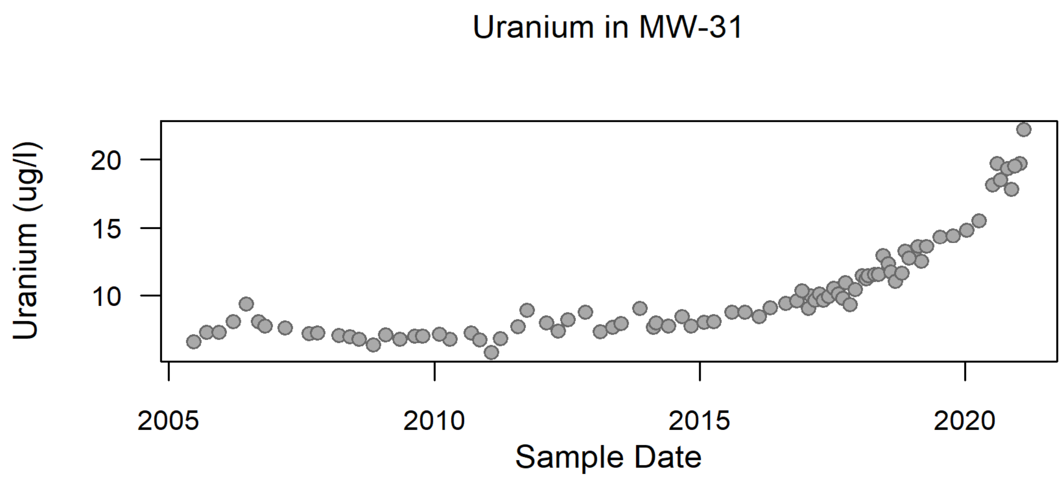


Uranium in MW-31 Post July 2020

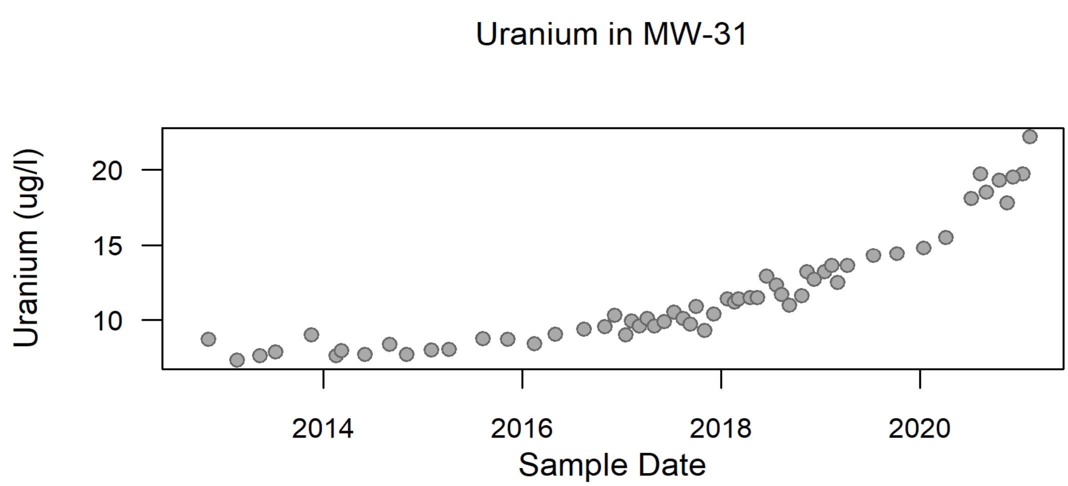


Appendix B-5: Timeseries and Linear Regression Analysis for Select Uranium Datasets in MW-31

Uranium in MW-31 All Data

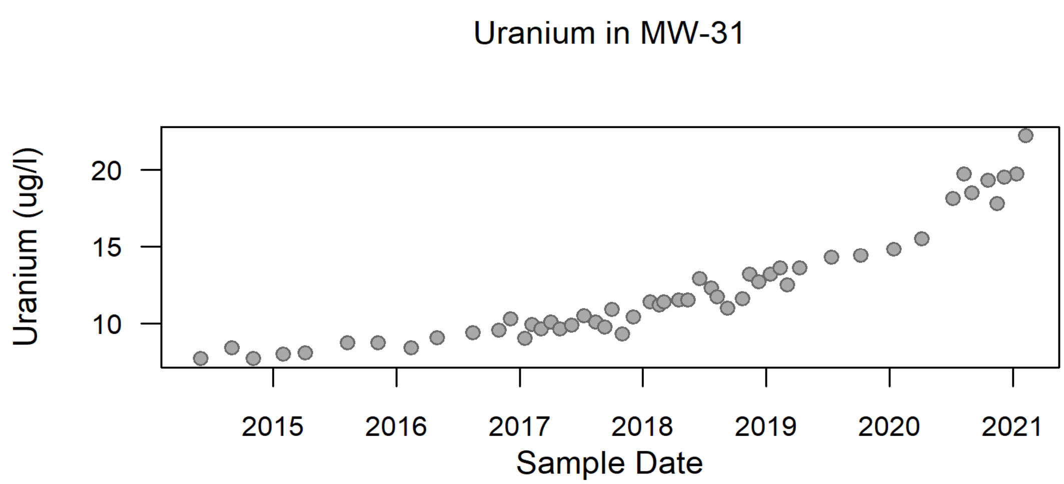


Uranium in MW-31 Post September 2012

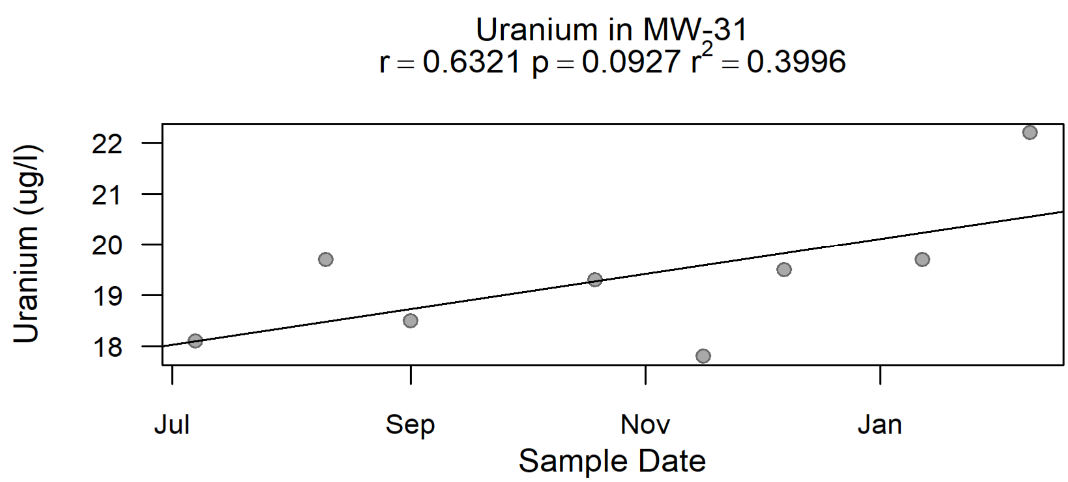


Appendix B-5: Timeseries and Linear Regression Analysis for Select Uranium Datasets in MW-31

Uranium in MW-31 Post May 2014



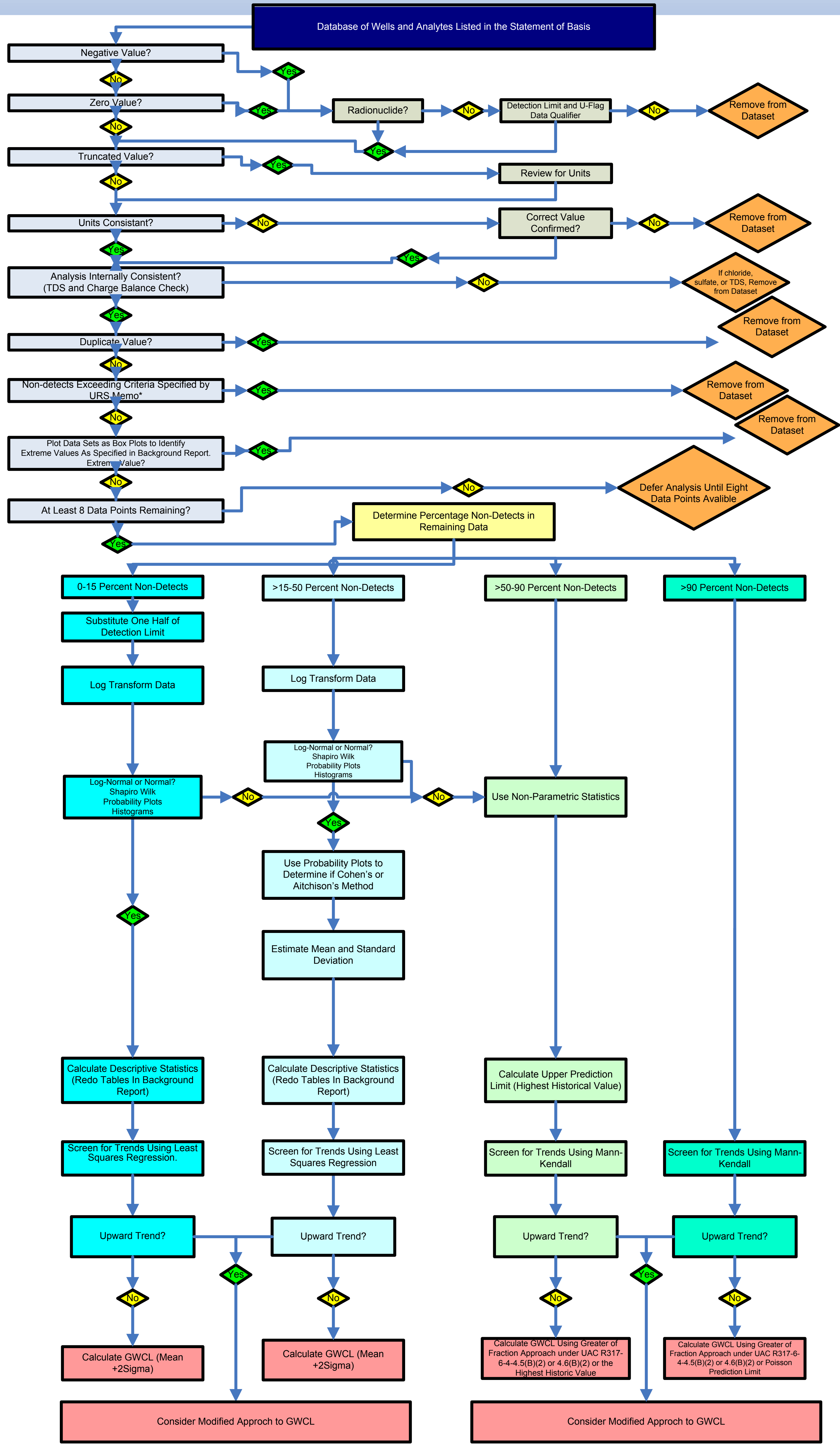
Uranium in MW-31 Post July 2020



APPENDIX C

Flowsheet (Groundwater Data Preparation and Statistical Process Flow for Calculating Groundwater Protection Standards, White Mesa Mill Site [INTERA, 2007a])

Appendix C. 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 D
Input and Output Files
(Electronic Only)