

RIO ALGOM MINING LLC

**AMBROSIA LAKE WEST
FACILITY**

License SUA-1473 Docket 40-8905

**Groundwater Stability
Monitoring Report
Second Half of 2021**

February 1, 2022

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ACRONYMS AND ABBREVIATIONS

ACL	alternate concentration limit
AOD	Assurance of Discontinuance
ALL	alluvium
Be	beryllium
CAP	corrective action program
EDD	electronic data deliverable
EPA	Environmental Protection Agency, United States
ft	feet
ft/ft	feet per foot
GPS	groundwater protection standard
H1	first half
H2	second half
KD	Dakota Sandstone
License	source material license SUA-1473
mg/L	milligram per liter
Mo	molybdenum
NMED	New Mexico Environment Department
NMEID	New Mexico Environmental Improvement Division, currently the NMED
NRC	Nuclear Regulatory Commission
pCi/L	picocurie per liter
POE	point of exposure
Q1	first quarter
Q2	second quarter
Q3	third quarter
Q4	fourth quarter
RAML	Rio Algom Mining LLC
Site	Rio Algom Mining LLC – Ambrosia Lake West Facility

TRA

Tres Hermanos A

TRB

Tres Hermanos B

**RIO ALGOM MINING LLC
AMBROSIA LAKE WEST FACILITY
GROUNDWATER STABILITY MONITORING REPORT –
SECOND HALF OF 2021**

The United States Nuclear Regulatory Commission (NRC) source material license SUA-1473 (the License), Condition 34.D, requires Rio Algom Mining LLC (RAML) to submit semiannual groundwater monitoring reports associated with the facility's groundwater stability monitoring plan established by Amendment 56. Condition 34.D states (bracketed definitions added):

Submit, by February 1 and August 1 of each year groundwater monitoring reports to include a minimum of the following: potentiometric surface maps for each aquifer; time vs. concentration plots for all parameters for which ACLs [alternate concentration limits] have been issued, hydrographs for the downgradient most trend well or POE [point of exposure] well in each aquifer, hydraulic gradient calculations, and tabulated analytical data for each ACL parameter for each well.

1.0 BACKGROUND

RAML's Ambrosia Lake West facility (Site) is located in McKinley County, approximately 24 miles due north of Grants, New Mexico, in the Ambrosia Lake Valley. Uranium milling activities started at the Site in 1957. The waste management structures were Cells 1 and 2, Decantation Pond 3, Evaporation Ponds 4 through 10, and the Section 4 Evaporation Ponds, as shown in **Figure 1**.

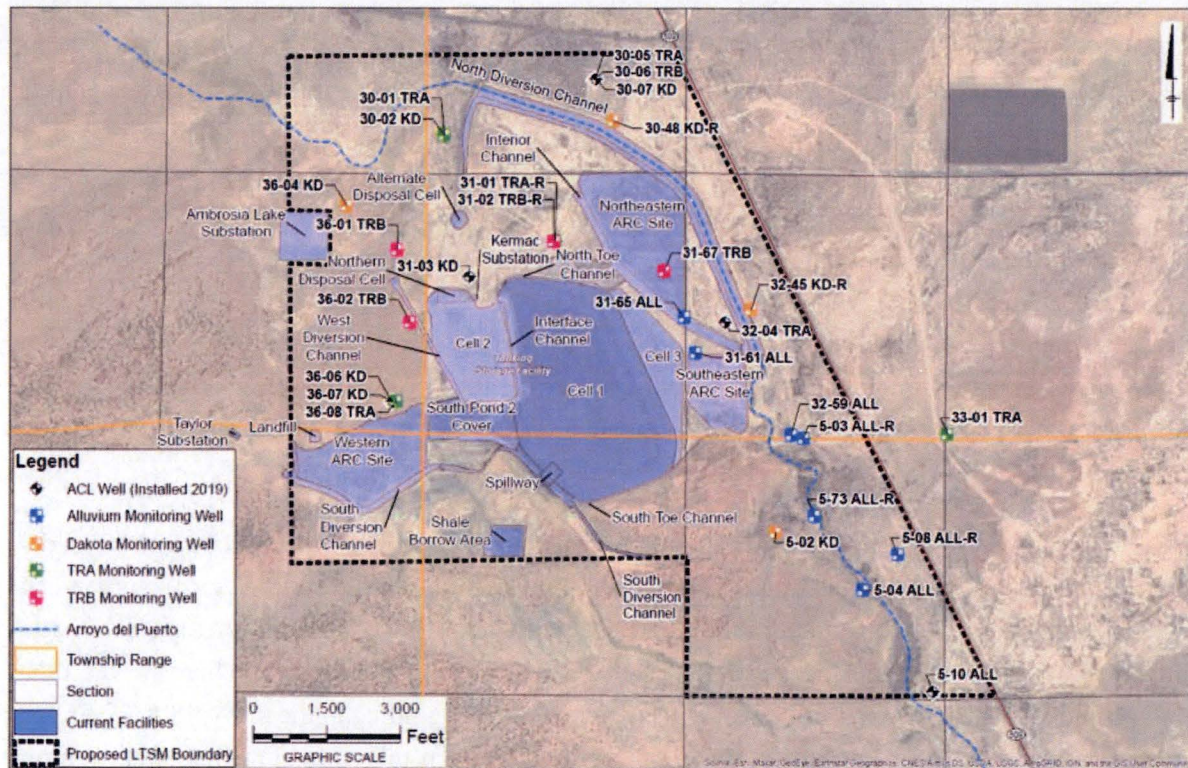


Figure 1. Monitoring Well Network with Historical Site Features

Cells 1 and 2 were built in 1958 and were constructed to accept tailings material. Cell 3 (formerly Pond 3) was also constructed in 1958 but was originally designed to accept decanted tailings liquids. Tailings were first produced at the Site in November 1958. In 1976, the natural course of the Arroyo del Puerto was diverted east of the Northeastern and Southeastern ARC sites (formerly Ponds 4, 5, 6, 9, and 10) and construction of the Section 4 Evaporation Ponds began. The solids fraction of the tailings were disposed through a slurry transfer system to Cells 1 and 2, while the liquids fraction was transferred to the Section 4 Evaporation Ponds. Evaporation pond residues were placed in Cells 1 and 2 prior to final reclamation. The aforementioned cells and ponds were unlined, except Pond 9, Pond 10, and the Section 4 Evaporation Ponds. Seepage from Cells 1 and

2 and Evaporation Ponds 3 through 6, along with seepage from unrelated mining and milling operations, saturated and impacted the alluvium of the Arroyo del Puerto and the Tres Hermanos B (TRB) sandstone. Seepage from Cells 1 and 2 and the Western ARC Site (formerly Evaporation Ponds 7 and 8) recharged and impacted the Tres Hermanos A (TRA) sandstone within the Mancos Formation shale, and the Dakota Sandstone (KD), which underlies the Mancos Formation.

In 1983, RAML's predecessor entered into an Assurance of Discontinuance (AOD) with the State of New Mexico Environmental Improvement Division (NMEID, currently the New Mexico Environment Department [NMED]) to minimize the future impact of mill tailings solutions seepage on groundwater. The approved AOD remedial action required the construction and maintenance of interceptor trench IT-1 and the cessation of discharges to unlined Ponds 4 through 8. These ponds were taken out of service in 1983. In the late 1990s, interceptor trenches IT-2, IT-3, and IT-4 south of Pond 10 were added to collect seepage potentially missed by IT-1 (Figure 1).

In 1986, after the State of New Mexico relinquished its licensing authority over uranium mill activities, the NRC reasserted its jurisdiction at the Site and required that the Site begin a groundwater detection monitoring program. Data from this program were the basis for the groundwater protection standards (GPSs) established for the Site by NRC, and a corrective action program (CAP) for the groundwater was developed based on this information.

The CAP required pumping, treating, and discharging treated groundwater into the Arroyo del Puerto. The treated groundwater management was implemented so that this water would sweep through the alluvium, creating a hydraulic barrier between Cells 1 and 2 and the Arroyo del Puerto while flushing existing impacted groundwater toward the interceptor trench, where it was then captured and disposed into Cell 1. The CAP was implemented beginning in the mid-1980s. The CAP and its requirements to pump and treat were discontinued when the alternate concentration limit (ACL) petition was granted through License Amendment 56 by the NRC in 2006.

Mining and milling operations in the area have had two notable hydrologic effects: (1) creation of a saturated zone in the alluvium and (2) creation of a cone of depression in bedrock aquifers, due to dewatering of underground mines. The saturated zone in the alluvium has continued to decrease since mine dewatering, milling processes, and the CAP were terminated. The cone of depression in bedrock aquifers which contains groundwater within these units is expected to remain for hundreds of years (INTERA 2018).

2.0 SECOND HALF OF 2021 ACTIVITIES

Groundwater monitoring and associated activities at the Site during the second half (H2) of 2021 were completed in accordance with the requirements of Condition 34 of the License. The monitoring well network was designed to track and assess groundwater impacts between Cells 1 and 2 and the proposed point of exposure (POE), which is currently the proposed long-term surveillance and maintenance boundary for the alluvium, TRA, TRB, and KD. The ACLs and GPSs for the Site are presented in **Table 1a** and **Table 1b**.

Table 1a. Rio Algom Mining – Ambrosia Lake West Facility Alternate Concentration Limits

Parameter	Dakota Sandstone	Tres Hermanos A Sandstone	Tres Hermanos B Sandstone	Alluvium
Chloride (mg/L)	3,200	1,070	2,810	7,110
Nitrate (mg/L)	22.8	9.2	7.7	351
Sulfate (mg/L)	6,480	2,584	4,760	12,000
Total Dissolved Solids (mg/L)	14,100	6,400	11,700	26,100
Molybdenum (mg/L)	-	-	-	176
Nickel (mg/L)	6.8	-	6.8	98
Selenium (mg/L)	-	-	-	49
Uranium (mg/L)	1.6	-	1.6	23
Thorium-230 (pCi/L)	945	945	945	13,627
Radium-226 and Radium-228 (pCi/L)	218	218	218	3,167
Lead-210 (pCi/L)	62	62	62	891

Notes:

- = No ACL is defined by the License

mg/L = milligram per liter

pCi/L = picocurie per liter

**Table 1b. Rio Algom Mining – Ambrosia Lake West Facility
Groundwater Protection Standards**

Parameter	Dakota Sandstone	Tres Hermanos A Sandstone	Tres Hermanos B Sandstone	Alluvium
Cyanide (mg/L)	0.04	0.01	0.01	-
Antimony (mg/L)	0.05	-	-	-
Arsenic (mg/L)	0.1	-	-	-
Beryllium (mg/L)	0.01	-	-	-
Cadmium (mg/L)	0.01	-	-	-
Lead (mg/L)	0.14	-	-	-
Molybdenum (mg/L)	0.06	0.03	0.08	-
Nickel (mg/L)	-	0.05	-	-
Selenium (mg/L)	0.04	0.03	0.04	-
Uranium (mg/L)	-	0.01	-	-

Notes:

- = No GPS is defined in the License

Attachments to this report present the following information as outlined in Conditions 19 and 34.D of the License: **Appendix 1** contains analytical data for ACL and GPS parameters for the KD, TRA, TRB, and alluvium units for H2 2021. **Appendix 2** contains time versus concentration plots for ACL parameters for the KD, TRA, TRB, and alluvium. **Appendix 3** contains hydrographs for the most downgradient monitoring well for the KD, TRA, TRB, and alluvium. **Appendix 4** contains monitoring well network and potentiometric surface maps for the KD, TRA, TRB, and alluvium during H2 2021. The monitoring well network is also illustrated on **Figure 1**. **Appendix 5** contains analytical laboratory reports and electronic data deliverables (EDDs) of groundwater monitoring data required by the License. As a courtesy to NRC, **Appendix 6** contains tabulated analytical data collected during H2 2021 from additional monitoring wells that have been installed to evaluate potential additional ACL requirements for the ACL program. **Appendix 7** is an electronic-only appendix containing analytical laboratory reports and EDDs of groundwater monitoring data for the ACL program.

2.1 Improvements to the Monitoring Program

Eight monitoring wells (**Figure 1**) were installed between July and November 2019, in accordance with the *Data Collection Work Plan in Support of Additional ACLs* (INTERA 2017). Alluvial well 5-10 ALL has been dry since installation. Groundwater monitoring of the new wells began in December 2019. Water quality data collected from these wells during H2 2021 are included in **Appendix 6**. RAML has now completed 8 quarters of monitoring of these wells, which started in

the first quarter (Q1) of 2020, to track the stabilization of the wells and obtain representative groundwater quality data to aid in the evaluation of the ACL program. Groundwater elevations from these wells have been incorporated into the potentiometric surface contours presented in **Appendix 4** and the hydraulic gradient calculations, where appropriate.

RAML continues to evaluate the condition of Dakota monitoring well 36-06 KD, where anomalous water elevation and chemistry conditions have been observed since the well was redeveloped in the third quarter (Q3) of 2020. The water level and chemistry in well 36-06 KD are notably different than in Dakota monitoring well 36-07 KD, which was installed in 2019 approximately 20 feet from well 36-06 KD. RAML's evaluation of well 36-06 KD included down-hole camera inspection and geophysical logging, aquifer testing, chemical analyses, and geochemical modeling. This evaluation is in progress and will be reported separate from the groundwater stability monitoring program. Preliminary findings suggest well 36-06 KD is in poor condition and samples collected from this well may not be representative of groundwater in the Dakota.

A flash flood occurred in and around Ambrosia Lake in August 2021 and one well, 5-04 ALL, was affected, resulting in approximately 30 feet of mud in the well casing. RAML attempted to redevelop this well in December 2021; however, it was found that the well casing had collapsed approximately 5 feet below the top of the well housing. RAML is currently unable to sample well 5-04 ALL, and is evaluating options to repair or replace the well.

3.0 DATA EVALUATION

As a component of the ACL approval process, NRC established ACLs for specific parameters and retained the GPSs for those constituents for which ACLs were not proposed (**Tables 1a and 1b**) (NRC 2020). Data collected during H2 2021 were compared to ACLs and GPSs (**Appendix 1**). Notable results are described in the following sections.

3.1 Dakota Sandstone

Analytical results from the KD groundwater monitoring well network specified in SUA-1473 are tabulated in **Appendix 1**, and ACL parameters are presented in time series plots in **Appendix 2**. A hydrograph for the most downgradient KD well, 30-02 KD, is included in **Appendix 3**. The KD potentiometric surface elevation is displayed in **Appendix 4**, page 4-1 and was used to calculate a hydraulic gradient of 0.029 feet per foot (ft/ft) during H2 2021.

KD monitoring wells 36-06 KD and 32-45 KD-R have been sampled monthly during H2 2021 due to exceedances of GPSs for beryllium in 36-06 KD and molybdenum in 32-45 KD-R. No other constituents were detected above applicable ACLs in KD monitoring wells during H2 2021. Monitoring well 30-02 KD was constructed with an 18-foot sump (**Appendix 3**) and contains approximately 5 feet of water, therefore monitoring of 30-02 KD is limited to water level and total depth measurements. The results of monthly sampling are discussed below.

3.1.1 36-06 KD

Monitoring well 36-06 KD was sampled monthly for beryllium in H2 2021 (**Table 2**). Beryllium concentrations are presented in **Figure 2**.

The *Quarterly Groundwater Monitoring Report, Third Quarter of 2020* (RAML 2020) describes recent beryllium exceedances and proposed a corrective action of the ongoing ACL program (INTERA 2017), and six months of monthly monitoring followed by a data evaluation that also considers nearby well 36-07 KD. The six-month period was completed in March 2021. As noted in Section 2.1, RAML continues to evaluate the condition of well 36-06 KD and whether samples from this well are representative of groundwater in the Dakota.

Elevated beryllium concentrations have been observed in 36-06 KD since 2006 and have gradually trended downward. Beryllium remained at or below the GPS in 2018 and 2019 until the well was redeveloped in Q3 2020. After redevelopment, beryllium concentrations increased above the GPS in fourth quarter (Q4) 2020 and Q1 2021 and then declined to below the GPS in second quarter (Q2) 2021. Beryllium concentrations have been increasing in H2 2021 and are currently above the GPS. The water level in well 36-06 KD also increased after redevelopment and has since declined to approximately the same elevation as before redevelopment. Beryllium in 36-06 KD will

continue to be monitored monthly. The results of the monthly monitoring will be presented in future quarterly and semiannual groundwater monitoring reports.

Beryllium concentrations were above the GPS in August, September, October, November, and December 2021 samples. The beryllium concentration in the sample collected in July 2021 did not exceed the GPS.

Table 2. Second Half of 2021 Analytical Result Summary for Beryllium in Monitoring Well 36-06 KD

Date	Beryllium (mg/L)
GPS	0.01
7/8/21	0.00922
8/11/21	0.0133
9/23/21	0.0143
10/5/21	0.0145
11/10/21	0.0185
12/9/21	0.0184

Note: exceedances are bolded

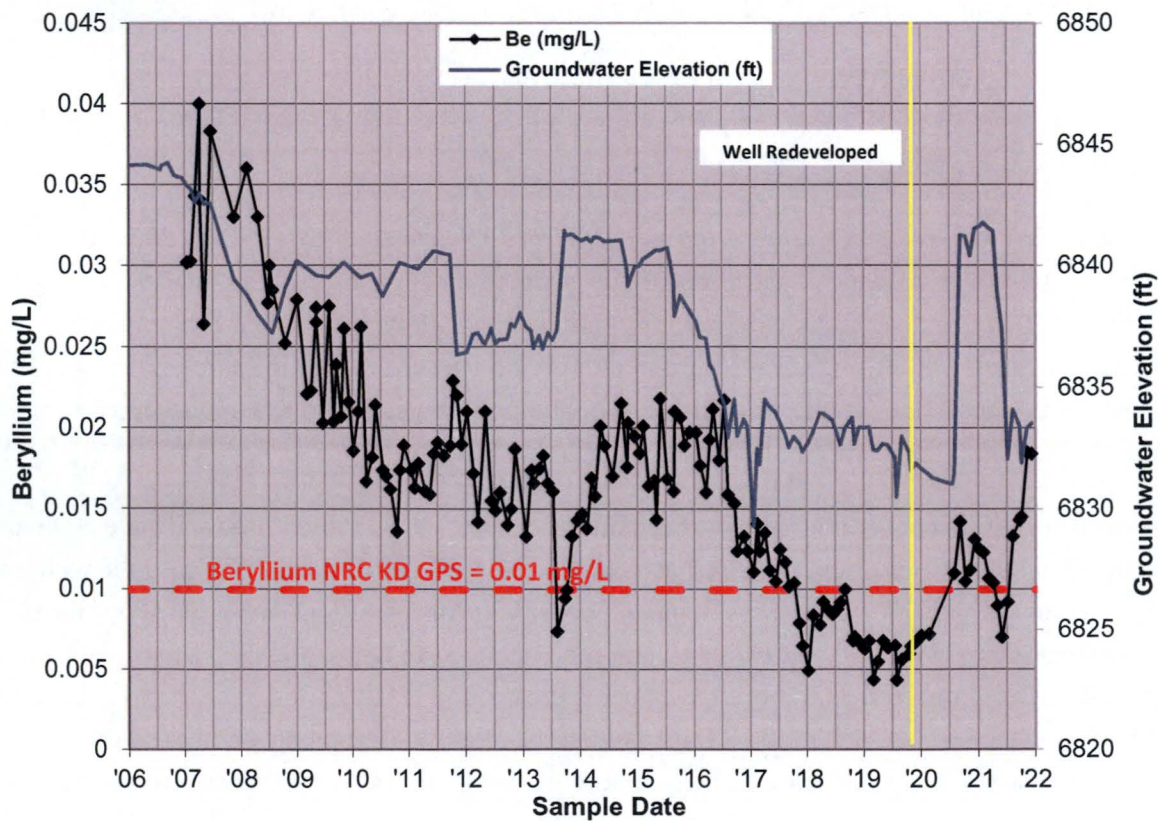


Figure 2. Beryllium Concentrations in Dakota Sandstone Monitoring Well 36-06 KD

3.1.2 32-45 KD-R

RAML performs monthly sampling for molybdenum at monitoring well 32-45 KD-R in response to historical exceedances of the molybdenum GPS.

Molybdenum in monitoring well 32-45 KD-R reached a maximum concentration of 0.505 mg/L in March of 2015 (**Figure 3**). Although molybdenum concentrations have generally decreased since then, they continue to exceed the GPS of 0.06 mg/L (**Table 3** and **Figure 3**). **Table 3** presents molybdenum concentrations in monitoring well 32-45 KD-R during H2 2021.

Molybdenum is not included in primary or secondary United States Environmental Protection Agency (EPA) Maximum Contaminant Levels for drinking water; however, NMED has a molybdenum standard for irrigation, which is 1.0 mg/L. Concentrations of molybdenum in groundwater samples from 32-45 KD-R do not exceed that standard.

Monthly sampling and analysis for molybdenum will continue, pending preparation of a License amendment, which may include a proposed GPS modification or an ACL for molybdenum in the KD.

Table 3. Second Half of 2021 Analytical Result Summary for Molybdenum in Monitoring Well 32-45 KD-R

Date	Molybdenum (mg/L)
GPS	0.06
7/8/21	0.0955
8/11/21	0.103
9/23/21	0.0779
10/5/21	0.0965
11/10/21	0.108
12/9/21	0.0932

Note: exceedances are bolded

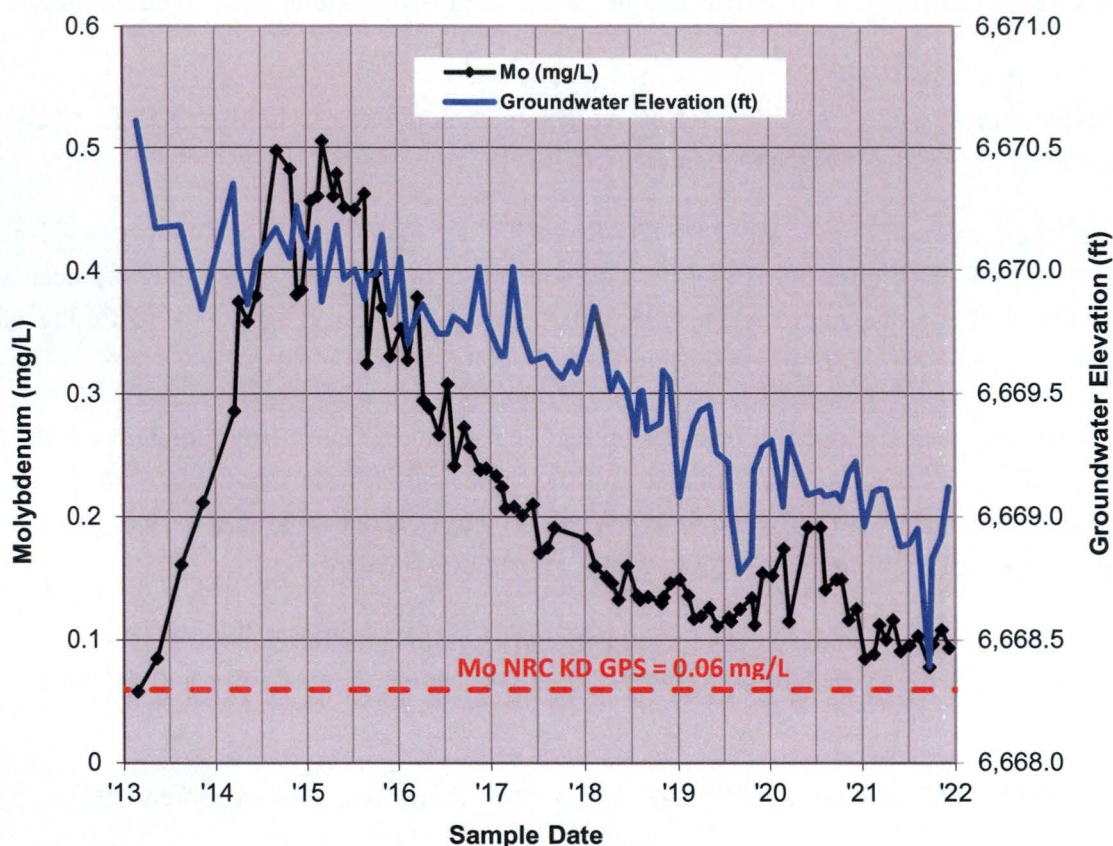


Figure 3. Molybdenum Concentration in Dakota Sandstone Monitoring Well 32-45 KD-R

3.2 Tres Hermanos A

Analytical results from TRA wells are tabulated in **Appendix 1** and presented graphically as time series plots in **Appendix 2**. A hydrograph for the most downgradient TRA well, 30-01 TRA, is included in **Appendix 3**. TRA potentiometric surface elevation is displayed in **Appendix 4**, page 4-2 and was used to calculate a hydraulic gradient of 0.030 ft/ft for H2 2021.

As illustrated in **Appendix 3**, monitoring well 30-01 TRA was constructed with a 20-foot sump and currently contains less than 5 feet of water, therefore monitoring of 30-01 TRA is limited to water level and total depth measurements. Groundwater samples from background well 33-01 TRA did not exceed License groundwater standards during H2 2021. Monitoring well 31-01 TRA-R had an exceedance of the TRA cyanide GPS of 0.01 mg/L in H2; however, cyanide was not detected above 0.003 mg/L in a confirmation sample collected within 7 days of becoming aware of the apparent exceedance, indicating that the initial analysis result was anomalous or erroneous. Monitoring of cyanide at 31-01 TRA-R will continue on a semiannual basis. No other constituents were detected above applicable ACLs or GPSs in samples collected from TRA monitoring wells in H2 2021.

3.3 Tres Hermanos B

Analytical results from TRB monitoring wells are tabulated in **Appendix 1** and are presented graphically as time series plots in **Appendix 2**. A hydrograph for the most downgradient TRB monitoring well, 31-67 TRB, is included in **Appendix 3**. TRB potentiometric surface elevation is displayed in **Appendix 4**, page 4-3, and was used to calculate a hydraulic gradient of 0.015 ft/ft for H2 2021.

Monitoring well 36-01 TRB was last sampled in 2009 and has not contained enough water for a sample since then. Background well 19-77 TRB had a cyanide result that was greater than the TRB GPS of 0.01 mg/L in H2. The cyanide concentration in 19-77 TRB was 0.011 mg/L. Because 19-77 TRB is a background well, no resampling was required. Aside from cyanide in 19-77 TRB, no new exceedances of ACLs or GPSs were observed in groundwater collected from TRB License monitoring wells in H2 2021.

3.4 Alluvium

Analytical results from the alluvial well network are tabulated in **Appendix 1** and are presented graphically as time series plots in **Appendix 2**. A hydrograph for the most downgradient alluvial well, MW-24 ALL, is included in **Appendix 3**. Alluvial potentiometric surface elevation is displayed in **Appendix 4**, page 4-4, and was used to calculate a hydraulic gradient of 0.008 ft/ft for H2 2021.

A flash flood occurred in and around the site in August and one well, 5-04 ALL, was affected, resulting in approximately 30 feet of mud in the well casing. The well was not able to be redeveloped as the casing had collapsed. RAML is considering repairing or replacing the well and the resolution will be documented in a future report to NRC. Monitoring well 32-59 ALL previously had not been sampled due to insufficient water, however after redevelopment in Q3 of 2020, water levels increased sufficiently to collect a sample in Q1 and Q3 of 2021.

Groundwater samples collected from License alluvial wells did not exceed ACLs during H2 2021.

4.0 CONCLUSIONS

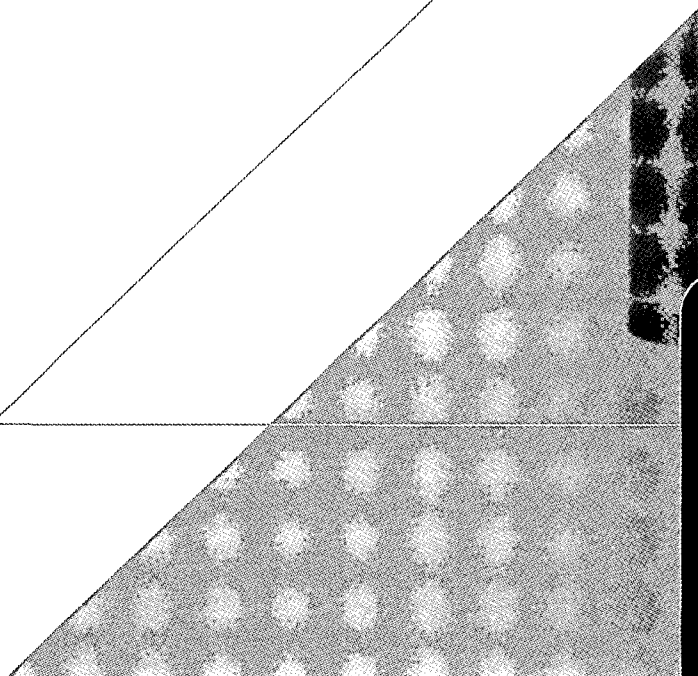
Table 5 summarizes the notable results from H2 2021 groundwater monitoring and provides path forward recommendations.

**Table 5. Rio Algom Mining – Ambrosia Lake West
Second Half of 2021 Summary and Path Forward**

Well(s)	Summary	Status	Path Forward
36-06 KD	Beryllium above GPS	Monthly sampling	Continue monthly sampling and quarterly reporting for beryllium until an alternative sampling schedule is approved by NRC.
32-45 KD-R	Molybdenum above GPS	Replacement well stabilizing, monthly sampling	Continue monthly sampling and quarterly reporting for molybdenum until an alternative sampling schedule is approved by NRC.
30-02 KD; 30-01 TRA	Dry; water level below screened interval (RAML 2019)	Not sampled	Propose removal from monitoring program in a future License amendment.
5-04 ALL	5-04 ALL was damaged due to floods in August 2021	Not sampled	This well cannot be sampled in its current condition. RAML is evaluating options to repair or replace the well and the resolution will be documented in a future report to NRC.
32-04 TRA; 36-07 KD; 36-08 TRA; 31-03 KD; 5-10 ALL; 30-05 TRA; 30-06 TRB; 30-07 KD	Installed in 2019 (INTERA 2017)	Change from quarterly to semi-annual sampling	RAML has now completed 8 quarters of monitoring for these wells and will monitor semi-annually starting in H1 of 2022. These wells are not subject to License monitoring requirements. As a courtesy to NRC, RAML will continue to provide laboratory and field data from these wells as a separate appendix in semiannual reports.

5.0 REFERENCES

- Intera. 2017. Rio Algom Mining, LLC's Ambrosia Lake Mill Site Data Collection Work Plan in Support of Additional Alternate Concentration Limits. November. ML17340A826.
- Intera. 2018. Groundwater Modeling for Closure of Old Stope Leaching Operations, Ambrosia Lake Facility. May.
- Nuclear Regulatory Commission (NRC), United States. 2020. SUA-1473 Docket No. 40-8905, NRC Materials License SUA 1473, Amendment 62. September 1. ML20218A586.
- RAML. 2019. SUA-1473 Docket 40-8905, Groundwater Stability Monitoring Report First Half 2019, Rio Algom Mining LLC, Ambrosia Lake Facility. ML19219A137.
- RAML. 2020. Ambrosia Lake Facility Quarterly Groundwater Monitoring Report, Third Quarter 2020. December 1. ML21056A012.



APPENDIX 1

Stability Monitoring Plan
Analytical Results

Appendix 1A: RIO ALGOM MINING LLC
Second Half 2021 ACL Parameters

Dakota Well Results

Well	Date	Depth to Water	Total Depth	Spec. Cond. (field)	Temp. (field)	pH (field)	Chloride	Nitrate	Sulfate	TDS	Ni	U	Pb-210	Ra-226 + Ra-228	Th-230
Unit	ft BTOC	ft BTOC	μS/cm	°C	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L	pCi/L
Alternate Concentration Limit							3,200	22.8	6,480	14,100	6.8	1.6	62	218	945
17-01 KD	8/16/2021	661.66	NM	1,447	16.5	9.27	20.3	<0.02	678	1,040	<0.0004	<0.0001	4.2	1.28	0.24
30-02 KD	8/19/2021	307.92	313	Insufficient Water											
30-48 KD-R	8/12/2021	329.55	358.62	4,038	14.7	7.01	552	0.028 B	2,300	4,200 H	<0.002	<0.0005	2.2	3.8	0.576
32-45 KD-R	8/11/2021	261.98	278.71	1,724	13.9	7.08	79.0	0.083 B	575	1,360	0.00089 B	0.0386	-2.6	4.2*	0.744
36-06 KD	8/11/2021	190.5	199.05	7,488	14.0	4.22	1,260 H	<0.02	3,970 H	7,240	0.162	0.605	-1.1	29.0	8.41
5-02 KD	8/23/2021	187.04	190.4	1,187	17.9	7.29	10.3	0.496	312	836	0.00115	0.00143	-0.46	1.08	0.493

TRA Well Results

Well	Date	Depth to Water	Total Depth	Spec. Cond. (field)	Temp. (field)	pH (field)	Chloride	Nitrate	TDS	Sulfate	Pb-210	Ra-226 + Ra-228	Th-230
Unit	ft BTOC	ft BTOC	μS/cm	°C	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L	pCi/L
Alternate Concentration Limit							1,070	9.2	6,400	2,584	62	218	945
30-01 TRA	8/19/2021	202.11	207.14	Insufficient Water									
31-01 TRA-R	8/16/2021	205.87	219	1,933	15.2	7.34	47.5	<0.02	1,670	1,030	5.3	0.49	0.294
33-01 TRA	8/25/2021	125.09	180.56	2,295	13.7	7.75	31.9	<0.02	2,710	1,680	-0.47	1.33	0.59

TRB Well Results

Well	Date	Depth to Water	Total Depth	Spec. Cond. (field)	Temp. (field)	pH (field)	Chloride	Nitrate	TDS	Sulfate	Ni	U	Pb-210	Ra-226 + Ra-228	Th-230
Unit	ft BTOC	ft BTOC	μS/cm	°C	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L	pCi/L
Alternate Concentration Limit							2810	7.7	11,700	4760	6.8	1.6	62	218	945
19-77 TRB	8/17/2021	288	288	4,442	16.9	7.63	15.8	0.359	3,530	2,200	0.00096 B	0.00894	1.1	1.76	0.435
31-02 TRB-R	8/17/2021	103.04	128.3	8,560	13.6	6.35	1,120	<0.02	7,920 H	3,850	<0.002	0.00451	19	16.4	0.539
31-67 TRB	8/17/2021	45.2	96.05	8,198	12.8	6.21	992	<0.02	7,620 H	3,830	0.00445 B	0.0122	5.5	50	0.398
36-01 TRB	8/19/2021	57.68	58.39	Insufficient Water											
36-02 TRB	8/24/2021	52.9	57.48	9,781	22.9	7.07	2,220	0.414	8,180	2,870	0.00461 B	0.00350	10	0.01	1.04

Appendix 1A: RIO ALGOM MINING LLC
Second Half 2021 ACL Parameters

Alluvial Well Results

Well	Date	Depth to Water	Total Depth	Spec. Cond. (field)	Temp. (field)	pH (field)	Chloride	Nitrate	TDS	Sulfate	Mo	Ni	Se	U	Pb-210	Ra-226 + Ra-228	Th-230
Unit	ft BTOC	ft BTOC	ft BTOC	µS/cm	°C	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	pCi/L	pCi/L	pCi/L
							7,110	351	26,100	12,000	176	98	49	23	891	3,167	13,627
5-73 ALL-R	8/23/2021	28.8	35.7	8,699	12.7	7.00	1,810	5.17	7,170	2,610	0.00782	0.00937	0.193	1.97	-2.7	0.37	1.38
5-03 ALL-R	8/13/2021	32.5	55.85	4,871	12.5	7.21	728	0.686	4,760 H	2,410	0.00089	0.00211	0.0032 B	0.104	3.4	3.24*	0.47
5-04 ALL	8/23/2021	24.47	60.27	Damaged Well													
5-08 ALL-R	8/19/2021	46.53	76.45	4,027	13.3	7.44	93.6	30.2	3,950	2,300	0.00484	0.00174 B	0.0123	0.0225	4.7	0.89	0.352
31-61 ALL	8/18/2021	19.7	29.13	15,649	12.0	6.31	2,240	11.2	13,700 H	6,780	<0.002	0.0511	0.0052	0.725	49	0.99	0.429
31-65 ALL	8/20/2021	18.67	41.93	17,054	10.9	6.13	2,750	<0.02	14,400	7,480	<0.002	0.108	0.0043 B	0.0665	21	0.7	43
32-59 ALL	8/23/2021	31.45	35.39	5,665	13.0	7.15	906	6.85	5,030	2,140	0.00509	0.00431 B	0.0303	0.336	2.2	2.3	1.04
MW-24 ALL	8/23/2021	50.13	50.4	Insufficient Water													

Notes:

Exceedances are bolded.

< = constituent was not detected above the method detection limit.

B = the analyte was detected at a value between method detection limit and practical quantitation limit. The associated value is an estimated quantity.

H = the analysis exceeded the method hold time

NA = not analyzed

NM = not measured

Monitoring wells 30-02 KD, 30-01 TRA, 36-01 TRB, and MW-24 ALL contained insufficient water for sample collection.

* = either Ra-226, Ra-228, or both were not detected above the lower level of detection (LLD); in this case, the LLD was used in the sum in lieu of the reported result.

µS/cm = microSiemen per centimeter

°C = degree Celsius

ACL = alternate concentration limit

ft BTOC = feet below top of casing

mg/L = milligram per liter

pCi/L = picocurie per liter

Spec. Cond. = specific conductivity

s.u. = standard units

TDS = total dissolved solids

Temp. = temperature

Appendix 1B: RIO ALGOM MINING LLC
Second Half 2021 GPS Parameters

Dakota Well Results

Well	Date	Depth to Water	Total Depth	Spec. Cond.	Temp	pH	Cyanide	As	Be	Cd	Mo	Pb	Sb	Se
Unit		ft BTOC	ft BTOC	µS/cm	°C	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
Groundwater Protection Standard							0.04	0.1	0.01	0.01	0.06	0.14	0.05	0.04
17-01 KD	8/16/2021	661.66	NM	1,447	16.5	9.27	0.015	0.00020 B	<0.00008	<0.00005	0.00198	<0.0001	0.00049 B	<0.002
30-02 KD	8/19/2021	307.92	313						Insufficient Water					
30-48 KD-R	8/12/2021	329.55	358.62	4,038	14.7	7.01	<0.003	<0.001	<0.0004	<0.00025	0.0199	<0.0005	<0.002	<0.002
32-45 KD-R	8/11/2021	261.98	278.71	1,724	13.9	7.08	<0.003	0.00043 B	<0.00008	<0.00005	0.103	<0.0001	0.00068 B	<0.002
36-06 KD	8/11/2021	190.5	199.05	7,495	14.4	4.22	<0.01	0.0156	0.0133	0.00839	<0.001	0.00120 B	<0.002	0.0028 B
5-02 KD	8/23/2021	187.04	190.4	1,187	17.9	7.29	0.013	<0.0002	<0.00008	<0.00005	0.00038 B	<0.0001	<0.0004	<0.002

TRA Well Results

Well	Date	Depth to Water	Total Depth	Spec. Cond. (field)	Temp. (field)	pH (field)	Cyanide	Mo	Ni	Se	U
Unit		ft BTOC	ft BTOC	µS/cm	°C	s.u.	mg/L	mg/L	mg/L	mg/L	mg/L
Groundwater Protection Standard							0.01	0.03	0.05	0.03	0.01
30-01 TRA	8/19/2021	202.11	207.14				Insufficient Water				
31-01 TRA-R	8/16/2021	205.87	219	1,945	15.2	7.3	0.015[†]	0.00632	0.00536	<0.005	0.00083
33-01 TRA	8/25/2021	125.09	180.56	2,295	13.7	7.75	<0.003	0.00203	<0.0008	<0.002	0.00067 B

TRB Well Results

Well	Date	Depth to Water	Total Depth	Spec. Cond. (field)	Temp. (field)	pH (field)	Cyanide	Mo	Se
Unit		ft BTOC	ft BTOC	µS/cm	°C	s.u.	mg/L	mg/L	mg/L
Groundwater Protection Standard							0.01	0.08	0.04
19-77 TRB	8/17/2021	288	288	4,442	16.9	7.63	0.011*	0.00377	<0.002
31-02 TRB-R	8/17/2021	103.04	128.3	8,560	13.6	6.35	<0.003	<0.001	<0.002
31-67 TRB	8/17/2021	45.2	96.05	8,198	12.8	6.21	<0.003	<0.001	<0.002
36-01 TRB	8/19/2021	57.68	58.39				Insufficient Water		
36-02 TRB	8/24/2021	52.9	57.48	9,781	22.9	7.07	<0.003	<0.001	<0.002

Notes:

Exceedances are bolded.

* = 19-77 TRB is a background well and is not screened against standards.

[†] = the sample was reanalyzed and cyanide was not detected above the method detection limit (MDL) of 0.003 mg/L, though the analysis was outside of the method hold time. The well was resampled on 11/19/2021, within 7 days of receipt of the reanalysis result. Cyanide was not detected above the MDL of 0.003 mg/L in the resample.

< = constituent was not detected above the method detection limit.

B = the analyte was detected at a value between MDL and practical quantitation limit. The associated value is an estimated quantity.

H = the analysis exceeded the method hold time

NM = Not Measured

µS/cm = microSiemen per centimeter

°C = degree Celsius

ft BTOC = feet below top of casing

GPS = groundwater protection standard.

MDL = method detection limit

mg/L = milligram per liter

Spec. Cond. = specific conductivity

s.u. = standard units

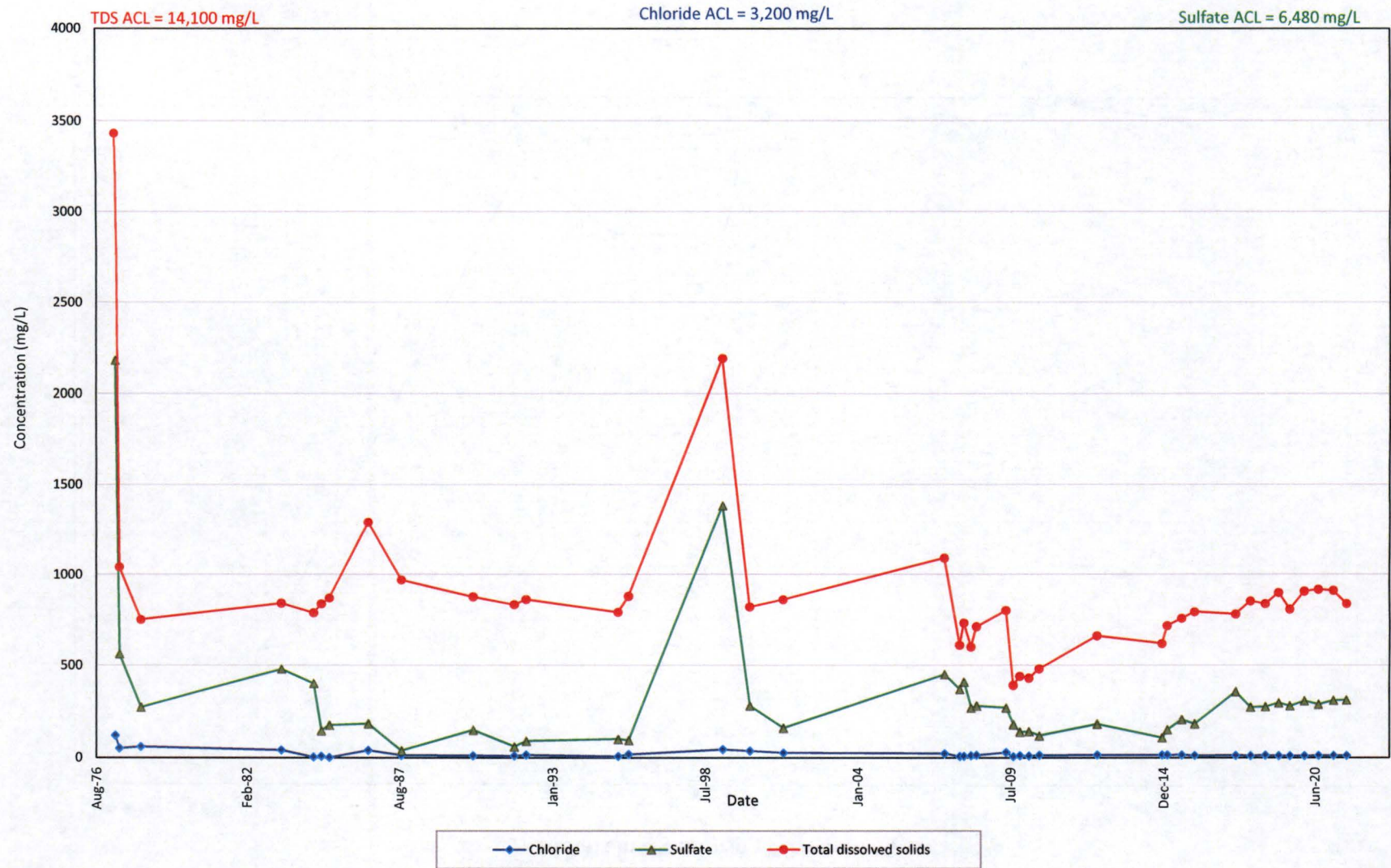
Temp = temperature

APPENDIX 2

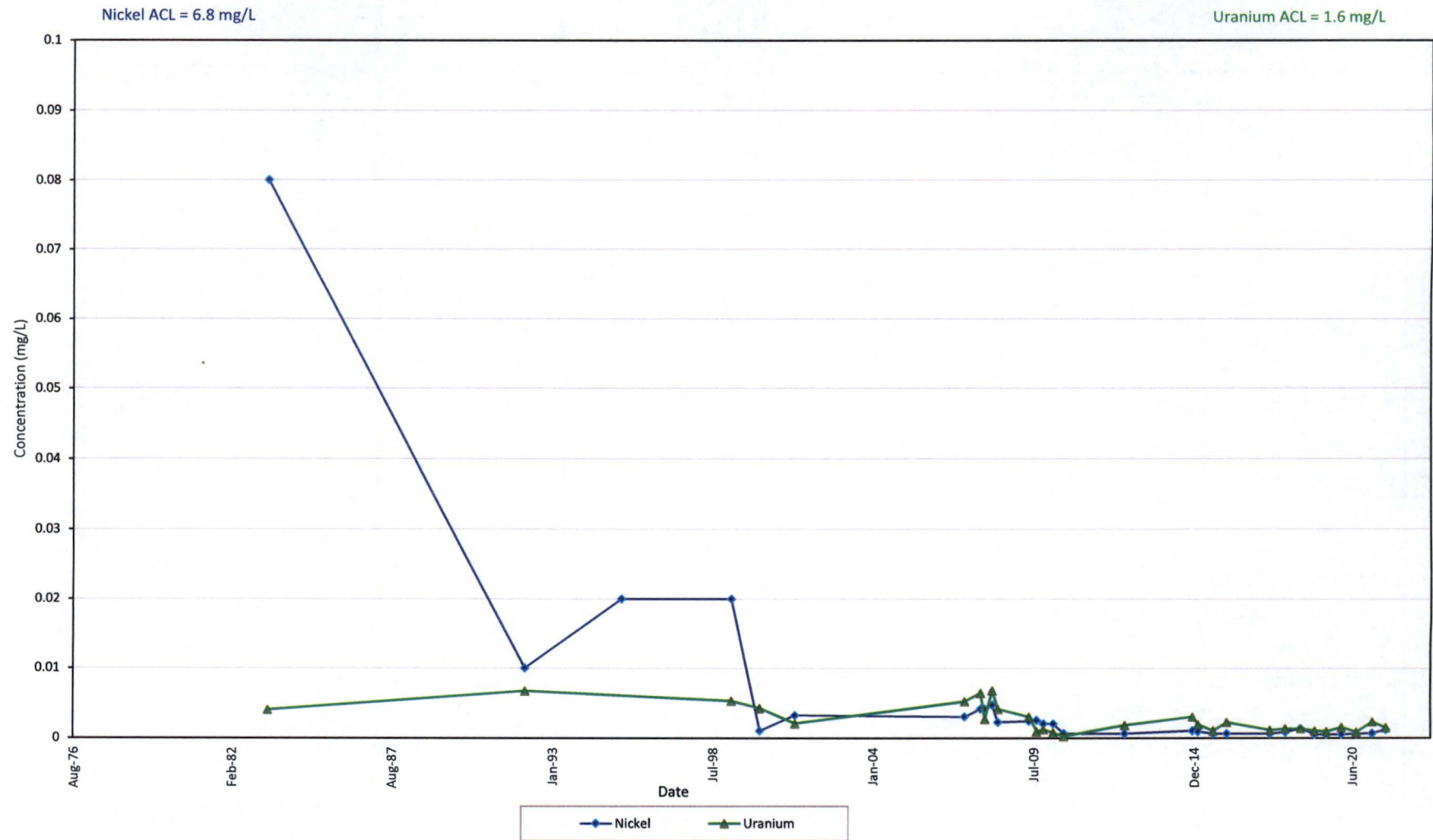
Stability Monitoring Plan
Time Versus Concentration Plots

**Stability Monitoring Plan
Time Versus Concentration Plots
Dakota**

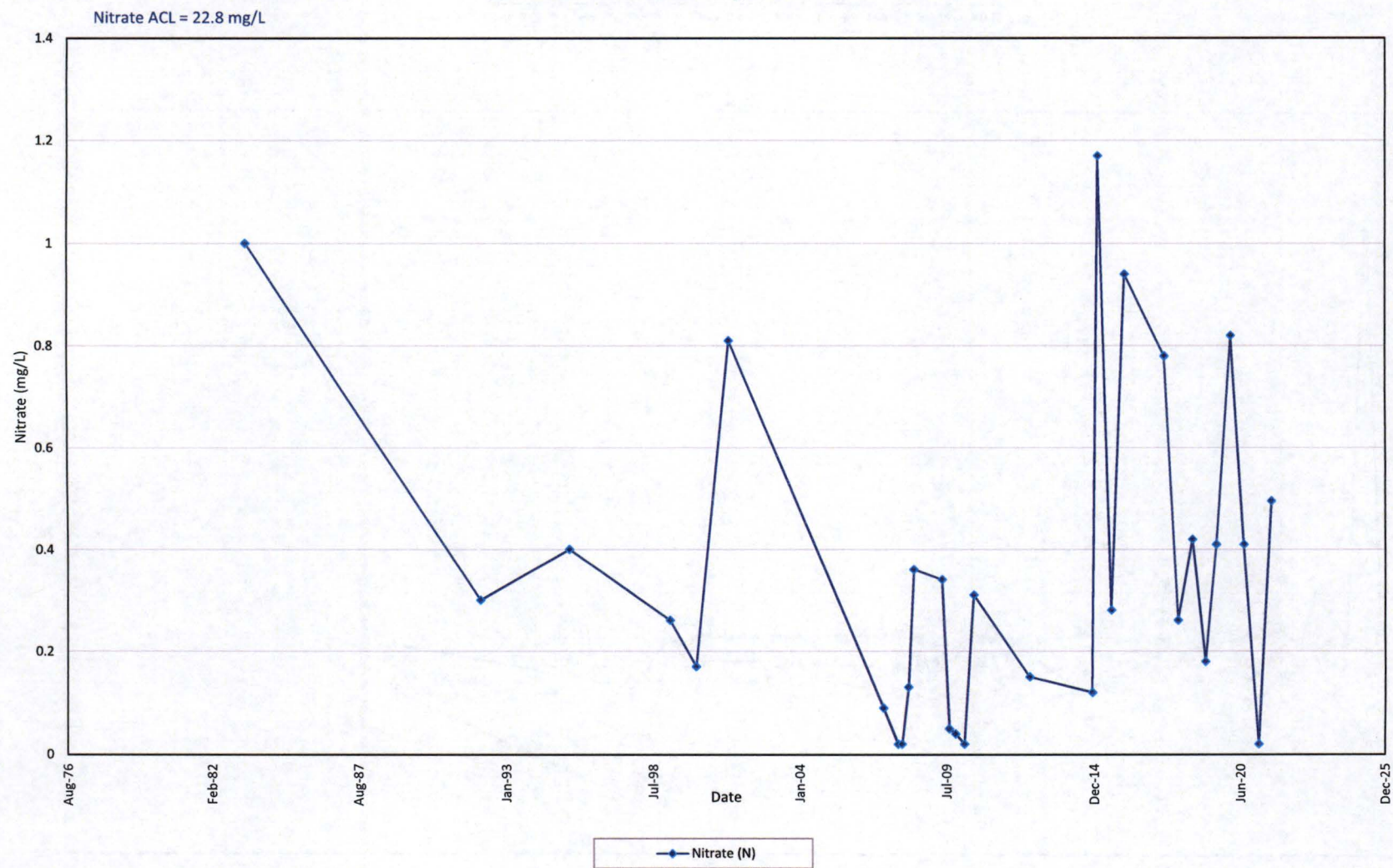
Anions and TDS in Monitoring Well 5-02 KD



Metals in Monitoring Well 5-02 KD



Nitrate in Monitoring Well 5-02 KD

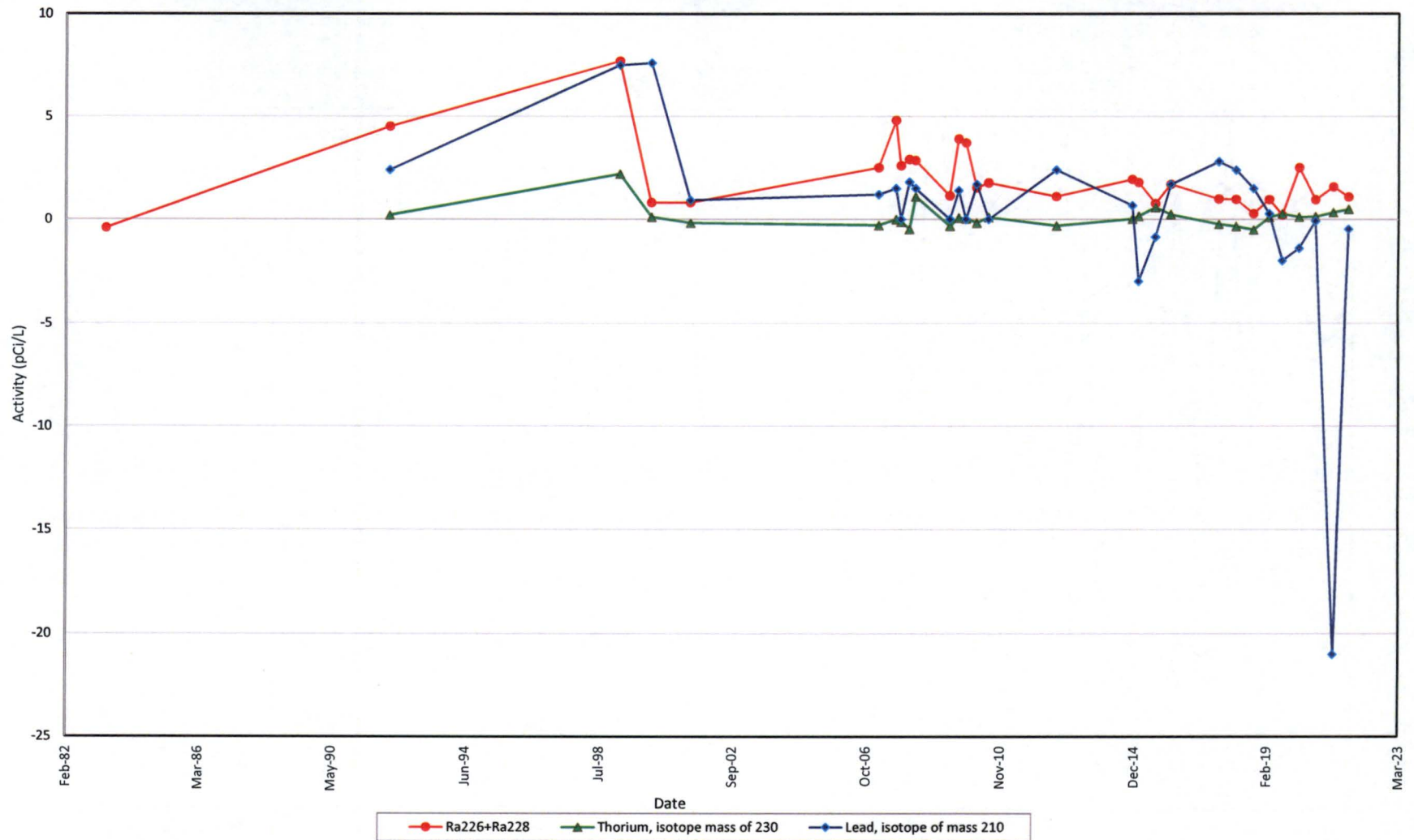


Radionuclides in Monitoring well in 5-02 KD

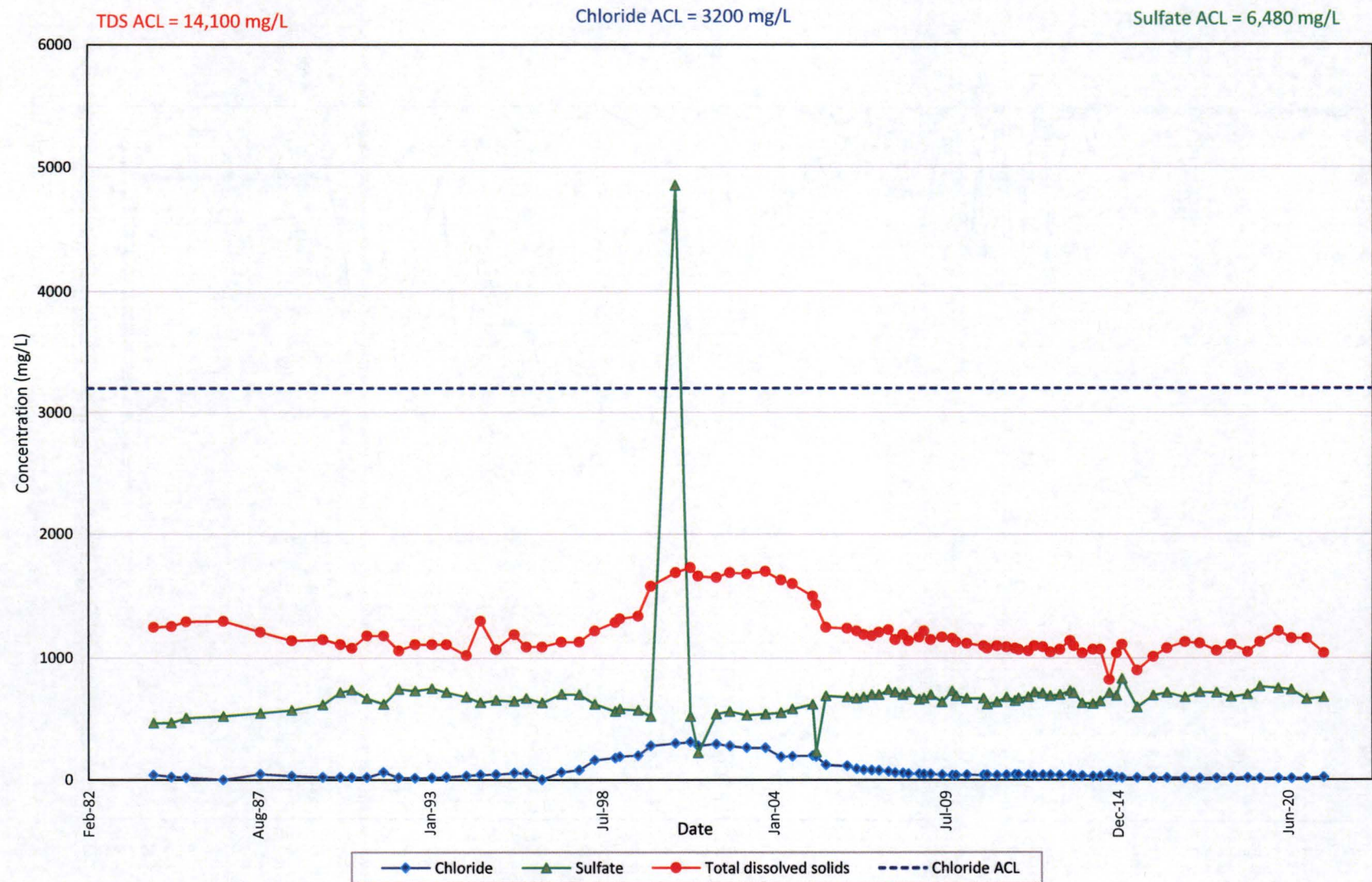
Pb-210 ACL = 62 pCi/L

Th-230 ACL = 945 pCi/L

Ra-226+228 ACL = 218 pCi/L



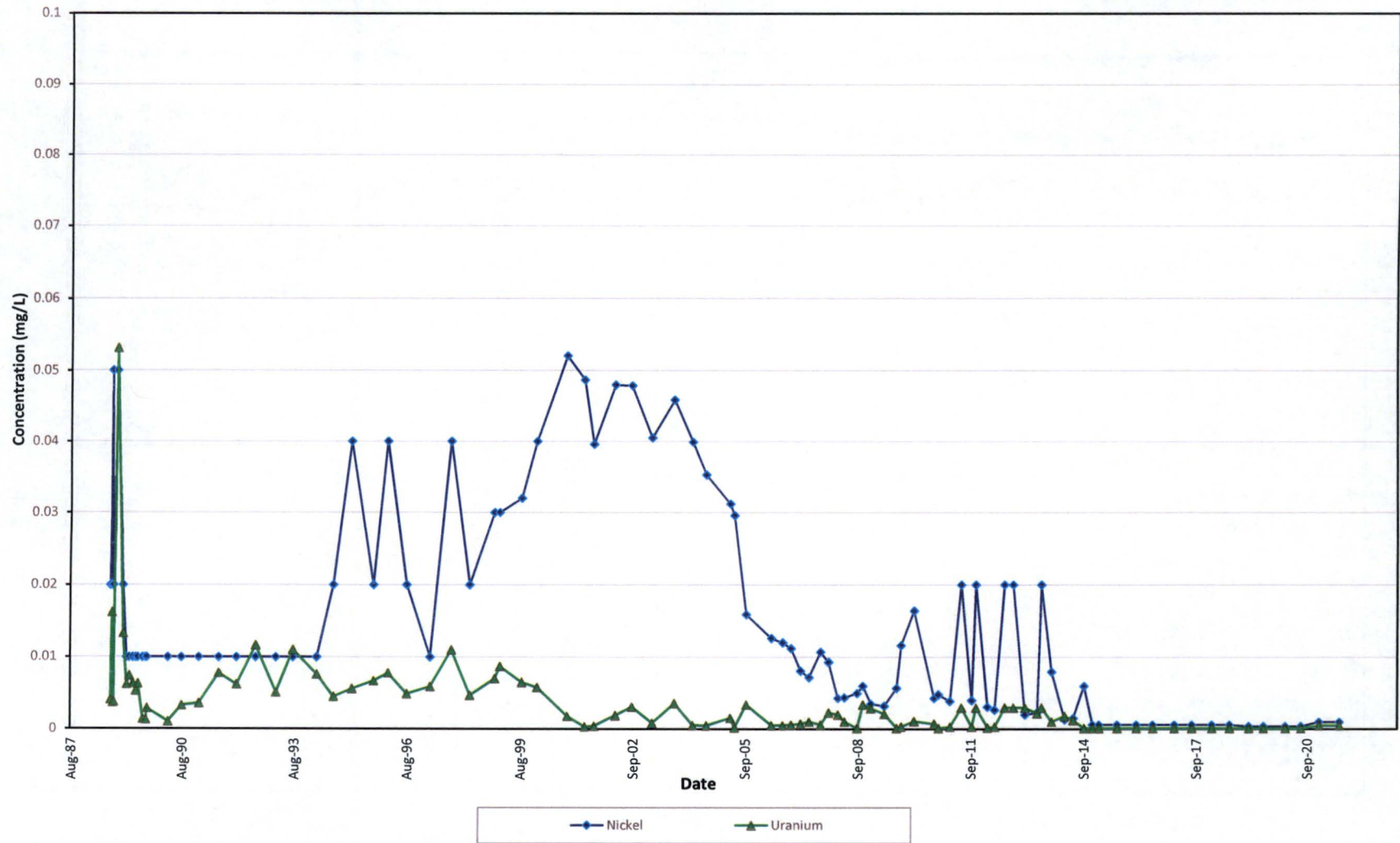
Anions and TDS in Monitoring Well 17-01 KD



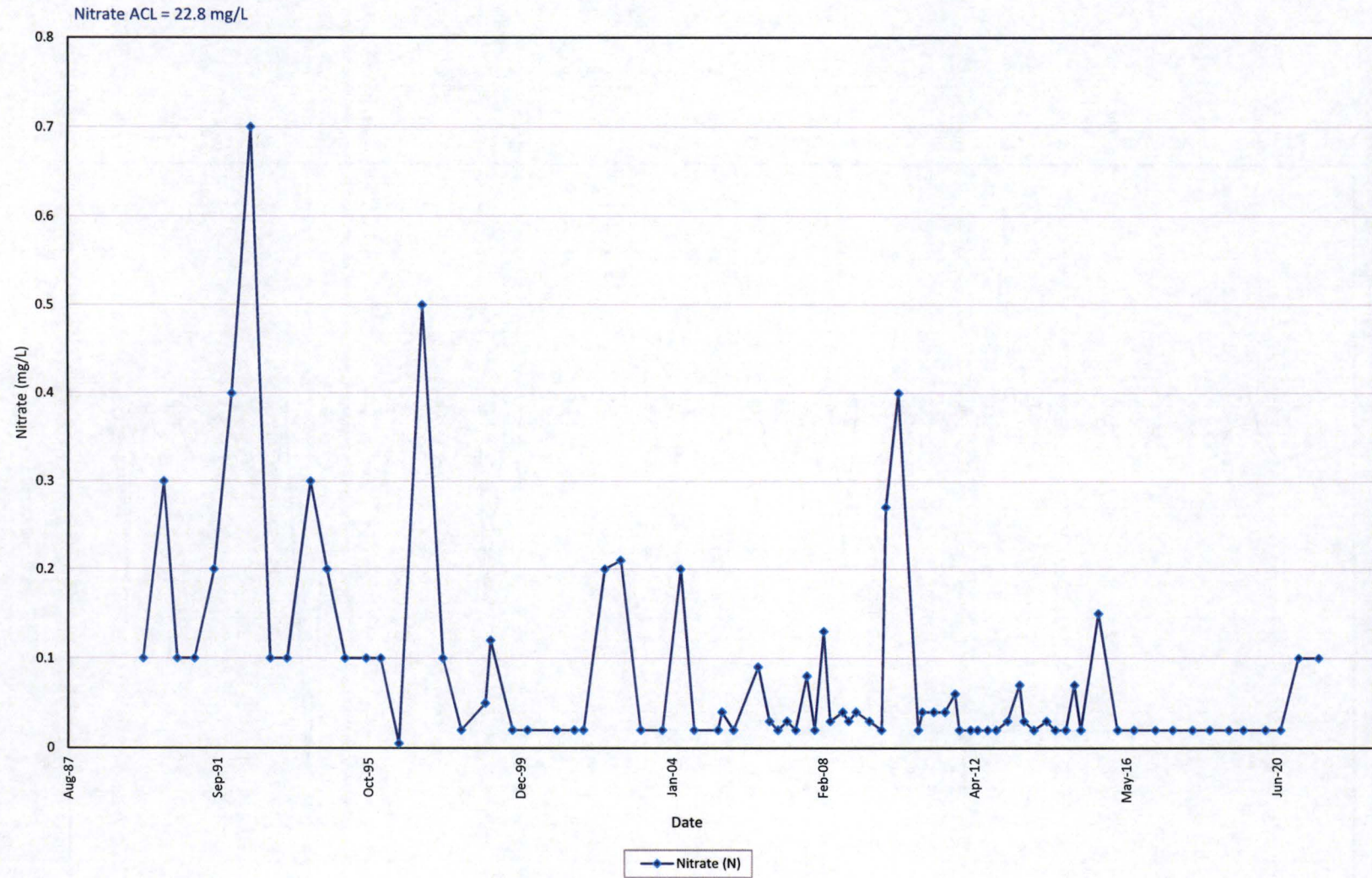
Metals in Monitoring Well 17-01 KD

Nickel ACL = 6.8 mg/L

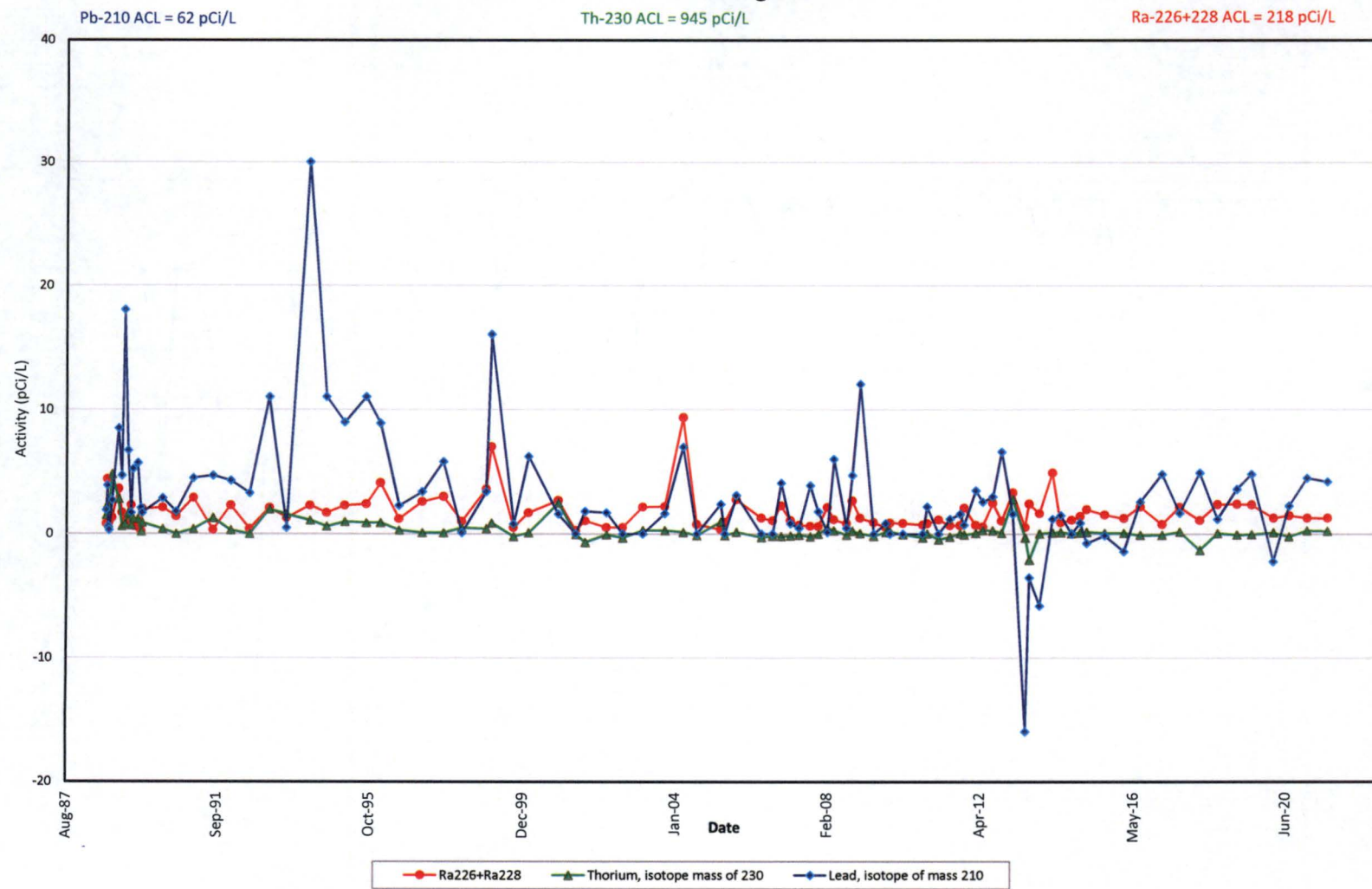
Uranium ACL = 1.6 mg/L



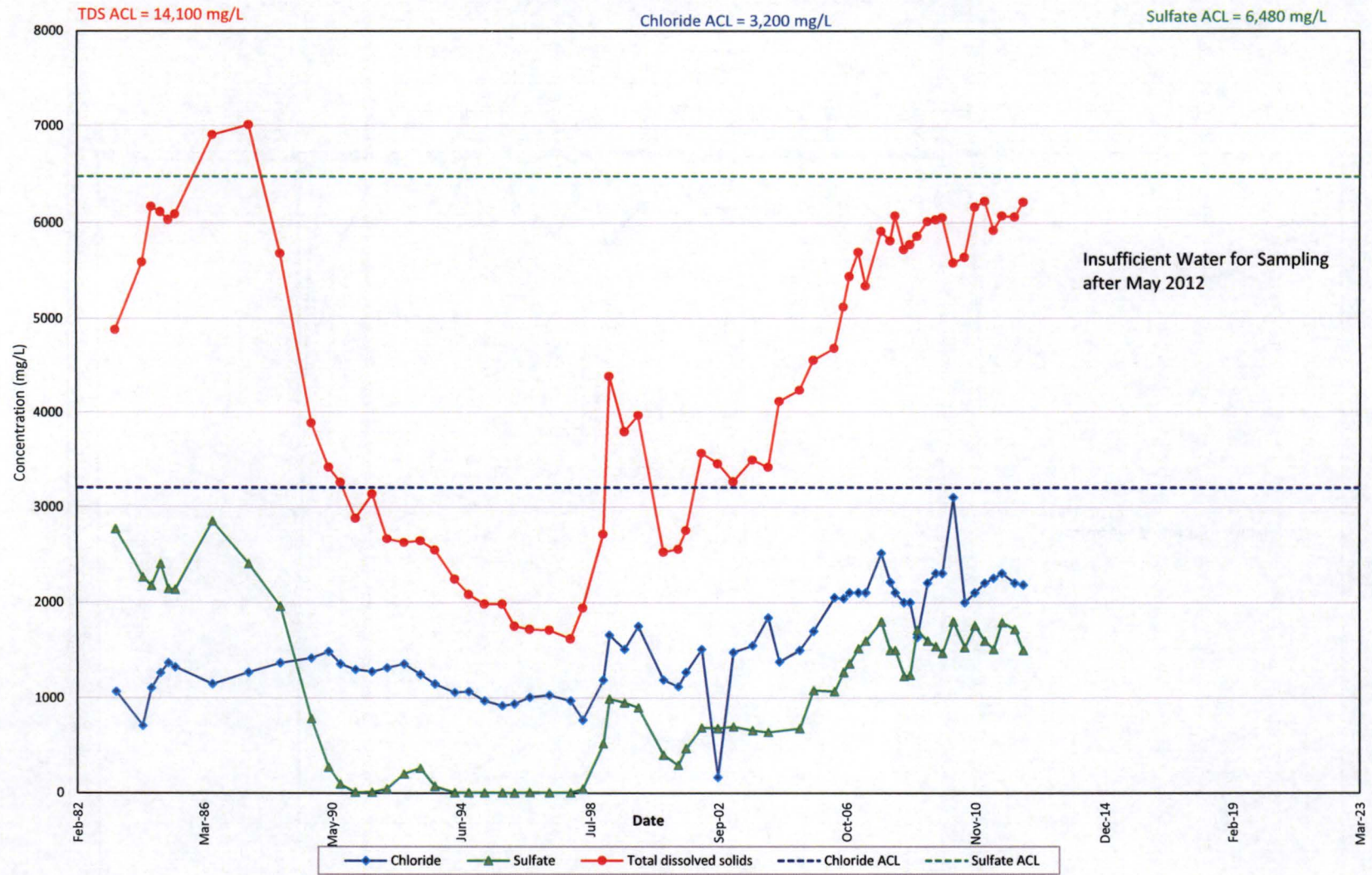
Nitrate in Monitoring Well 17-01 KD



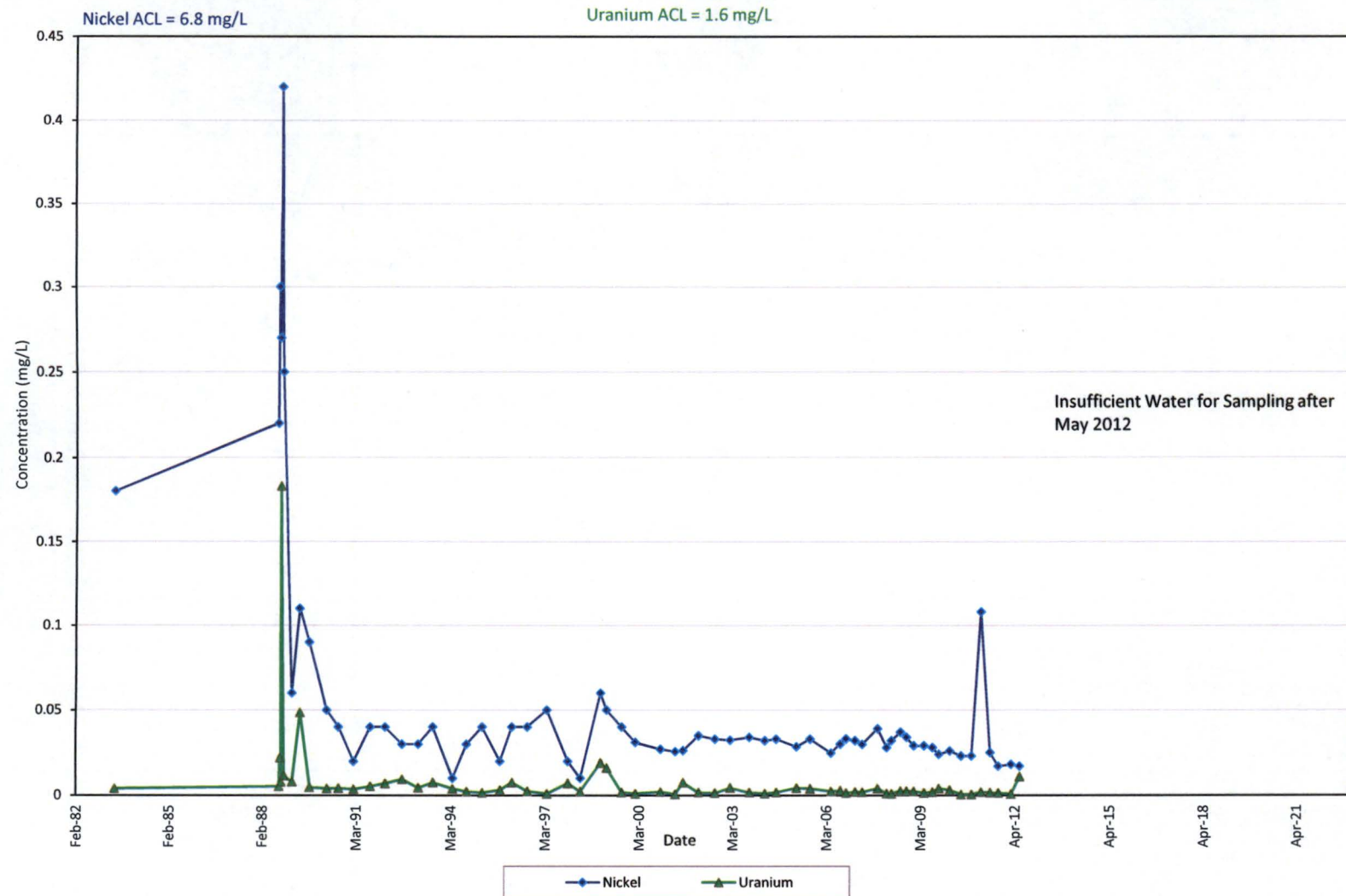
Radionuclides in Moniotring Well 17-01 KD



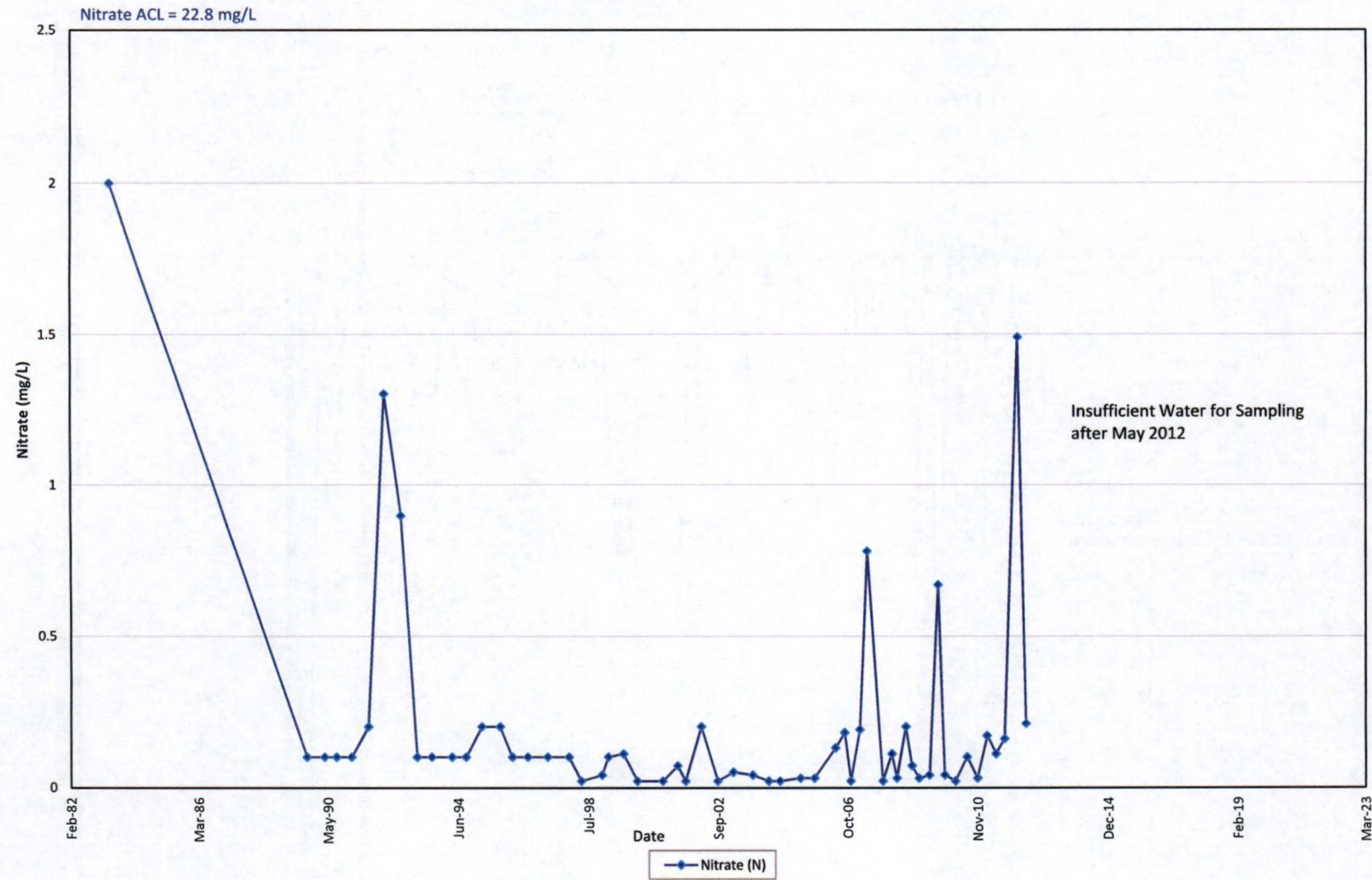
Anions and TDS in Monitoring Well 30-02 KD



Metals in Monitoring Well 30-02 KD



Nitrate in Monitoring Well 30-02 KD

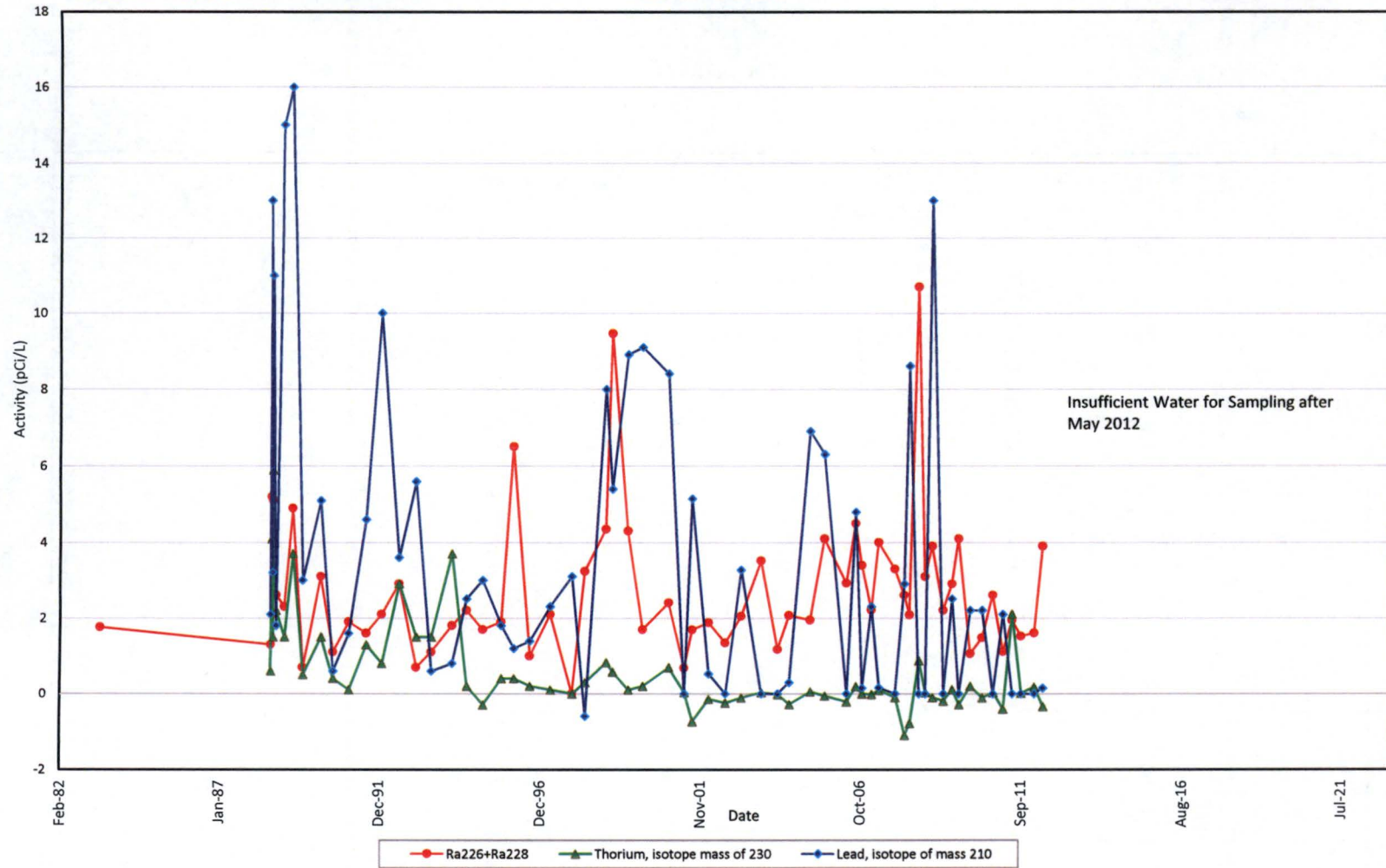


Radionuclides in Monitoring Well 30-02 KD

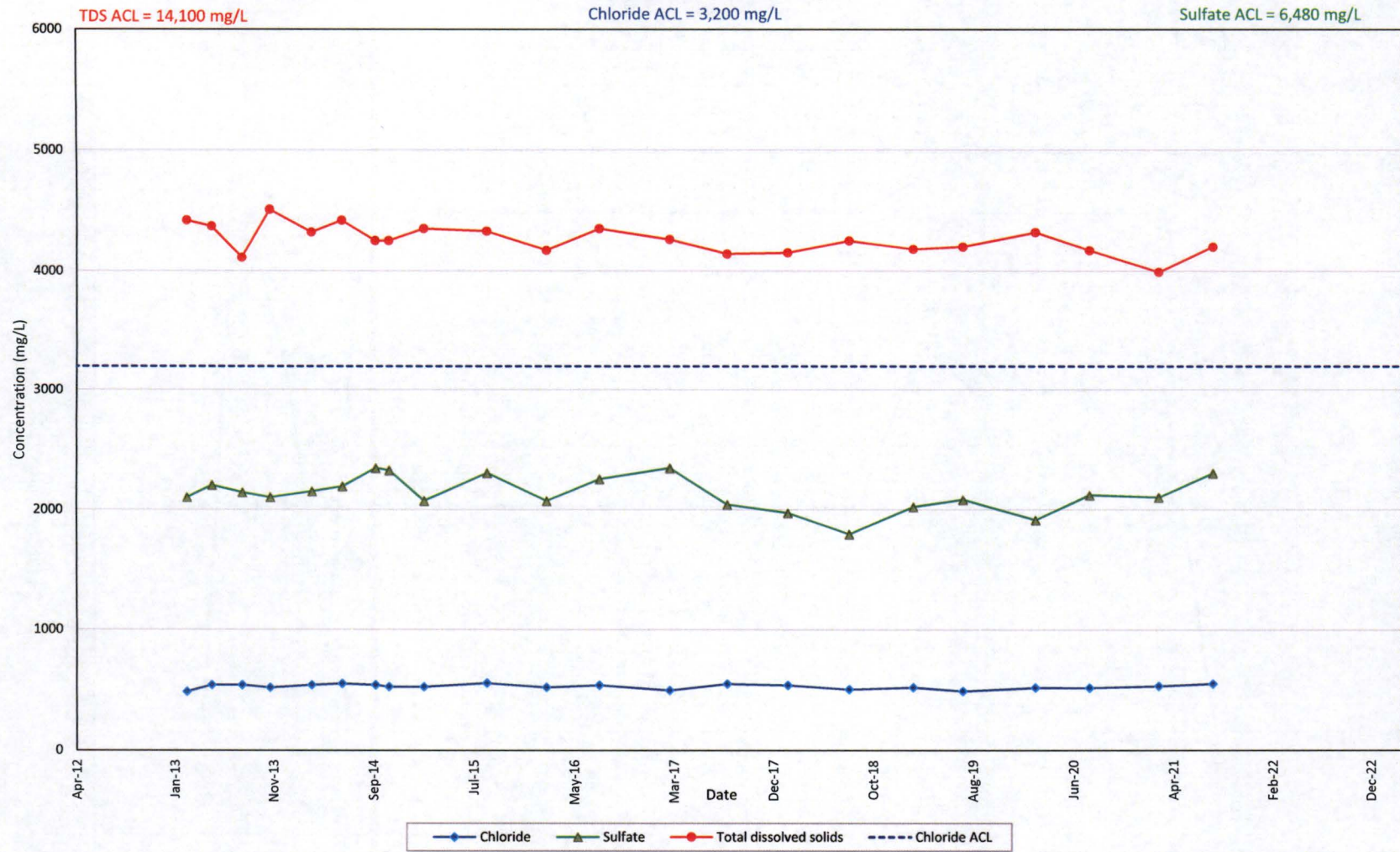
Pb-210 ACL = 62 pCi/L

Th-230 ACL = 945 pCi/L

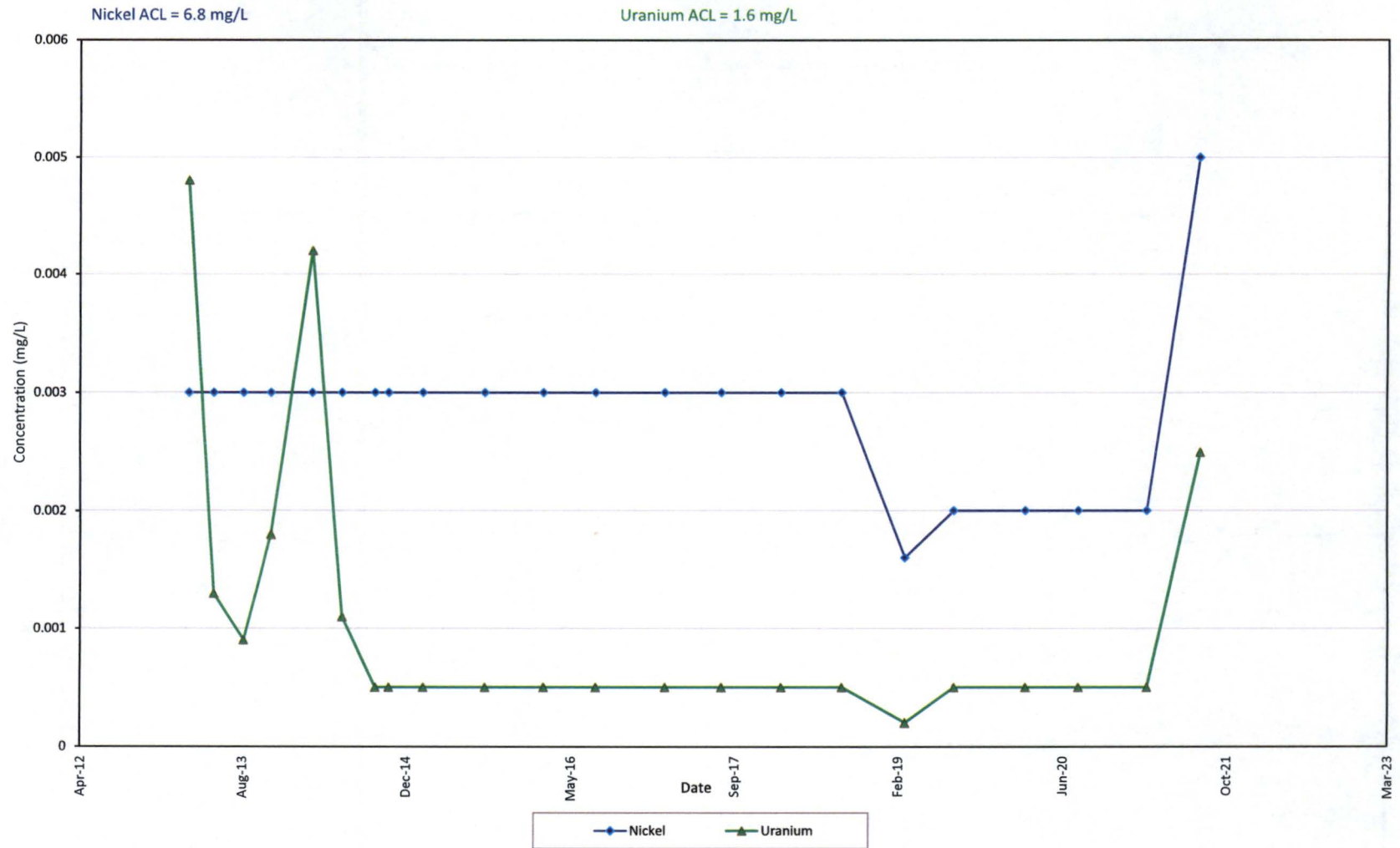
Ra-226+228 ACL = 218 pCi/L



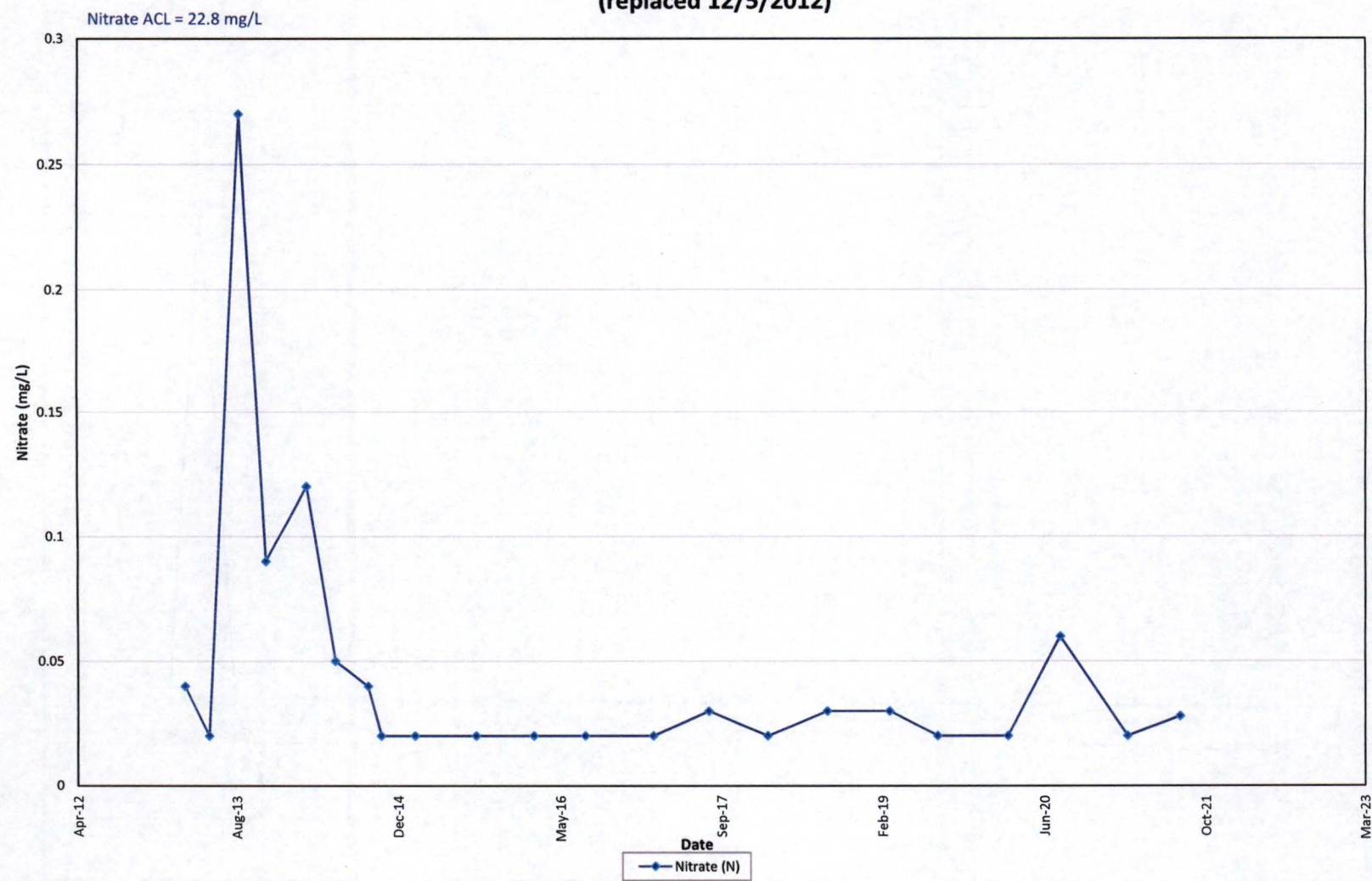
Anions and TDS in Monitoring Well 30-48 KD-R
(replaced 12/5/2012)



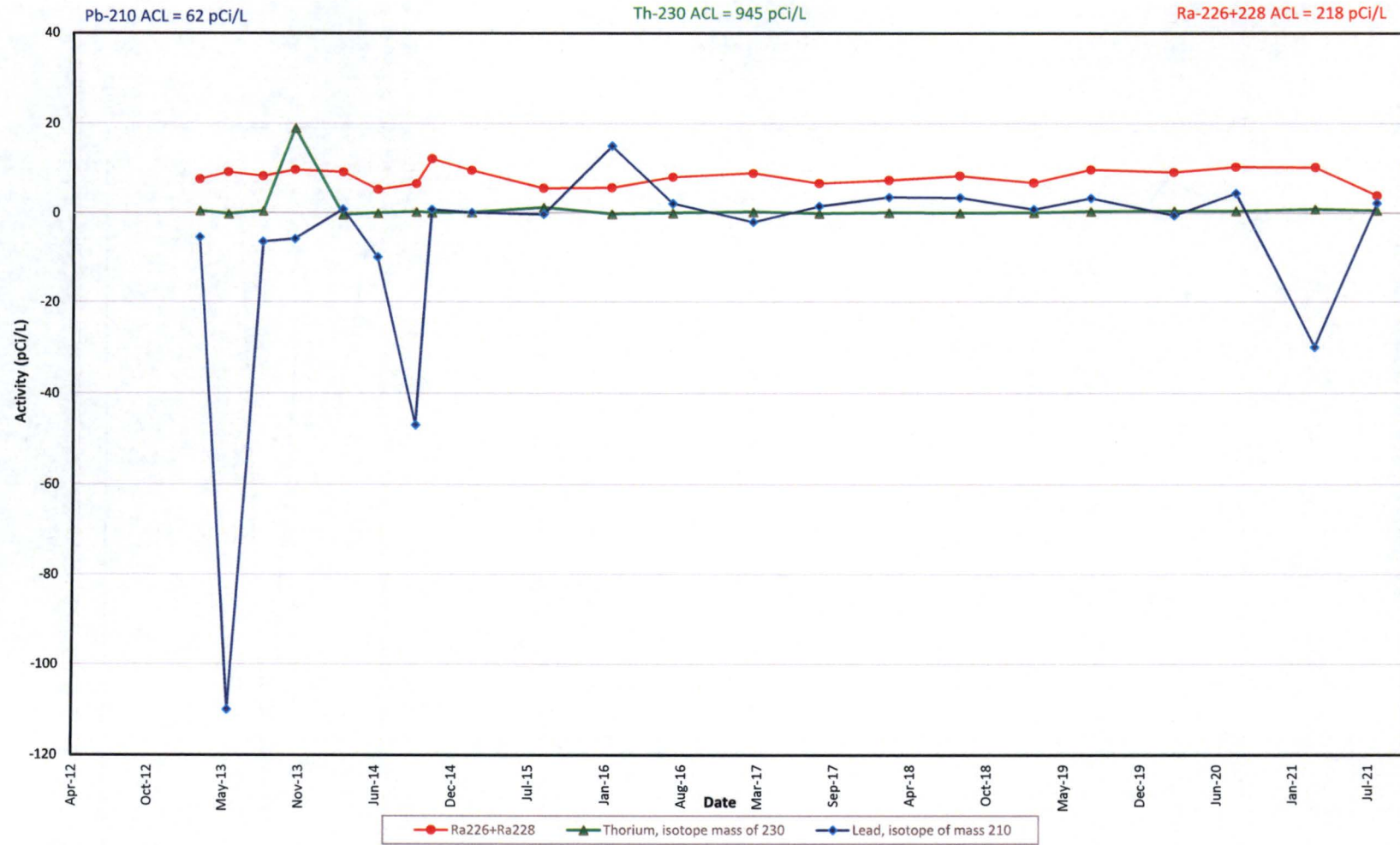
**Metals in Monitoring Well 30-48 KD-R
(replaced 12/5/2012)**



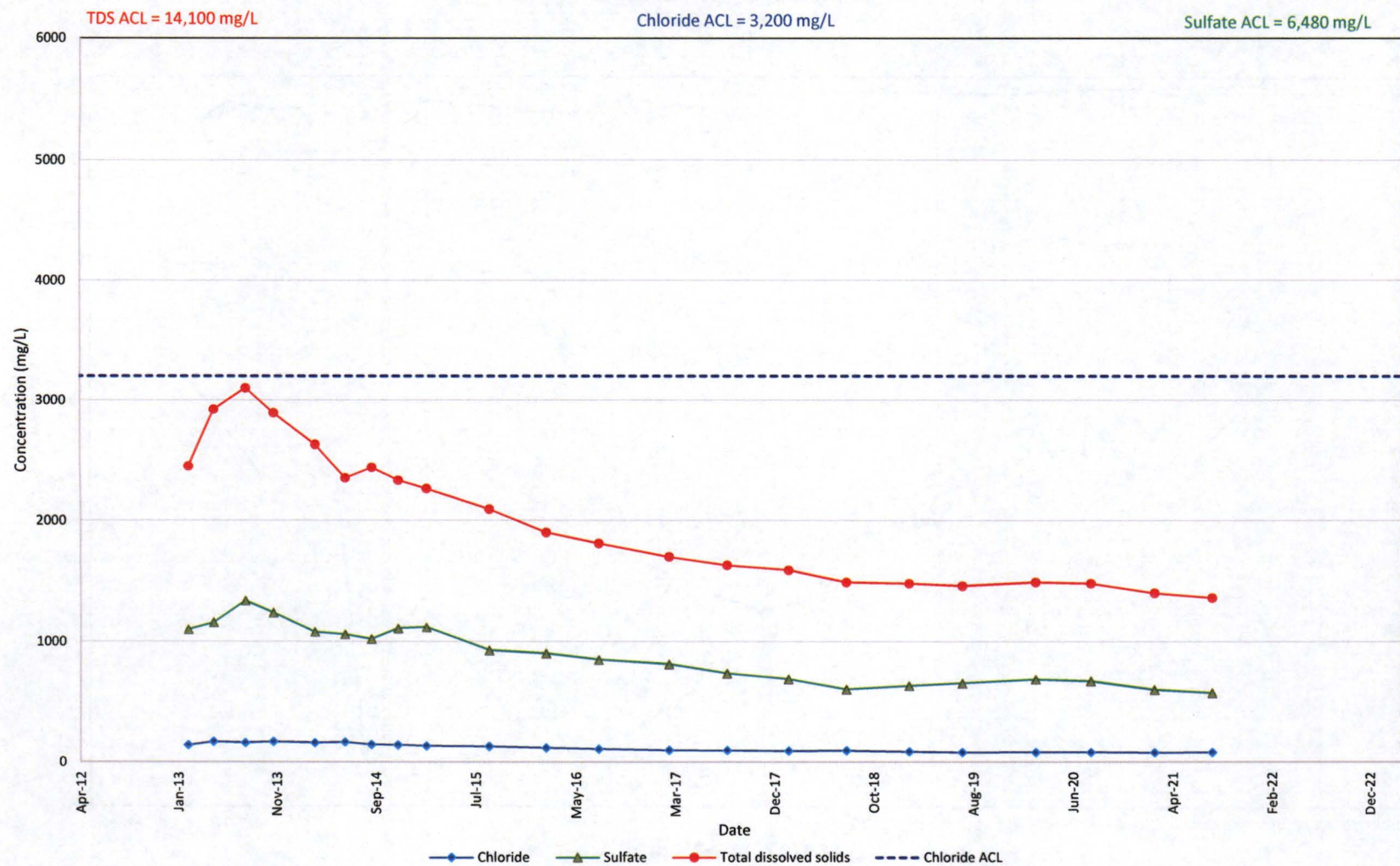
Nitrate in Monitoring Well 30-48 KD-R
(replaced 12/5/2012)



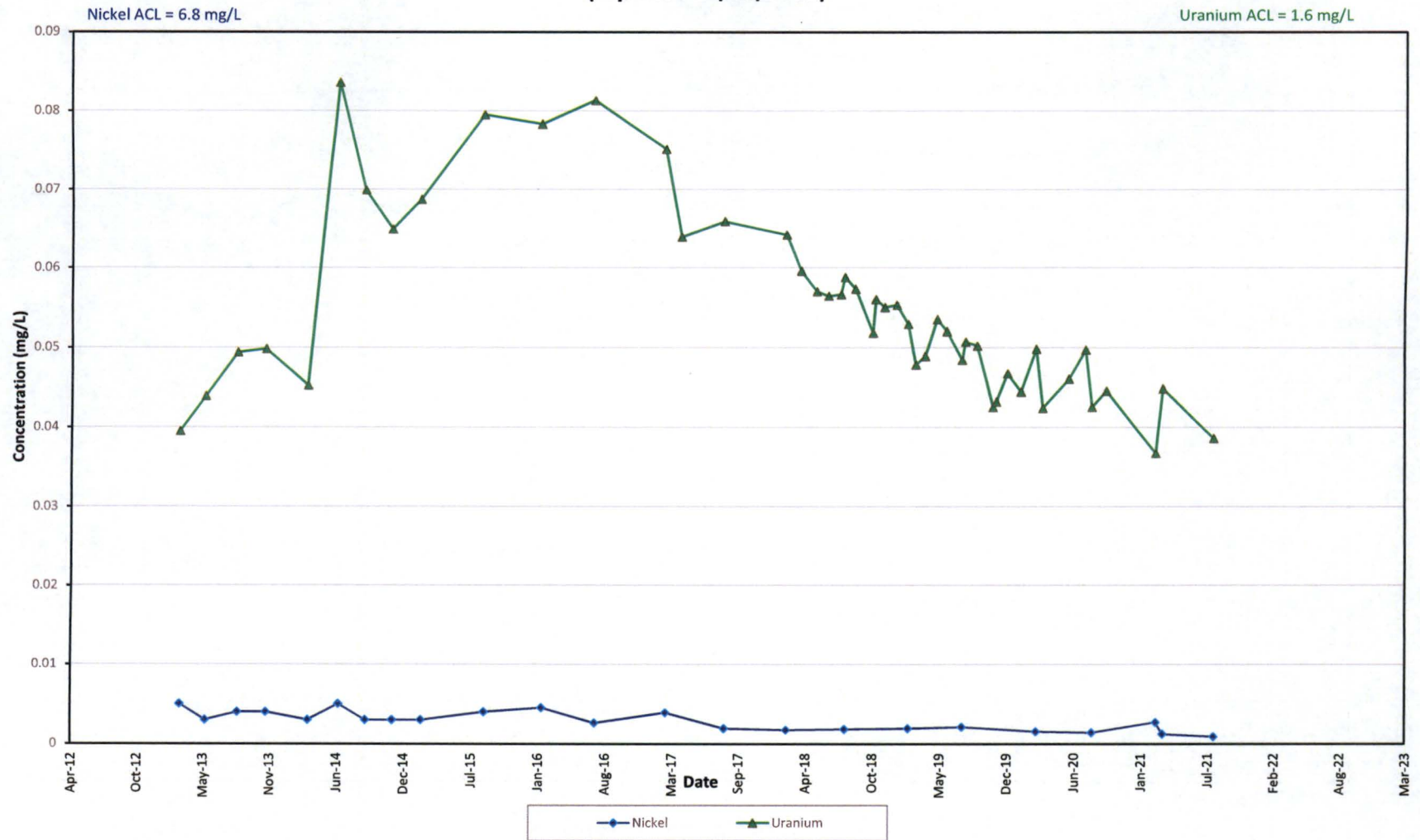
**Radionuclides in Monitoring Well 30-48 KD-R
(replaced 12/5/2012)**



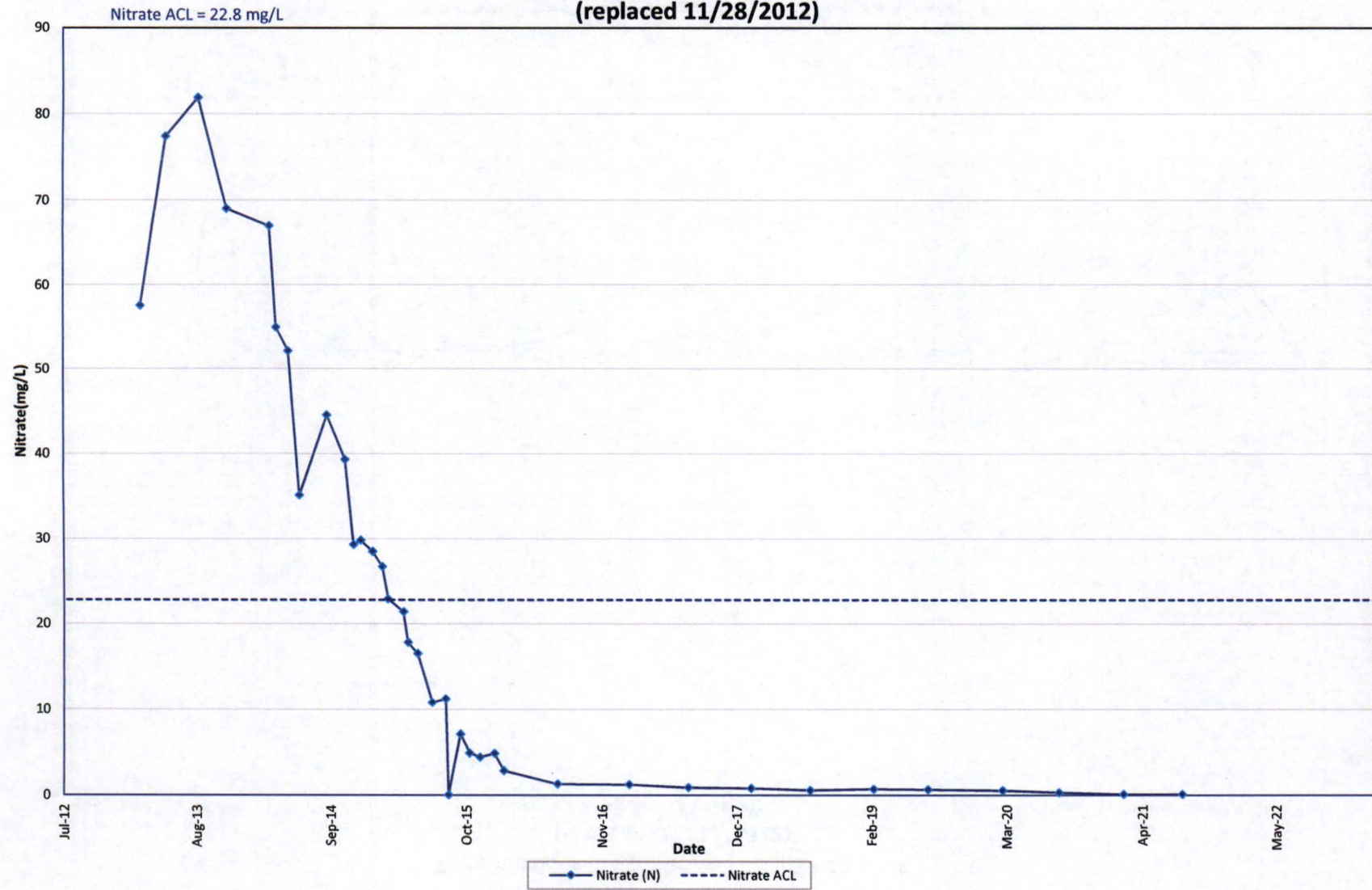
Anions and TDS in Monitoring Well 32-45 KD-R
(replaced 11/28/2012)



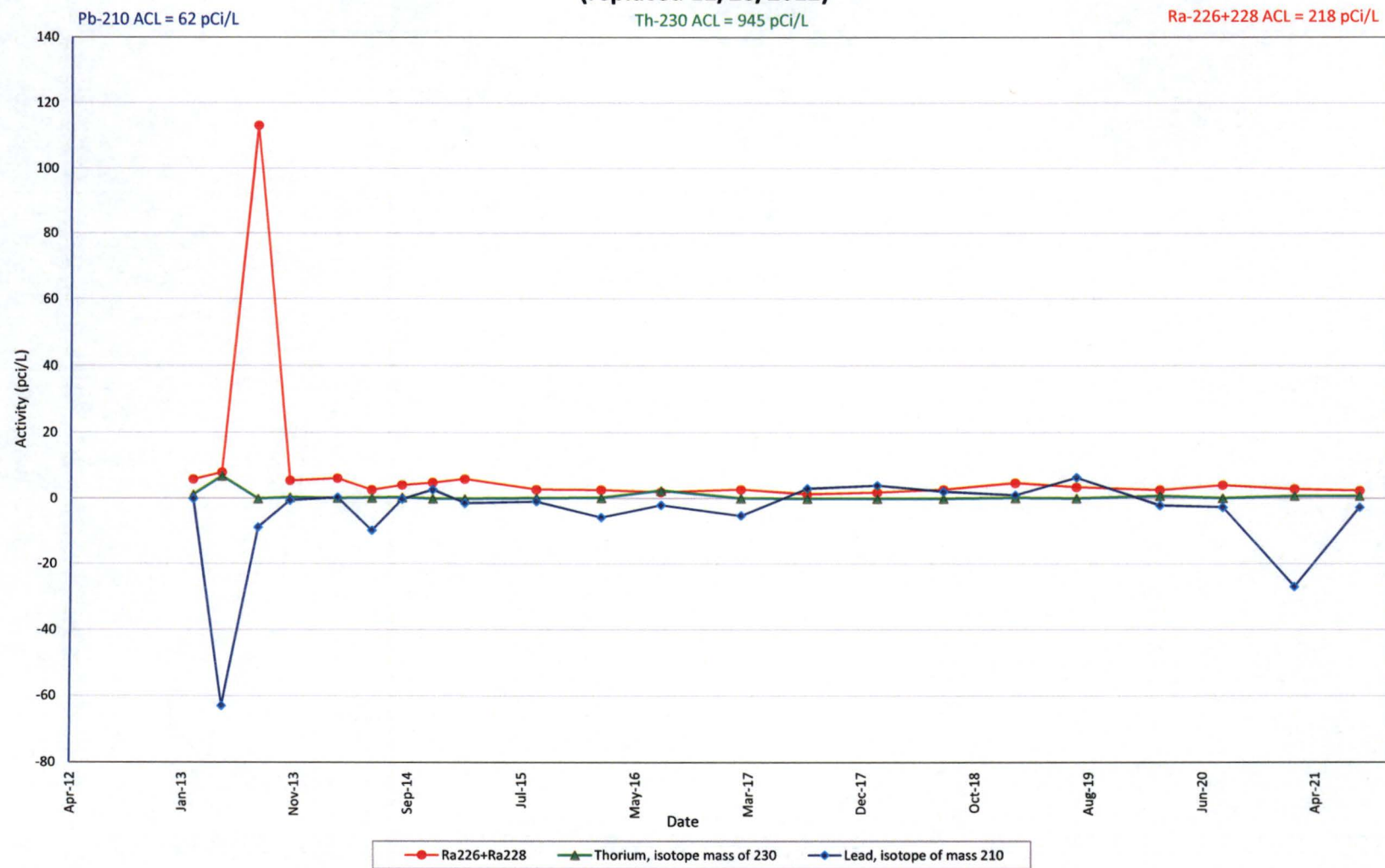
**Metals in Monitoring Well 32-45 KD-R
(replaced 11/28/2012)**



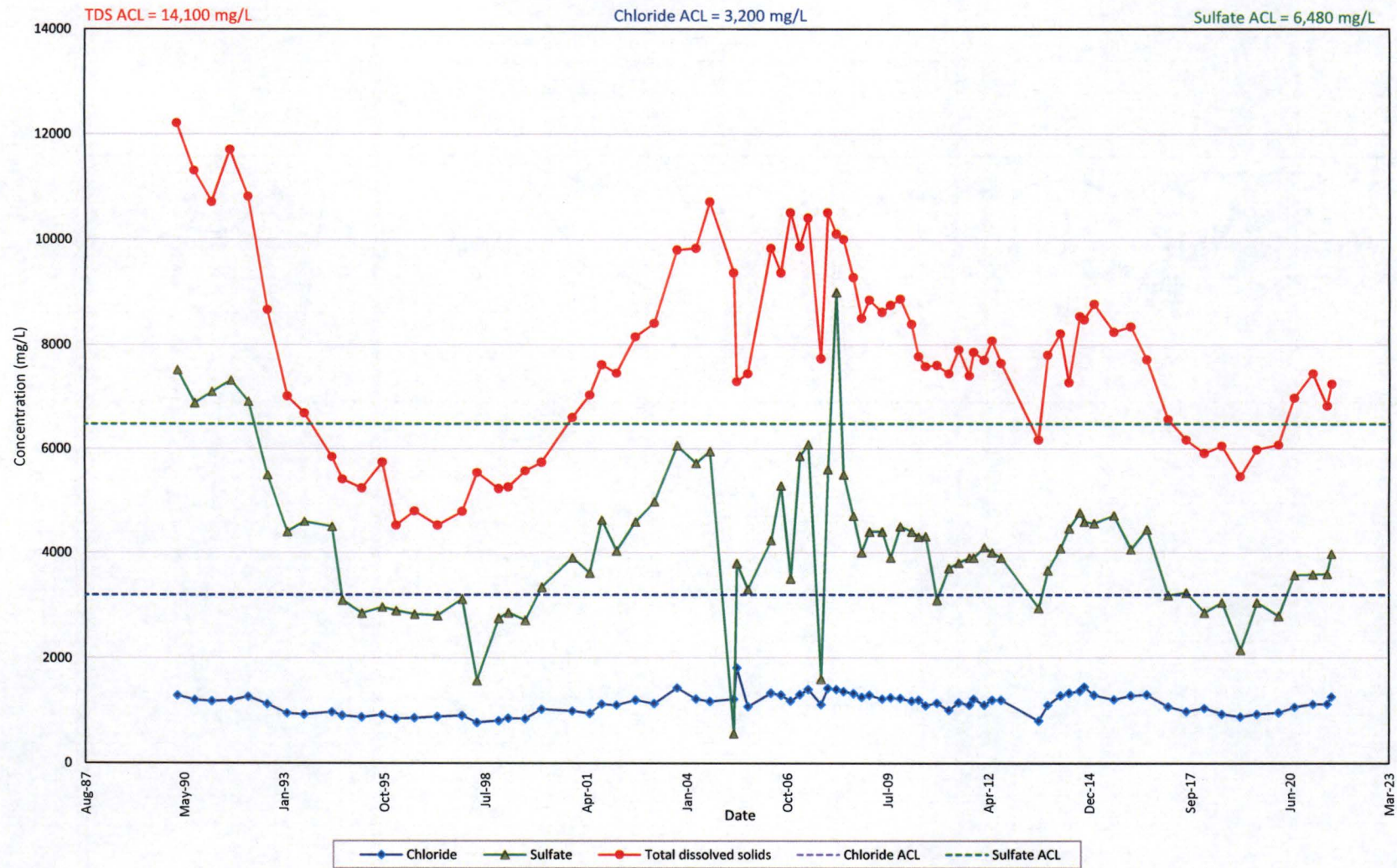
Nitrate in Monitoring Well 32-45 KD-R
(replaced 11/28/2012)



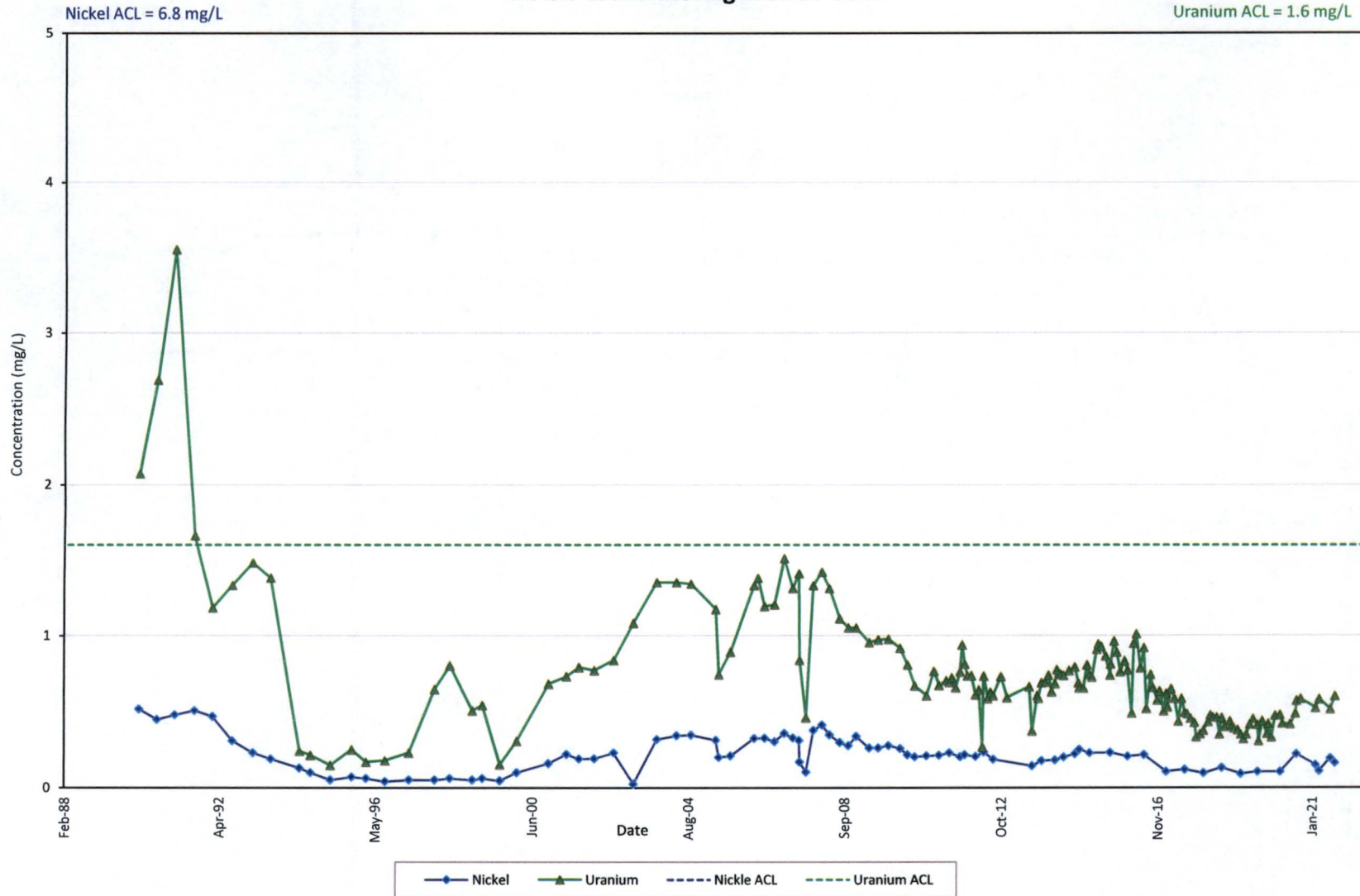
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(replaced 11/28/2012)**



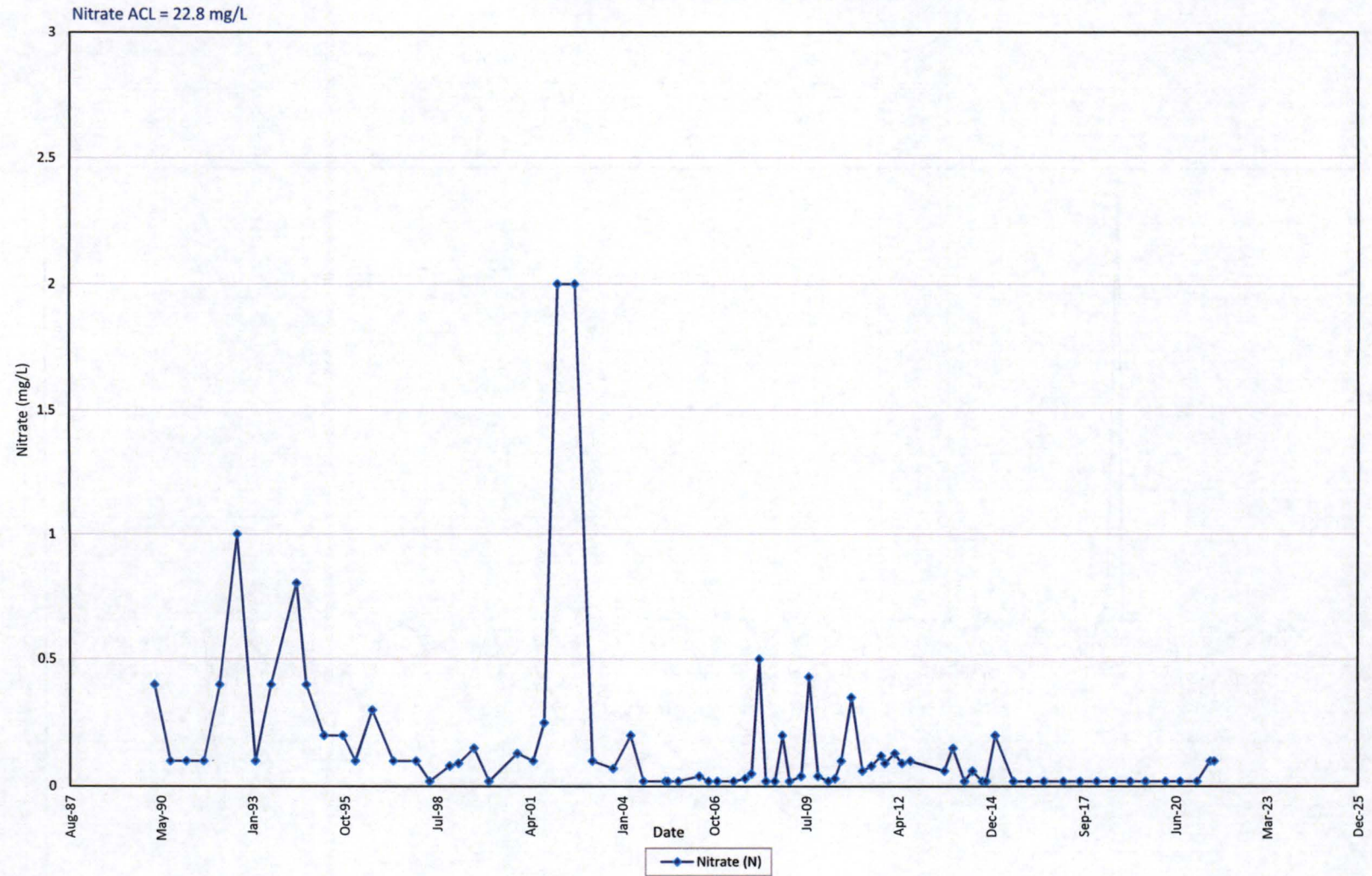
Anions and TDS in Monitoring Well 36-06 KD



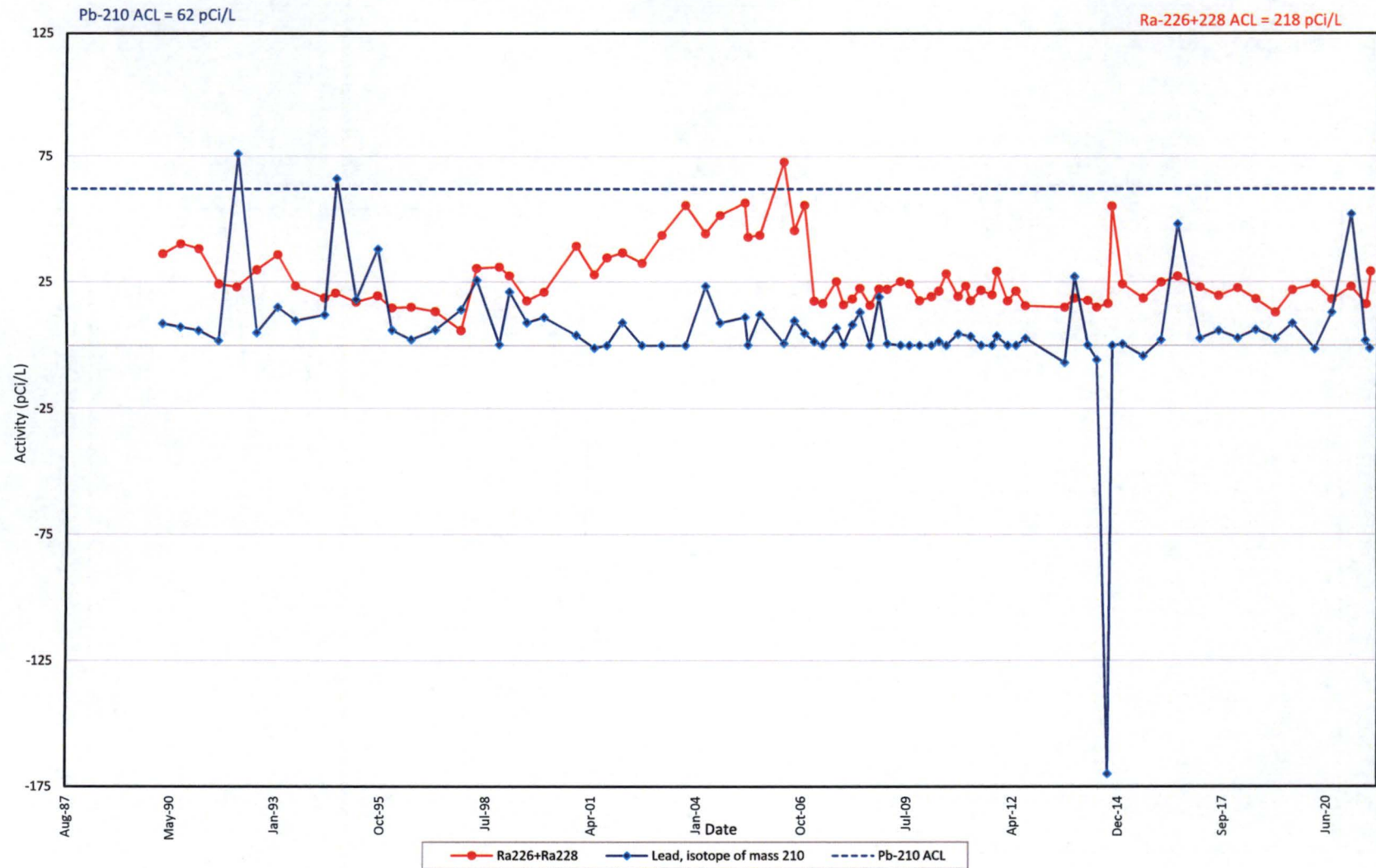
Metals in Monitoring Well 36-06 KD



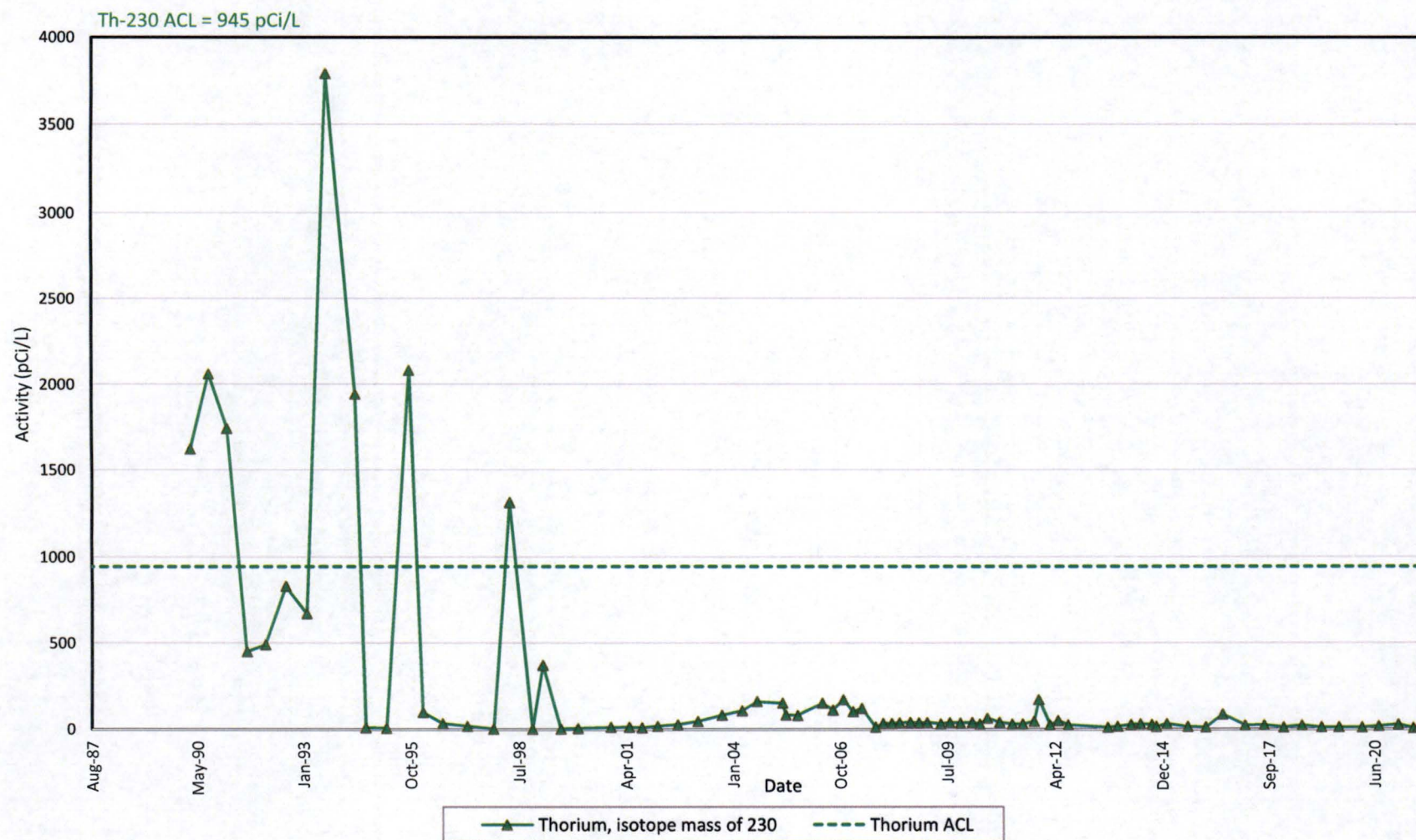
Nitrate in Monitoring Well 36-06 KD



Radionuclides in Monitoring Well 36-06 KD

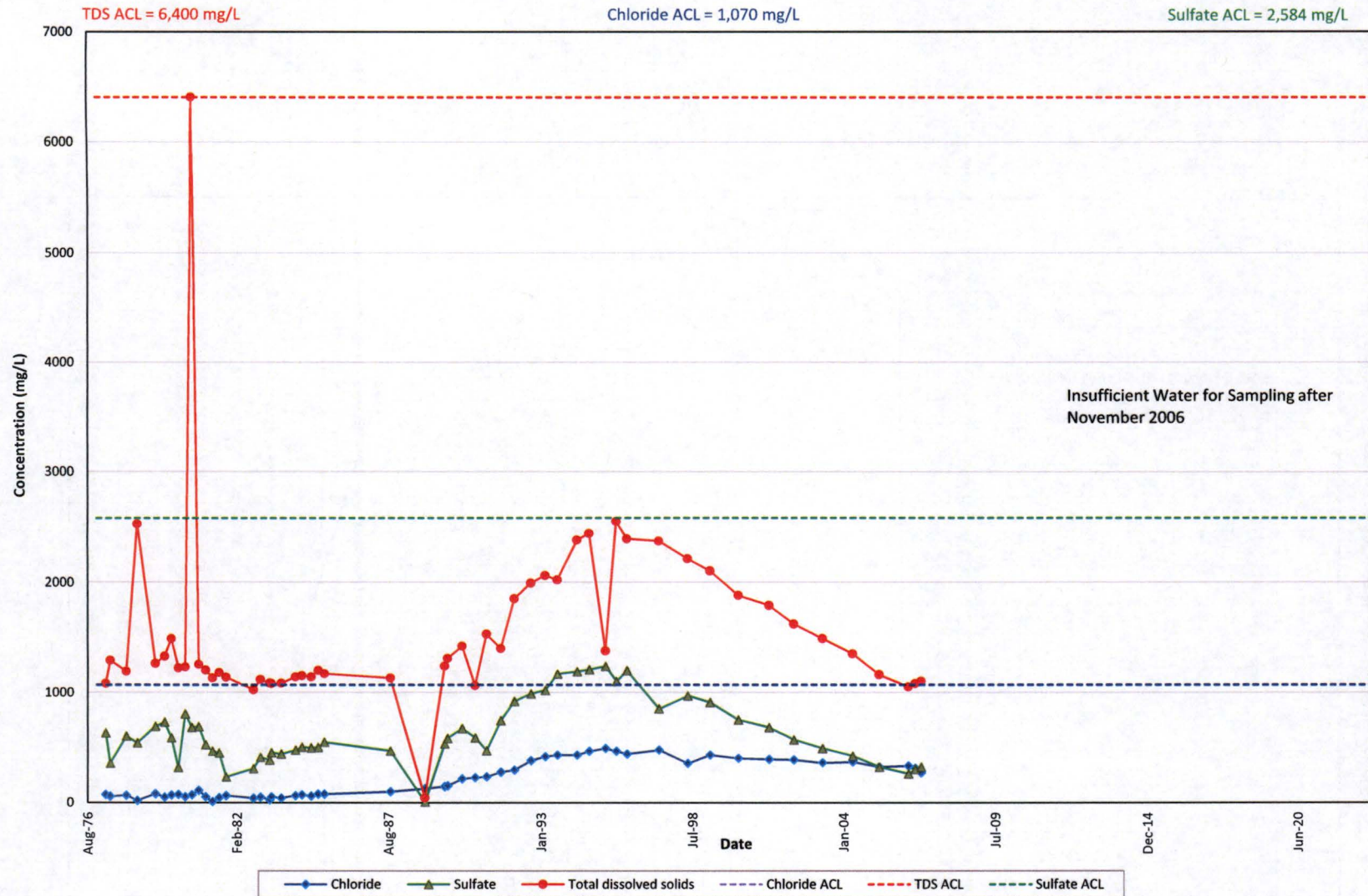


Thorium-230 in Monitoring Well 36-06 KD

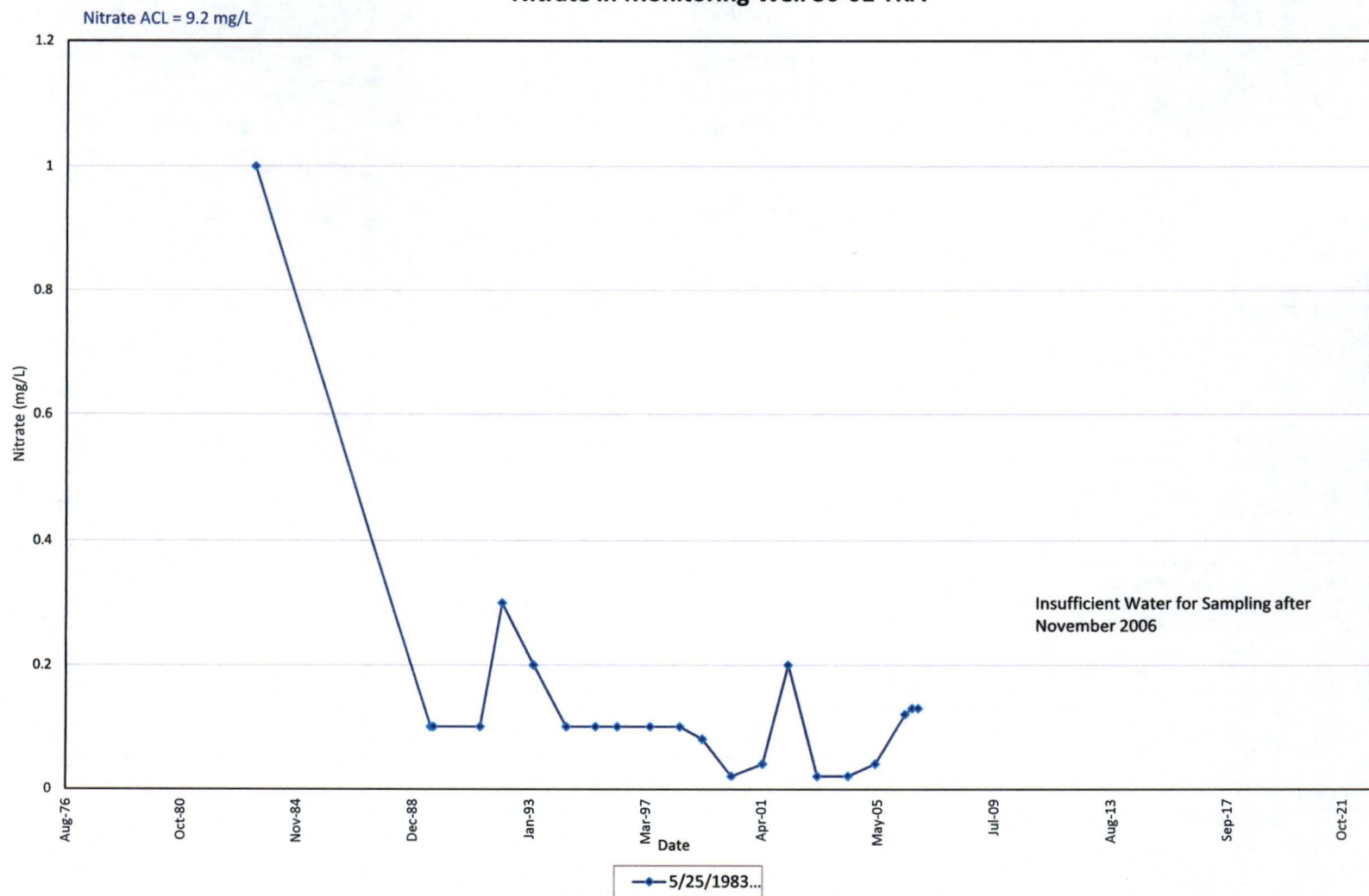


Stability Monitoring Plan
Time Versus Concentration Plots
Tres Hermanos A

Anions and TDS in Monitoring Well 30-01 TRA



Nitrate in Monitoring Well 30-01 TRA

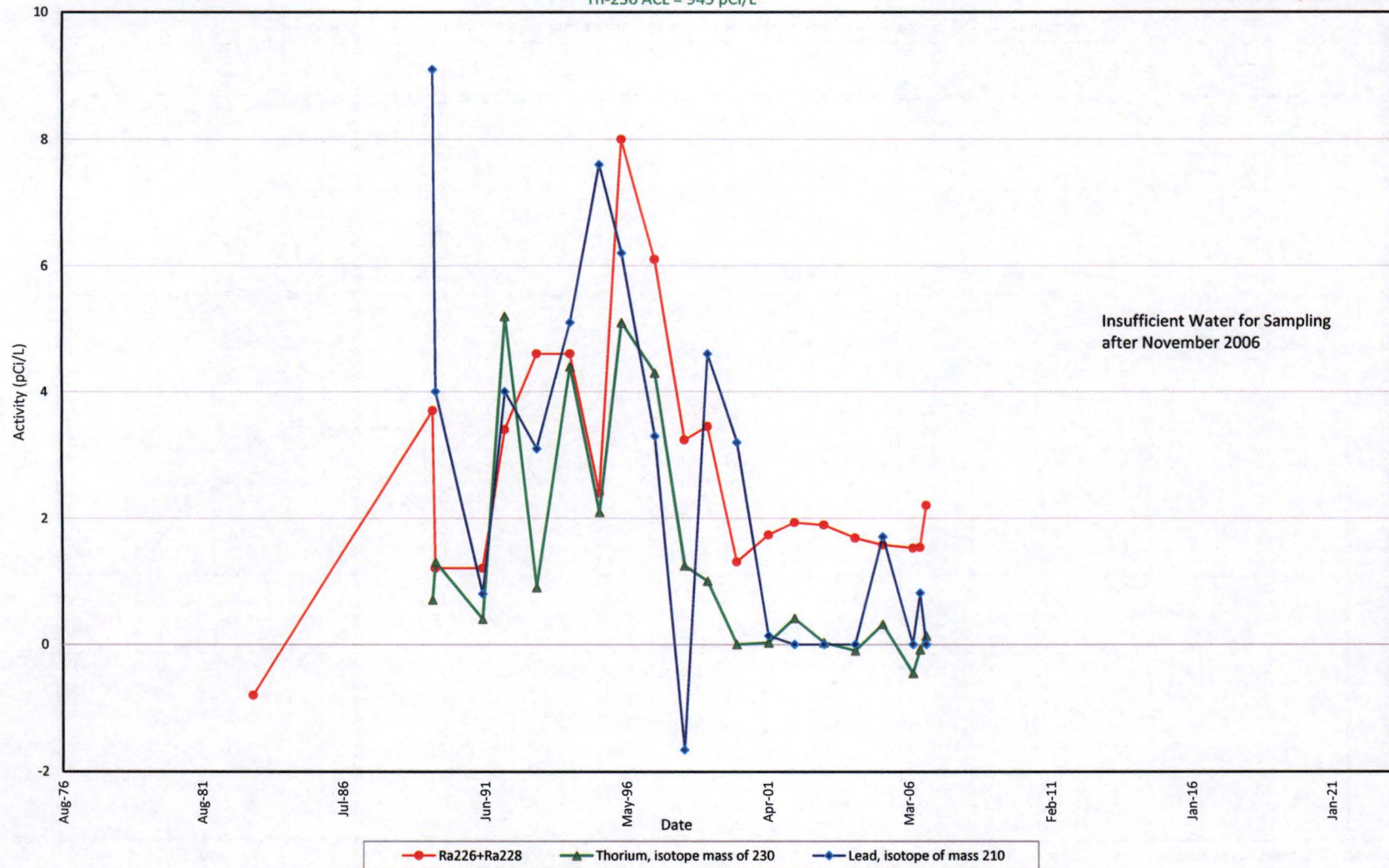


Radionuclides in Monitoring Well 30-01 TRA

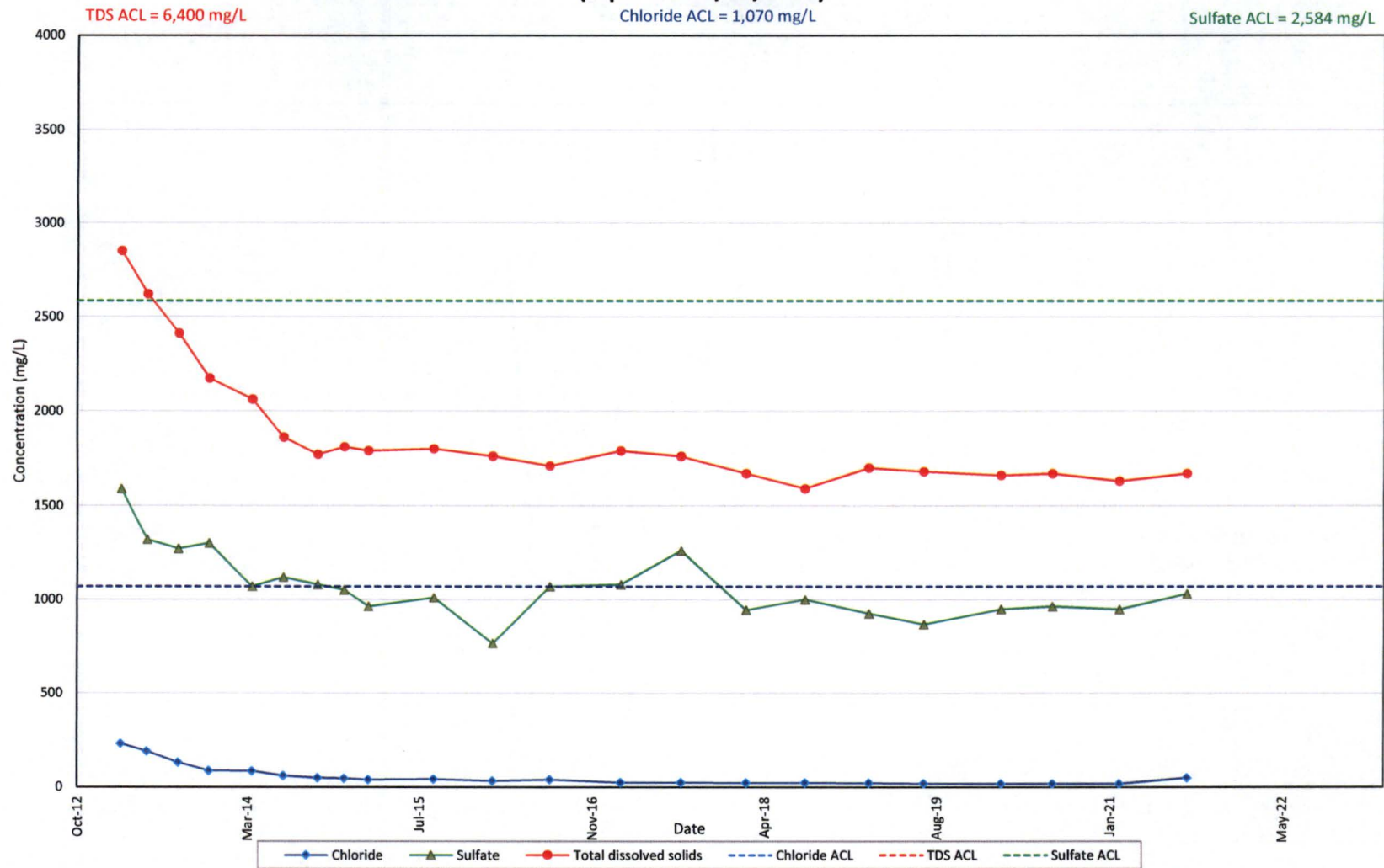
Pb-210 ACL = 62 pCi/L

Th-230 ACL = 945 pCi/L

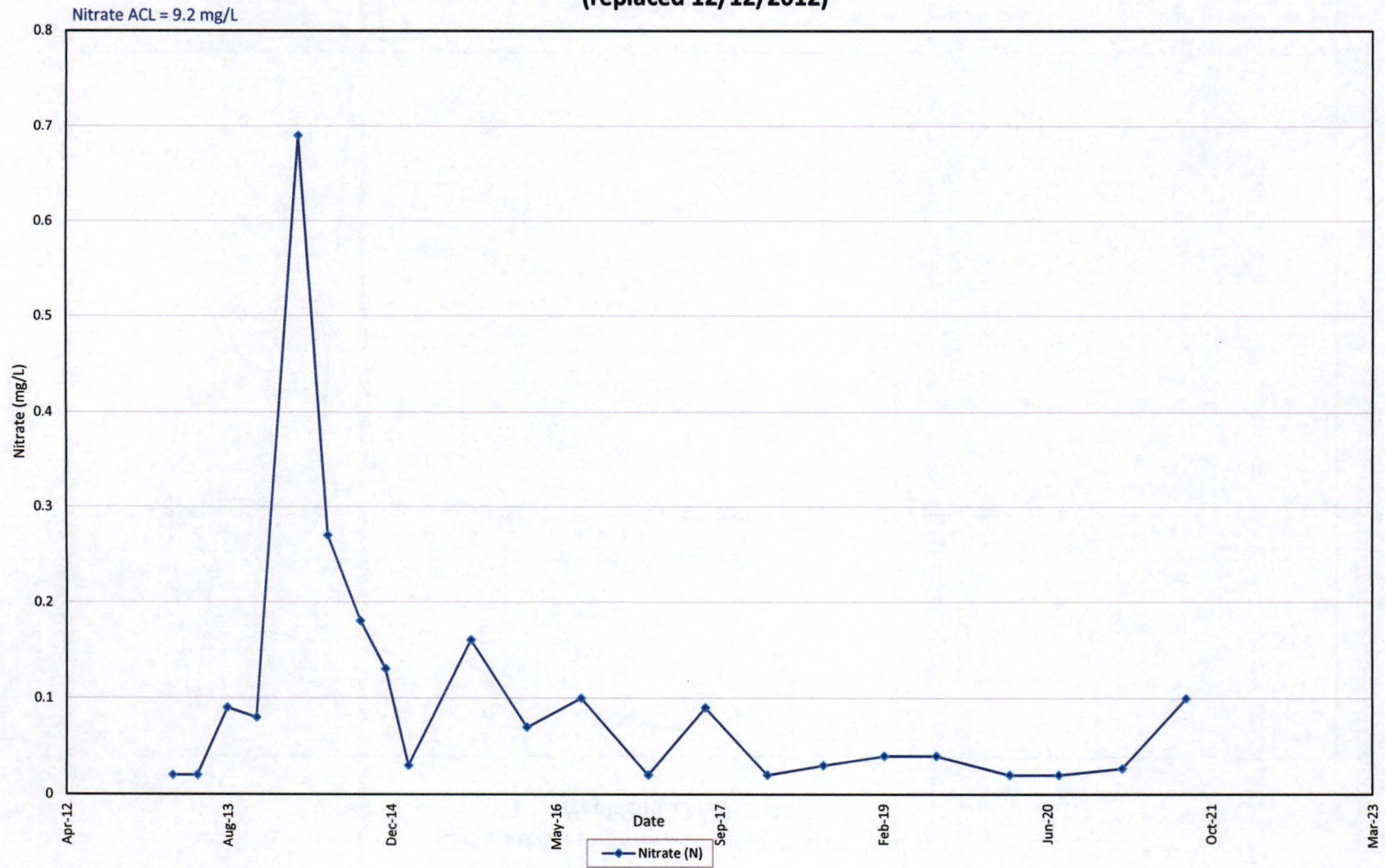
Ra-226+228 ACL = 218 pCi/L



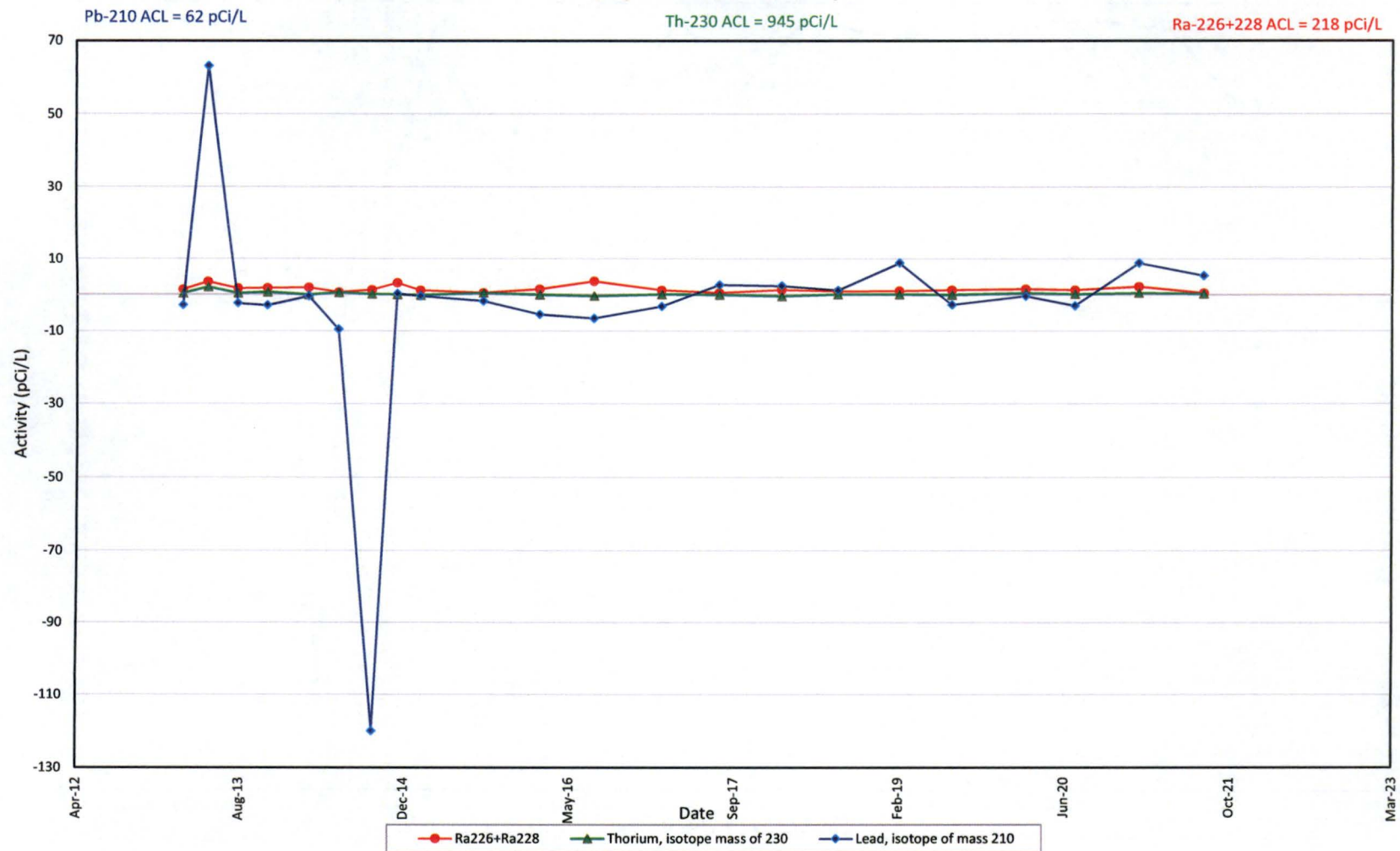
**Anions and TDS in Monitoring Well 31-01 TRA-R
(replaced 12/12/2012)**



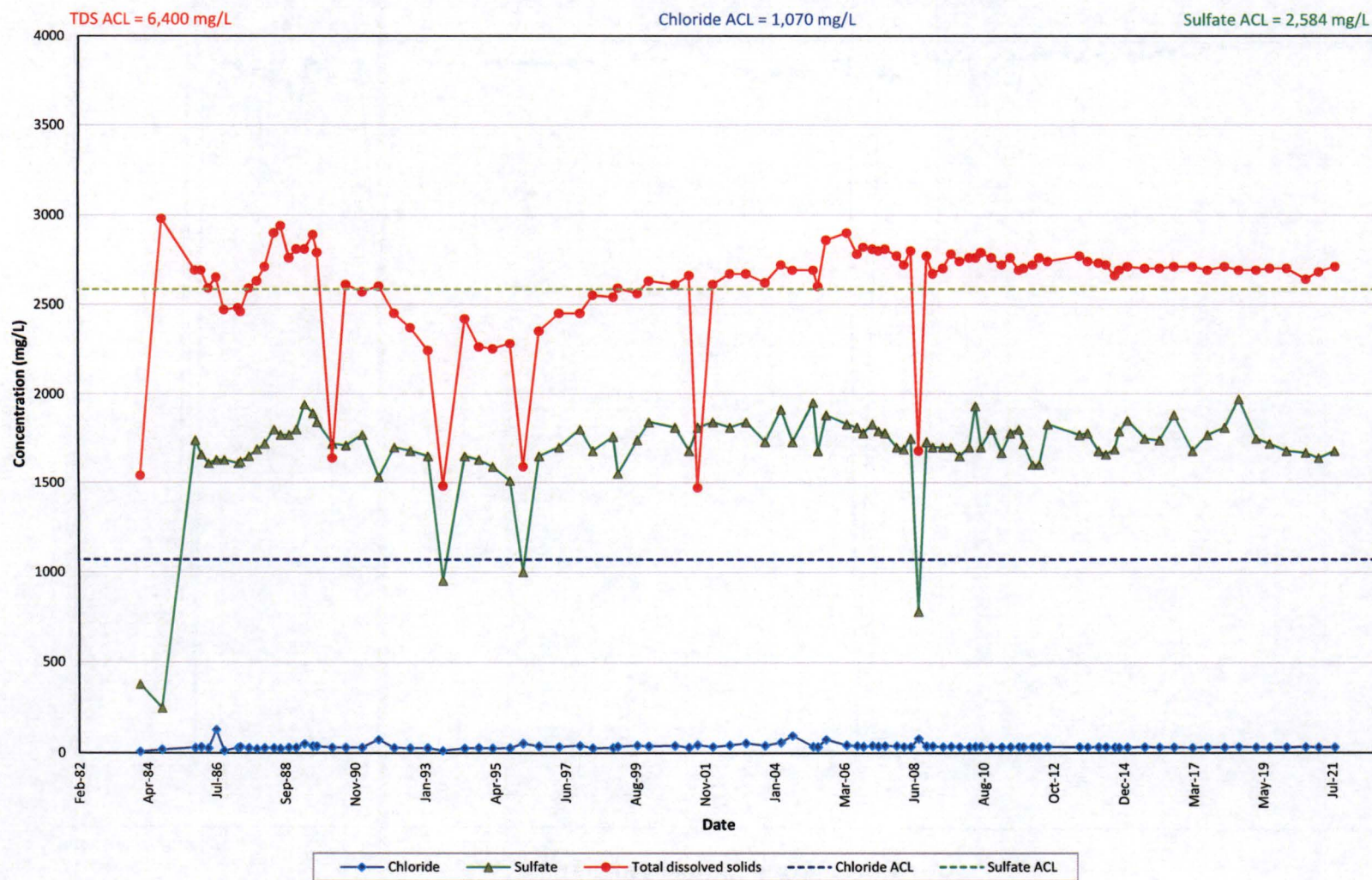
Nitrate in Monitoring Well 31-01 TRA-R
(replaced 12/12/2012)



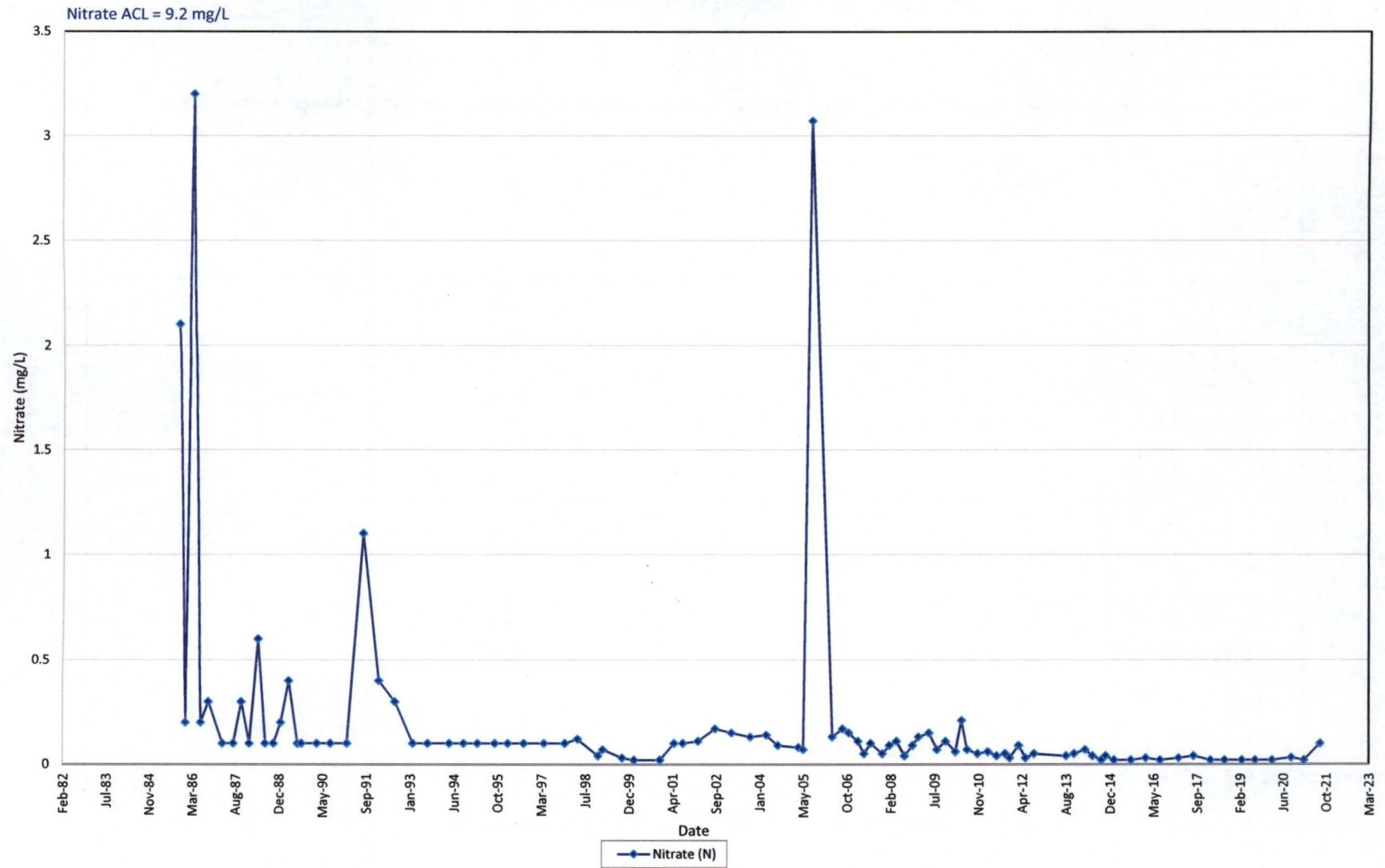
**Radionuclides in Monitoring Well 31-01 TRA-R
(replaced 12/12/2021)**



Anions and TDS in Monitoring Well 33-01 TRA-R



Nitrate in Monitoring Well 33-01 TRA

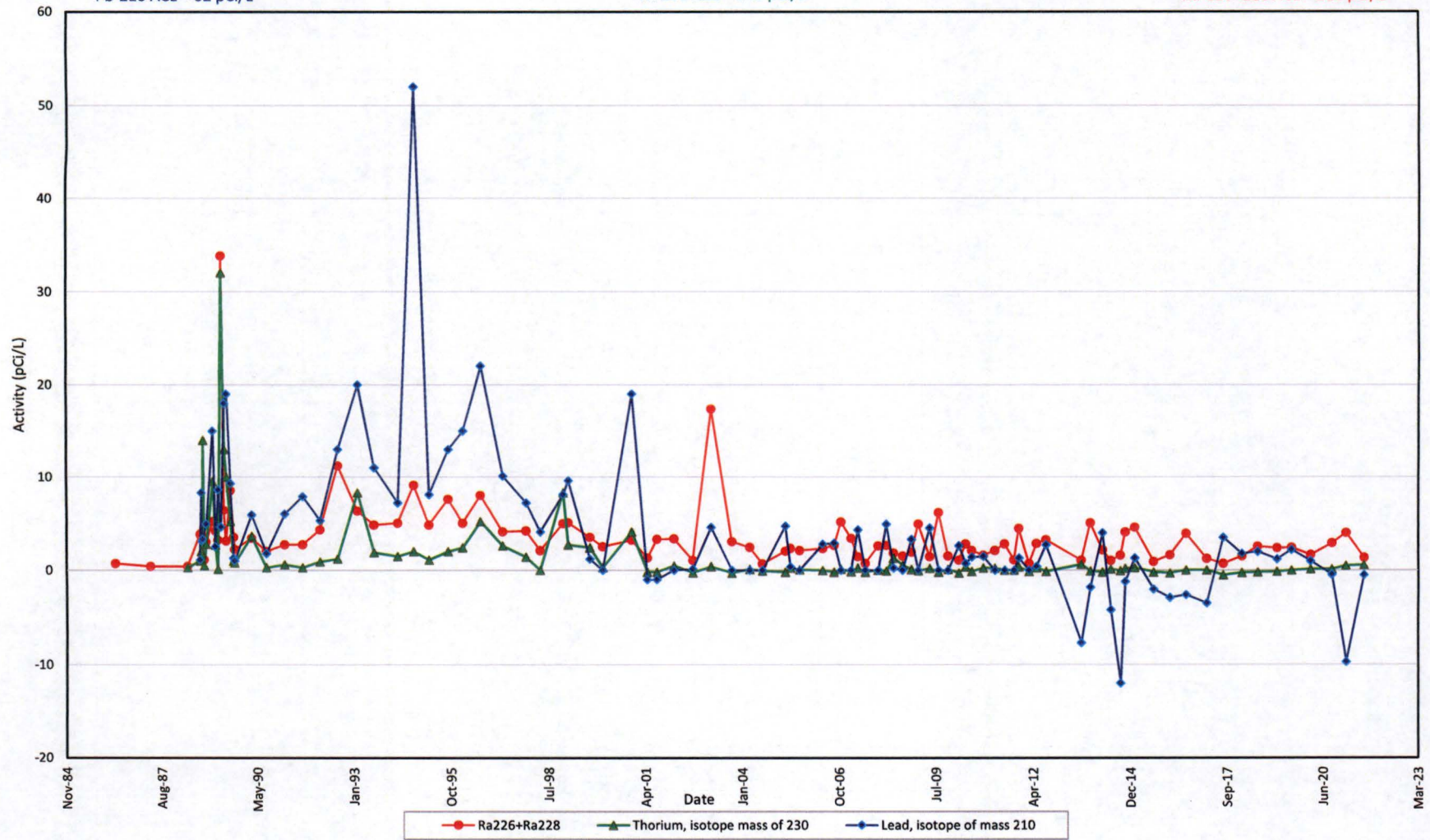


Radionuclides in Monitoring Well 33-01 TRA

Pb-210 ACL = 62 pCi/L

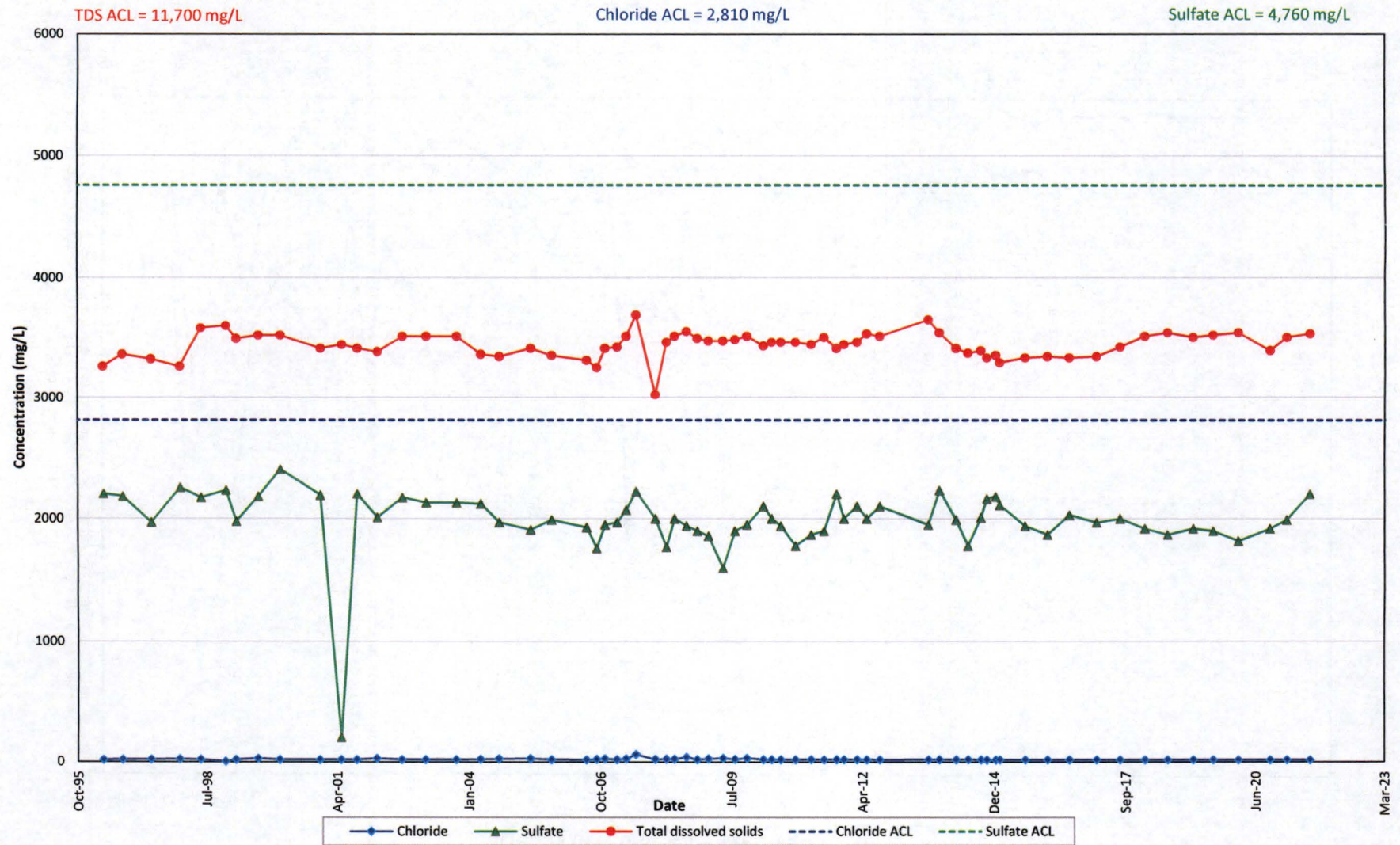
Th-230 ACL = 945 pCi/L

Ra-226+228 ACL = 218 pCi/L

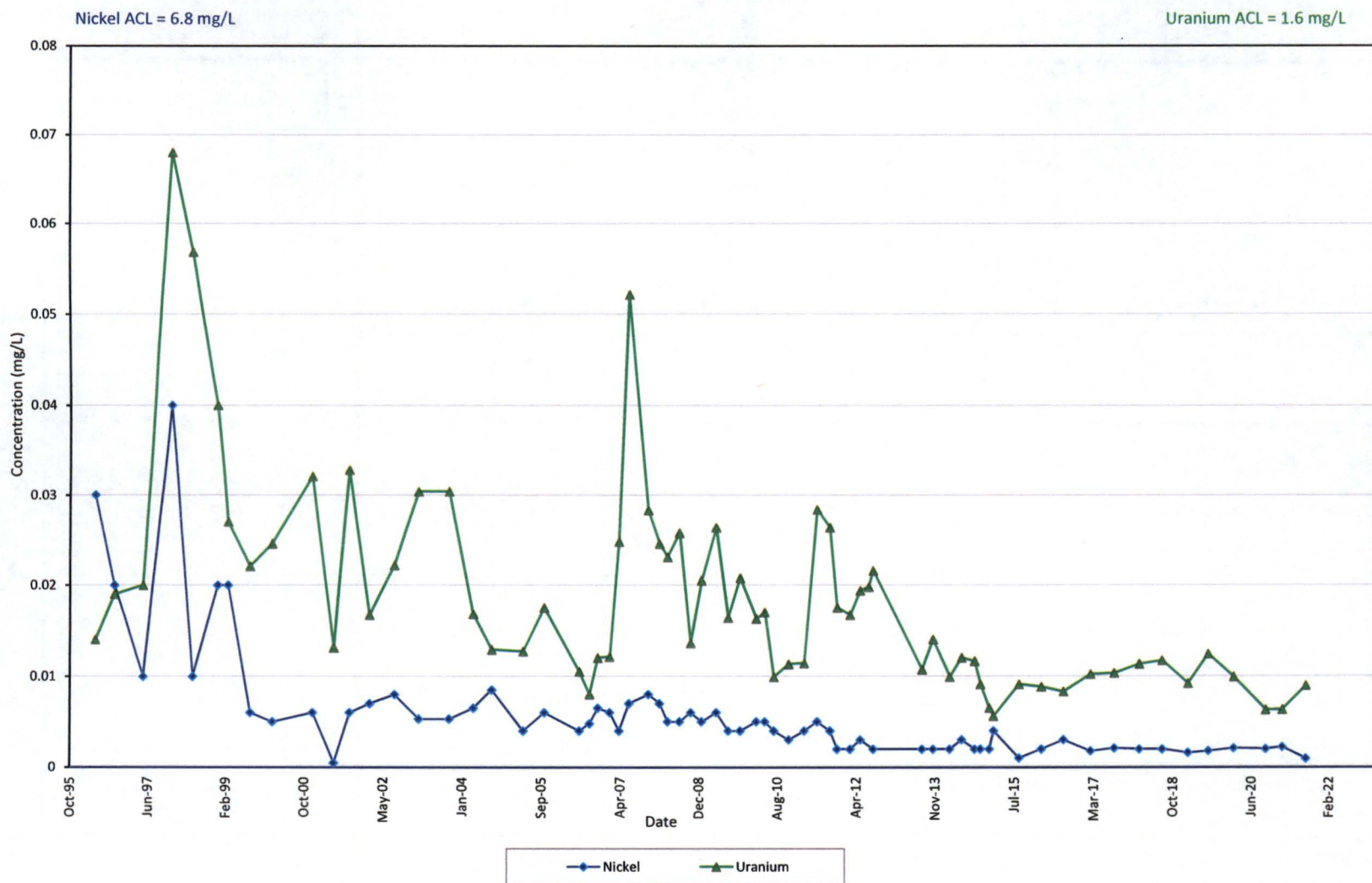


Stability Monitoring Plan
Time Versus Concentration Plots
Tres Hermanos B

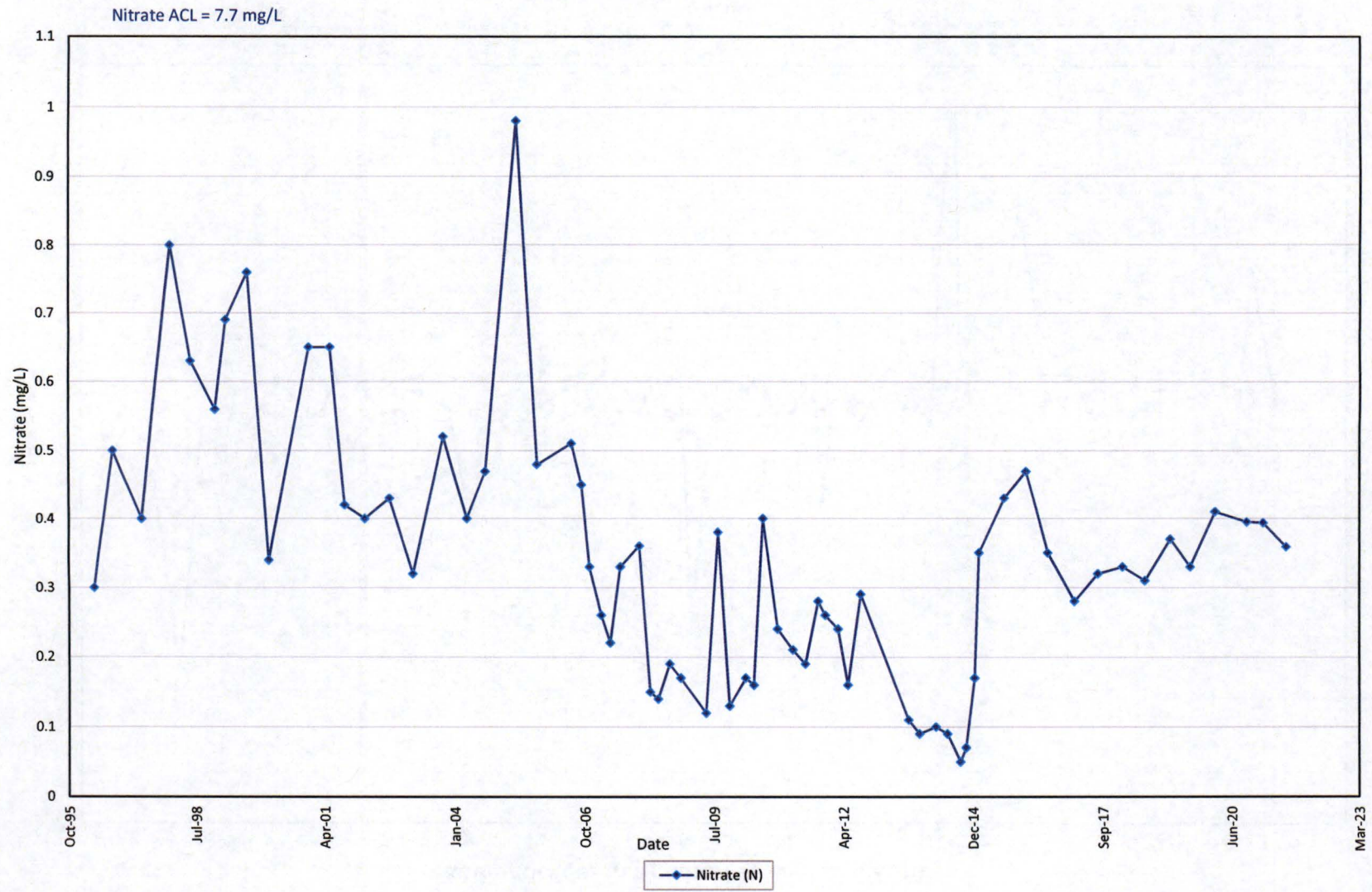
Anions and TDS in Monitoring Well 19-77 TRB



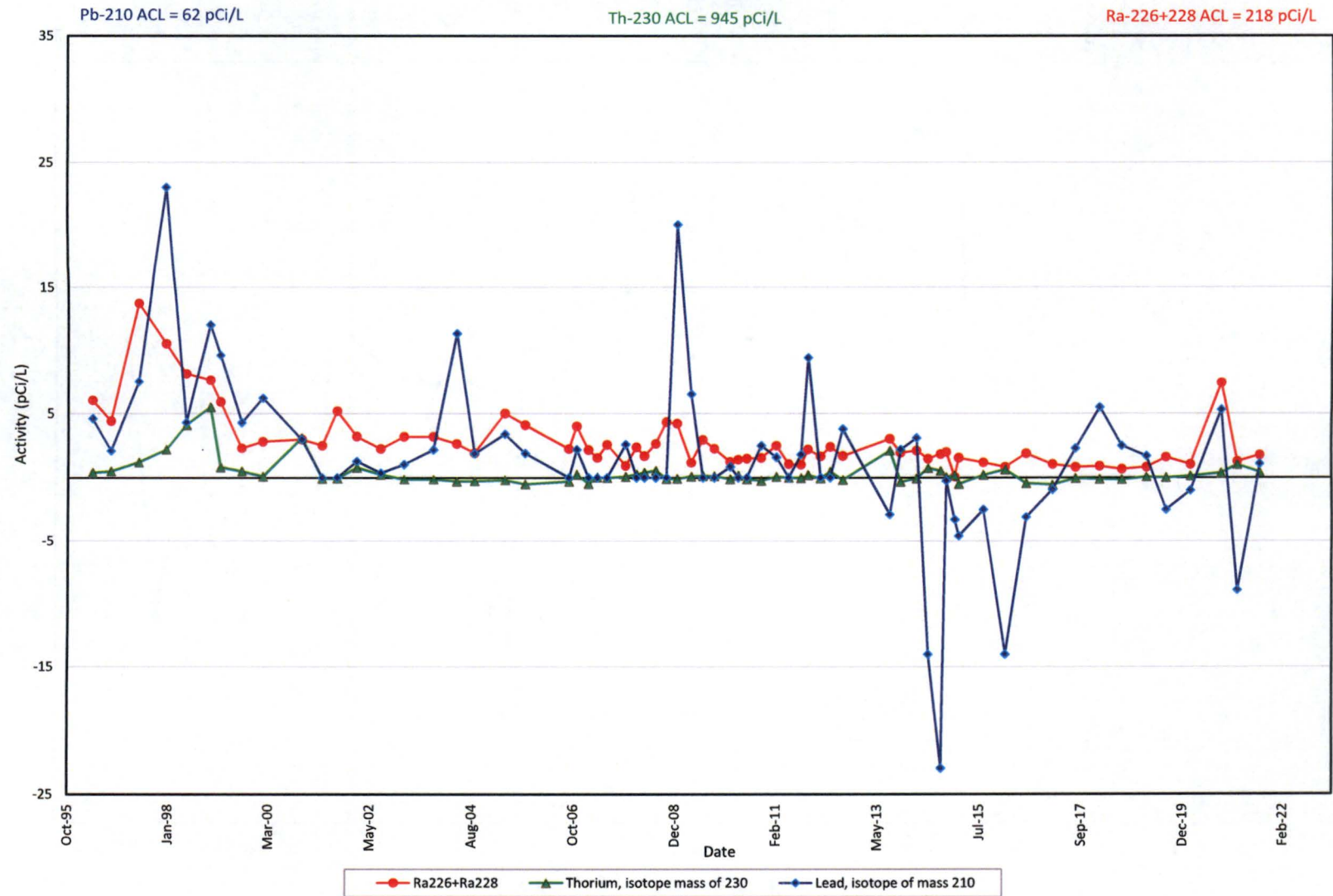
Metals in Monitoring Well 19-77 TRB



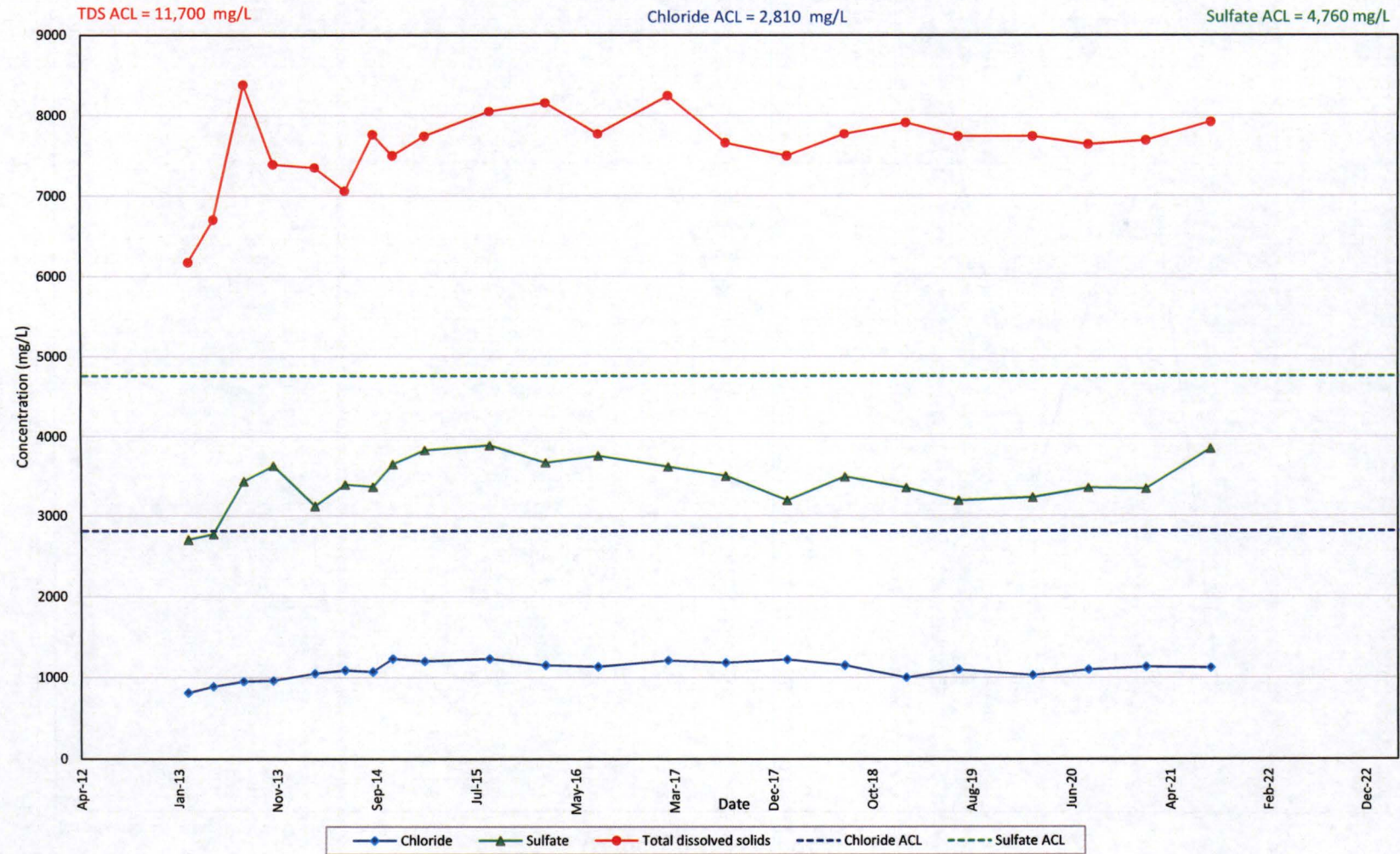
Nitrate in Monitoring Well 19-77 TRB



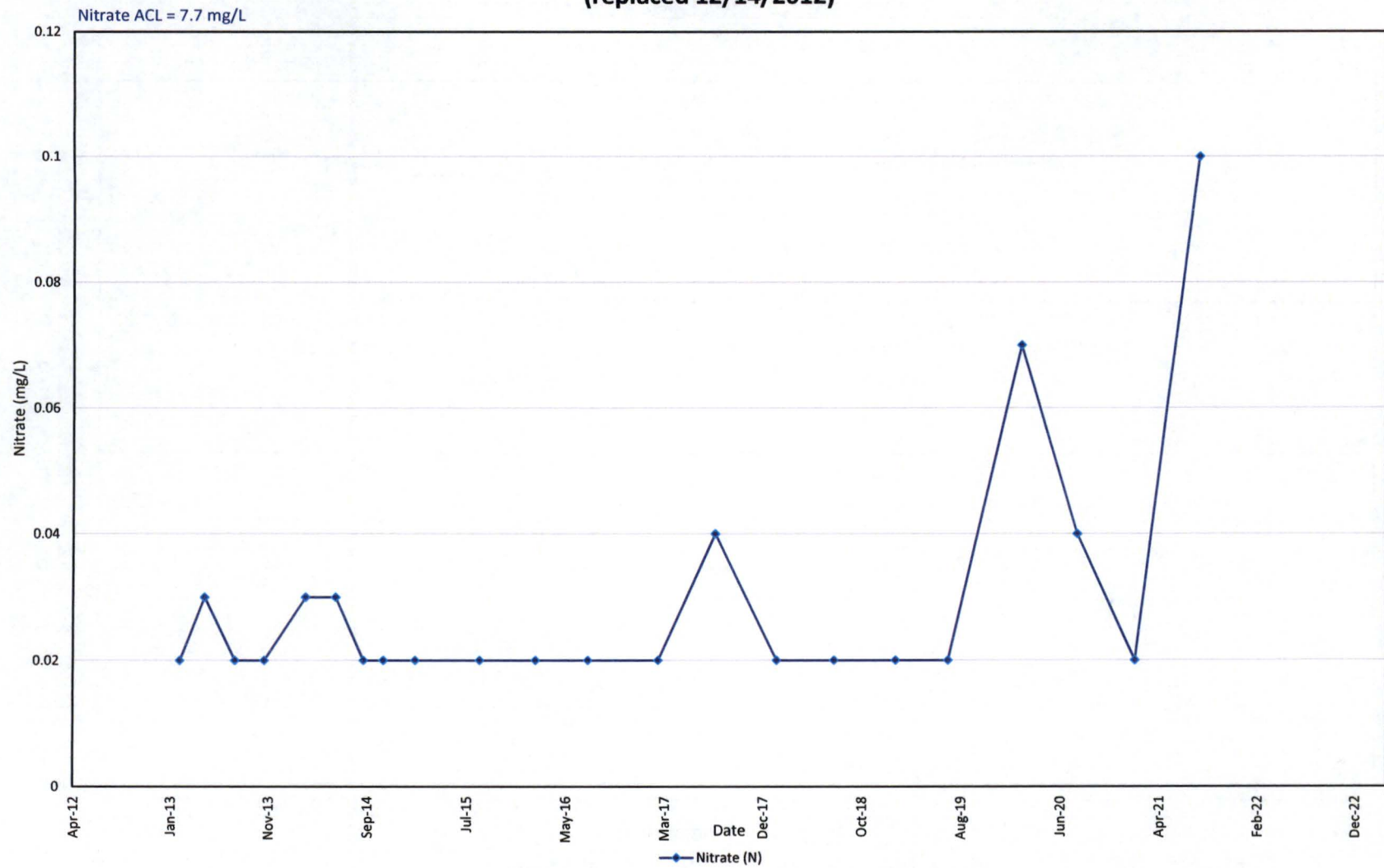
Radionuclides in Monitoring Well 19-77 TRB



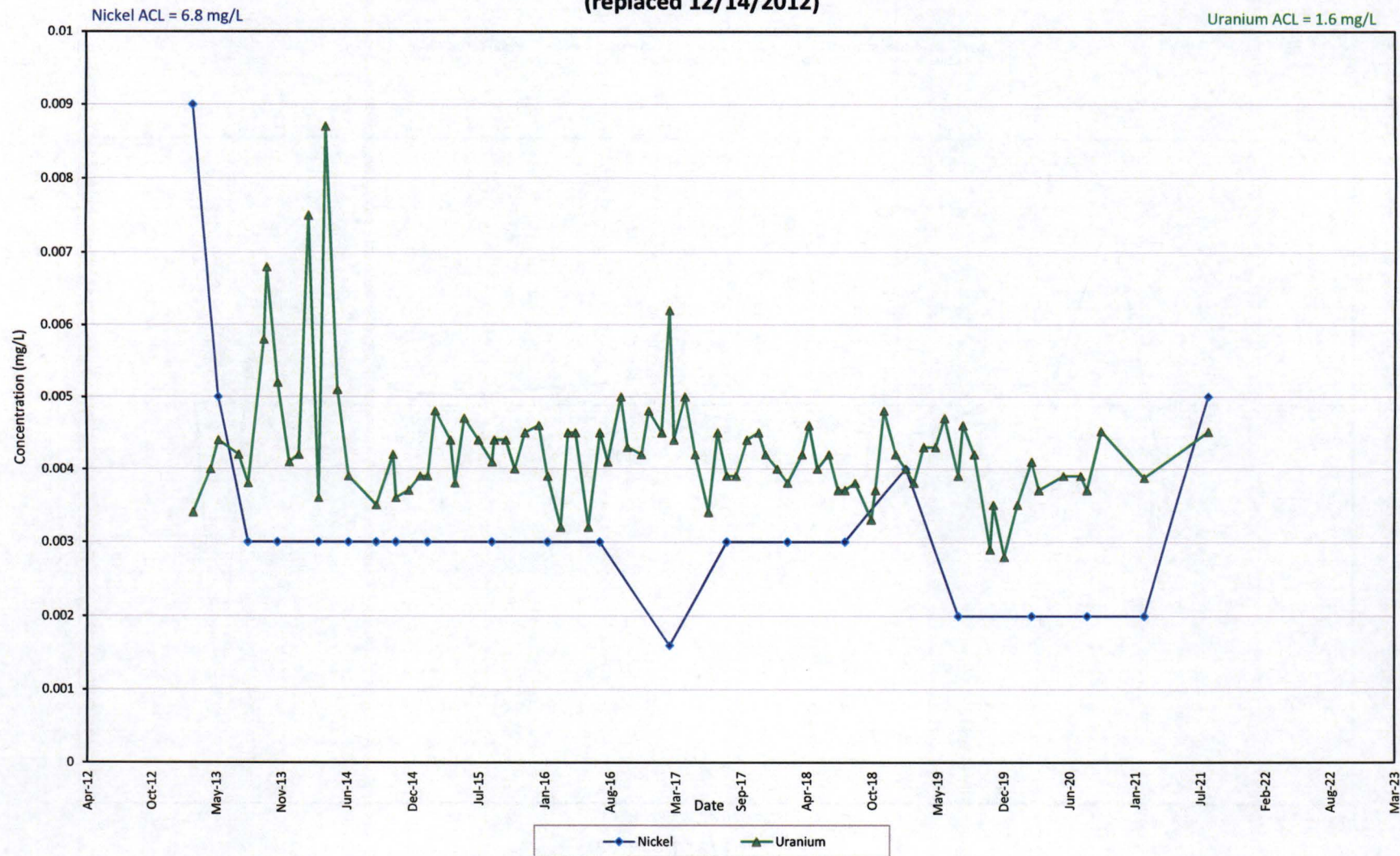
**Anions and TDS in Monitoring Well 31-02 TRB-R
(replaced 12/14/2012)**



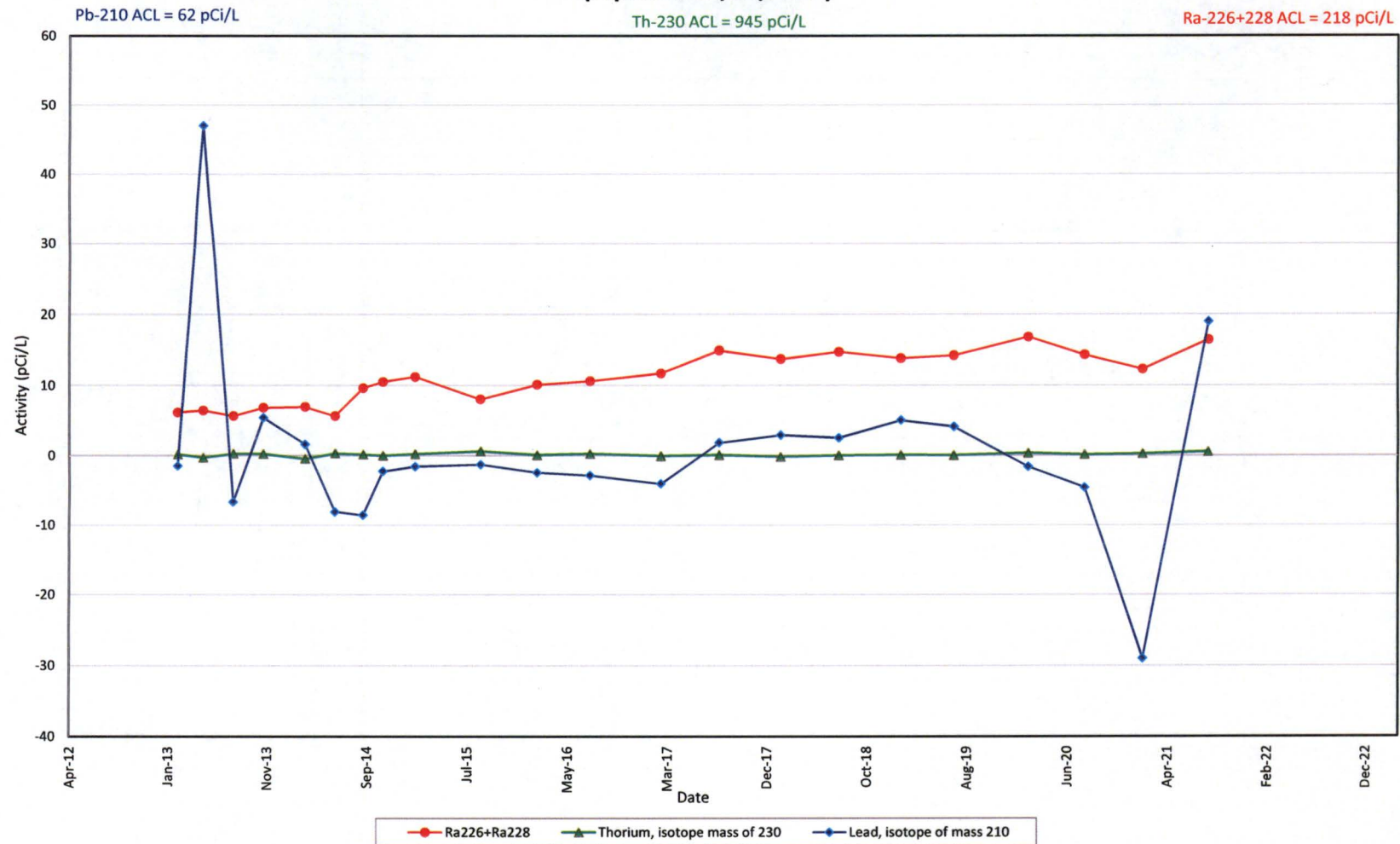
**Nitrate in Monitoring Well 31-02 TRB-R
(replaced 12/14/2012)**



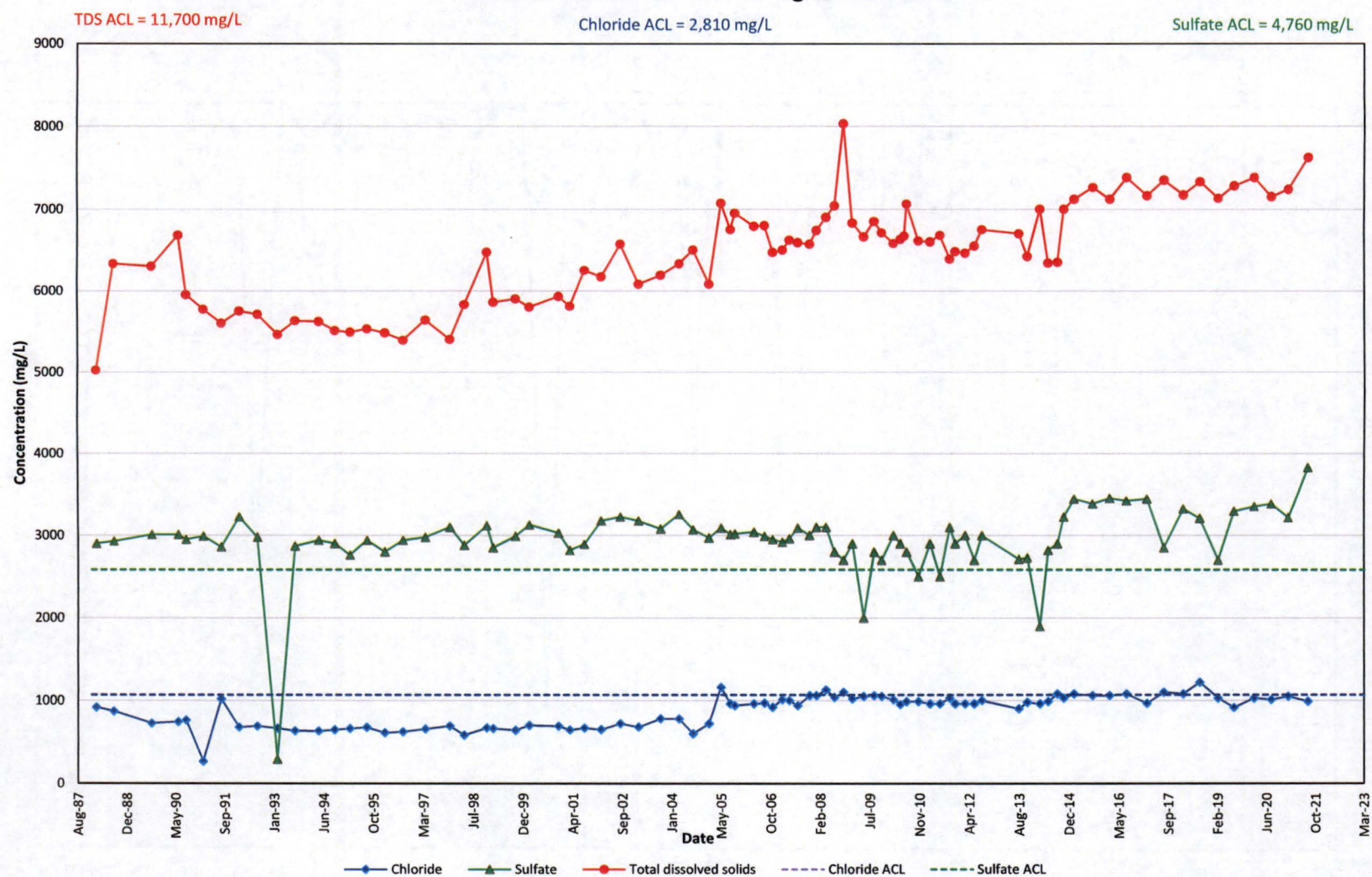
**Metals in Monitoring Well 31-02 TRB-R
(replaced 12/14/2012)**



**Radionuclides in Monitoring Well 31-02 TRB-R
(replaced 12/14/2012)**



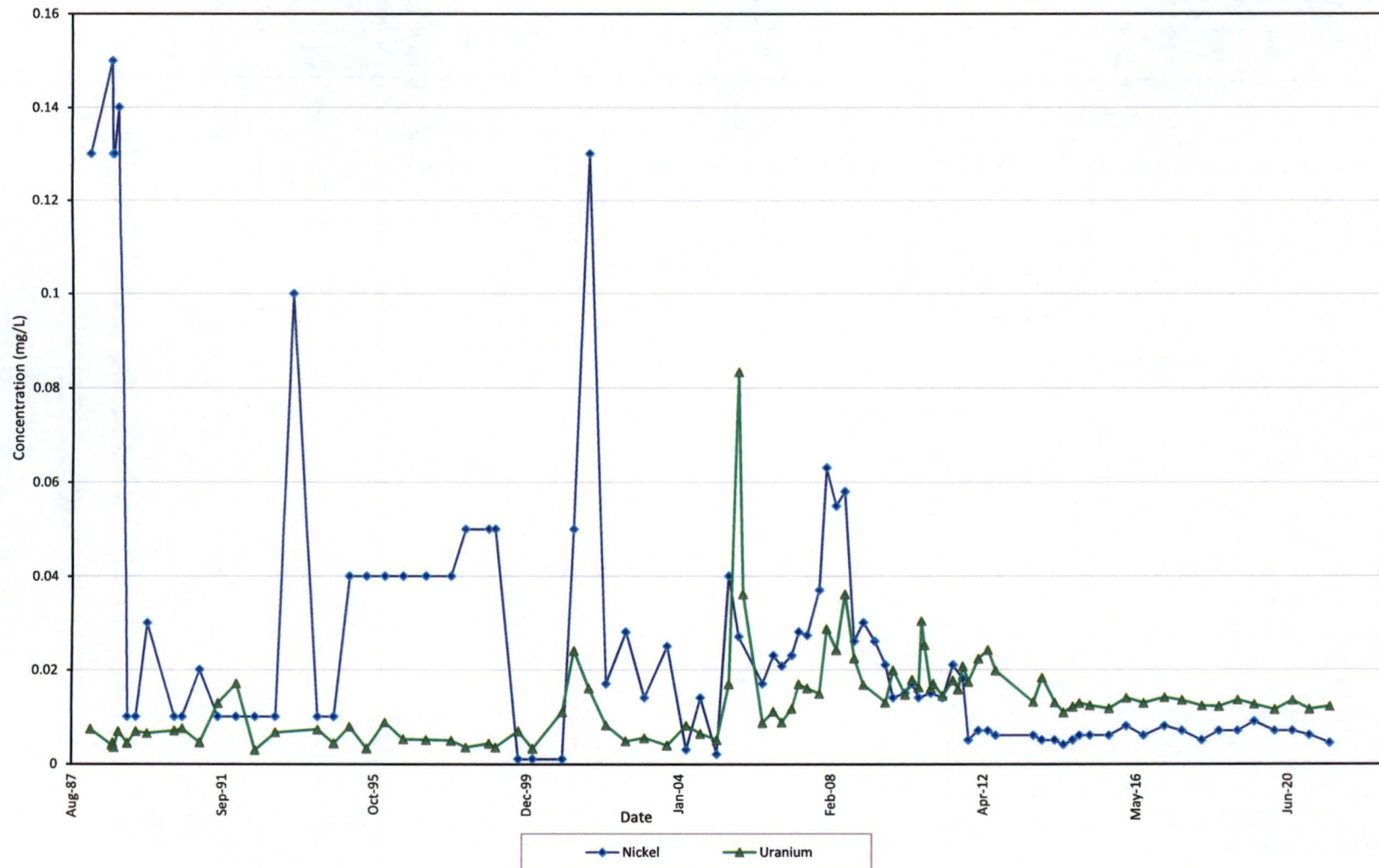
Anions and TDS in Monitoring Well 31-67 TRB



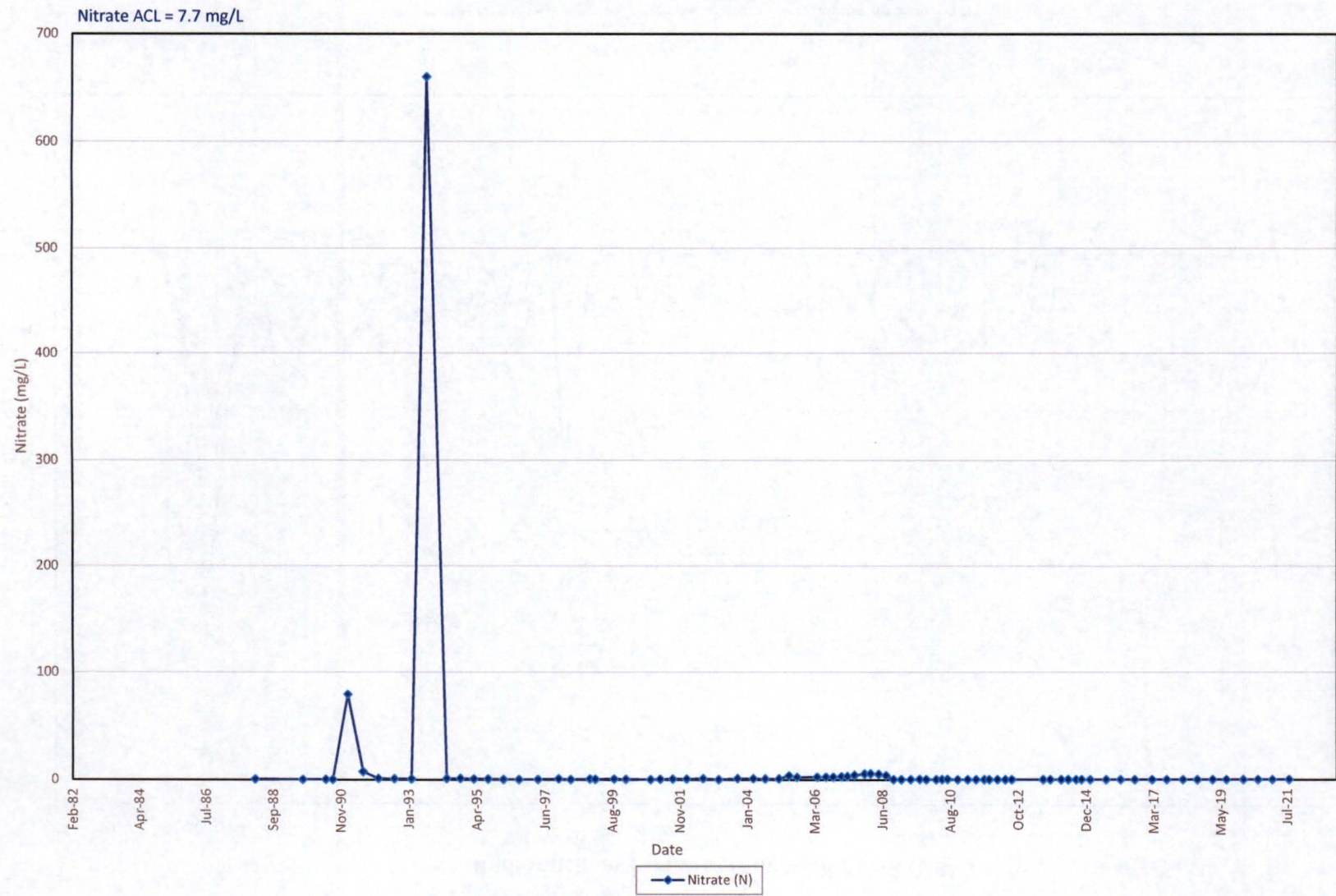
Metals in Monitoring Well 36-67 TRB

Nickel ACL = 6.8 mg/L

Uranium ACL = 1.6 mg/L



Nitrate in Monitoring Well 31-67 TRB

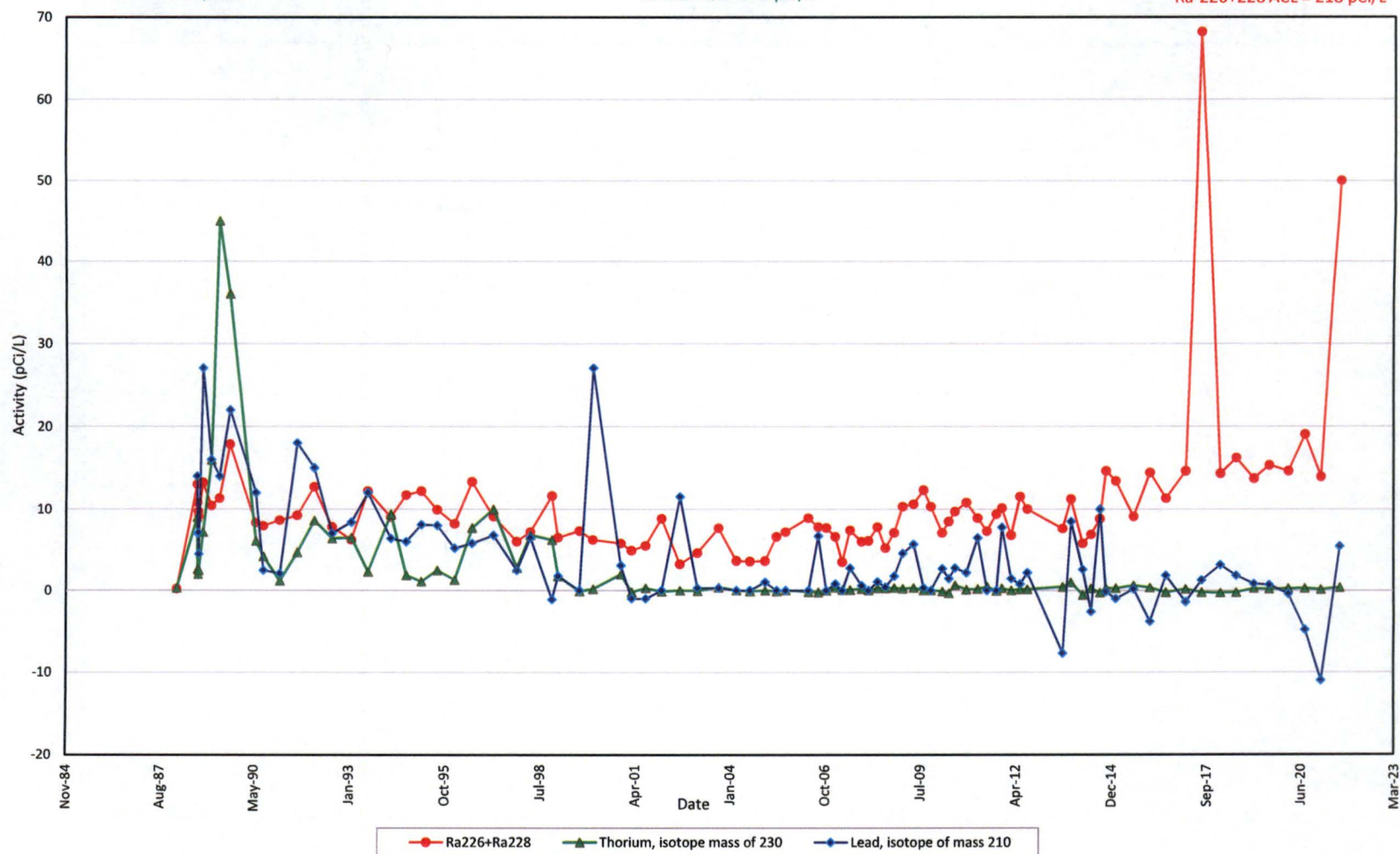


Radionuclides in Monitoring Well 31-67 TRB

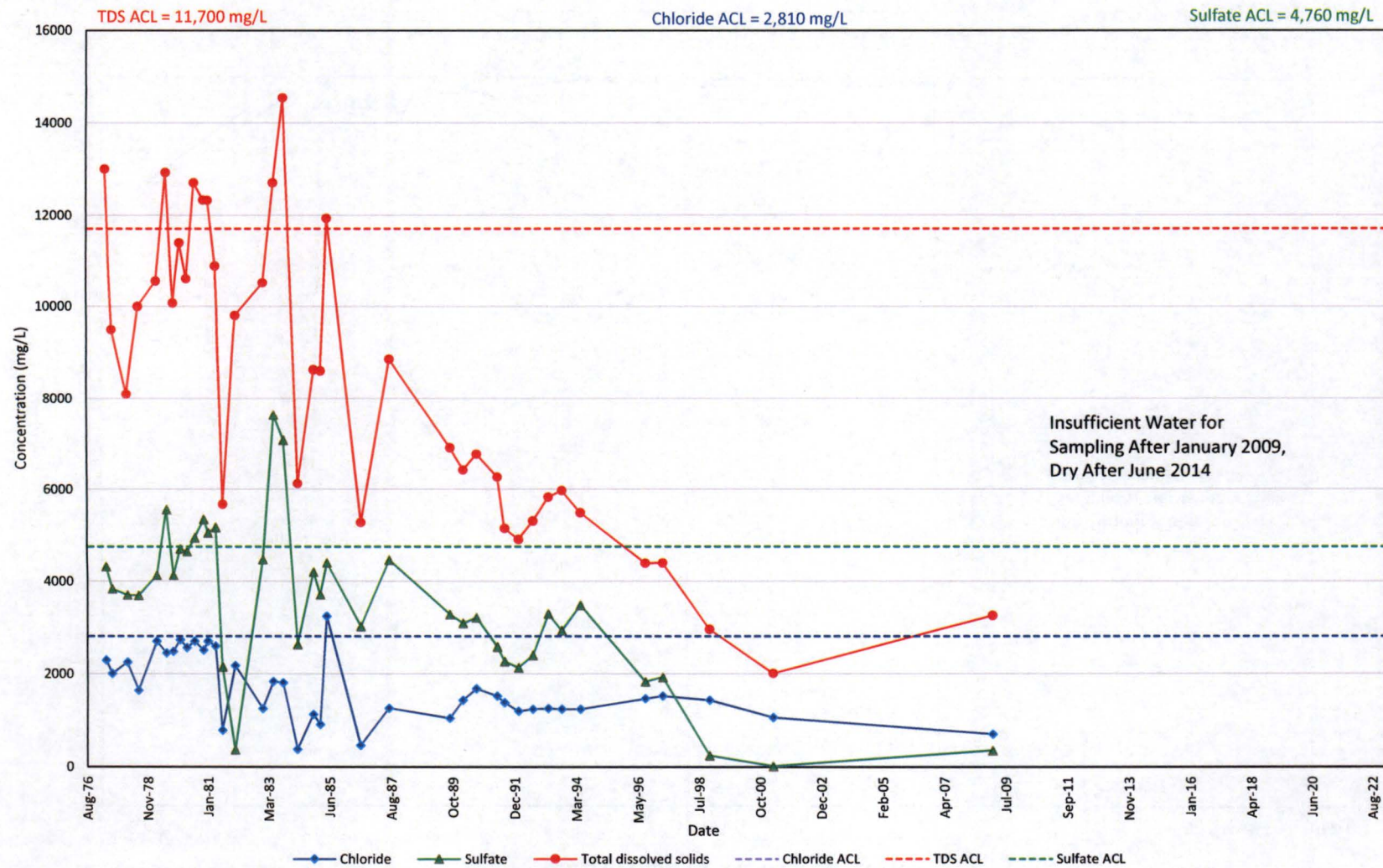
Pb-210 ACL = 62 pCi/L

Th-230 ACL = 945 pCi/L

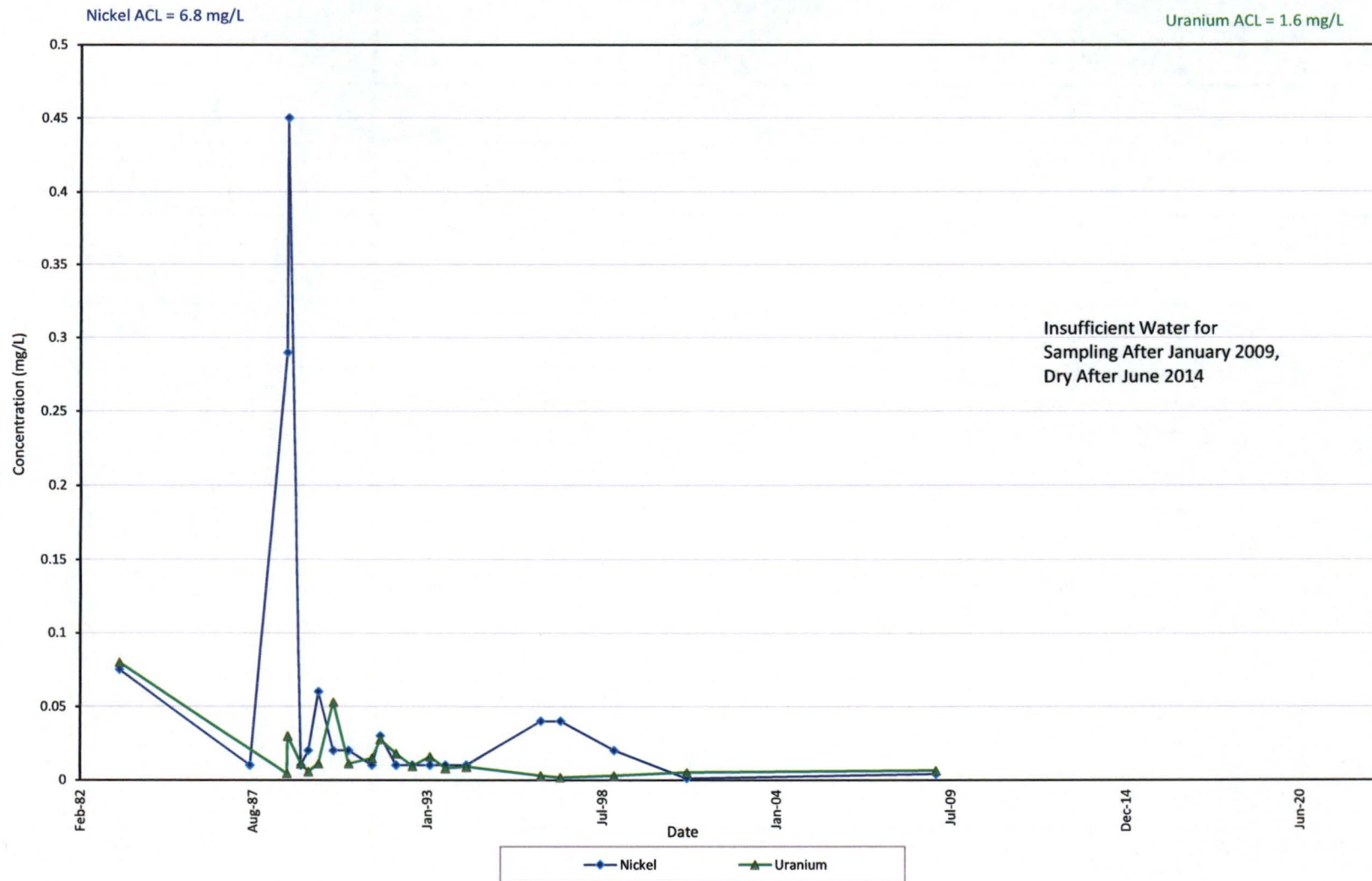
Ra-226+228 ACL = 218 pCi/L



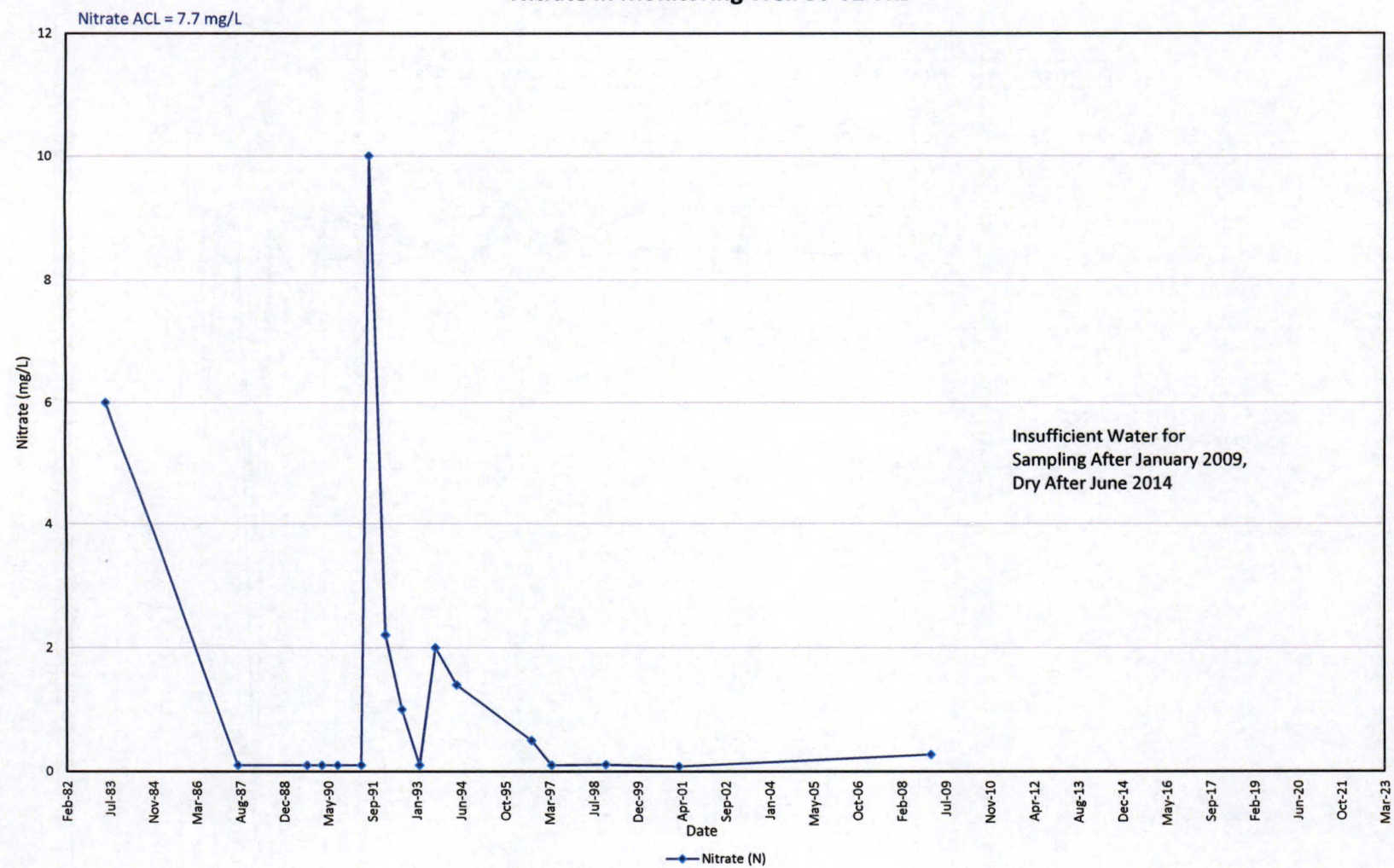
Anions and TDS in Monitoring Well 36-01 TRB



Metals in Monitoring Well 36-01 TRB



Nitrate in Monitoring Well 36-01 TRB

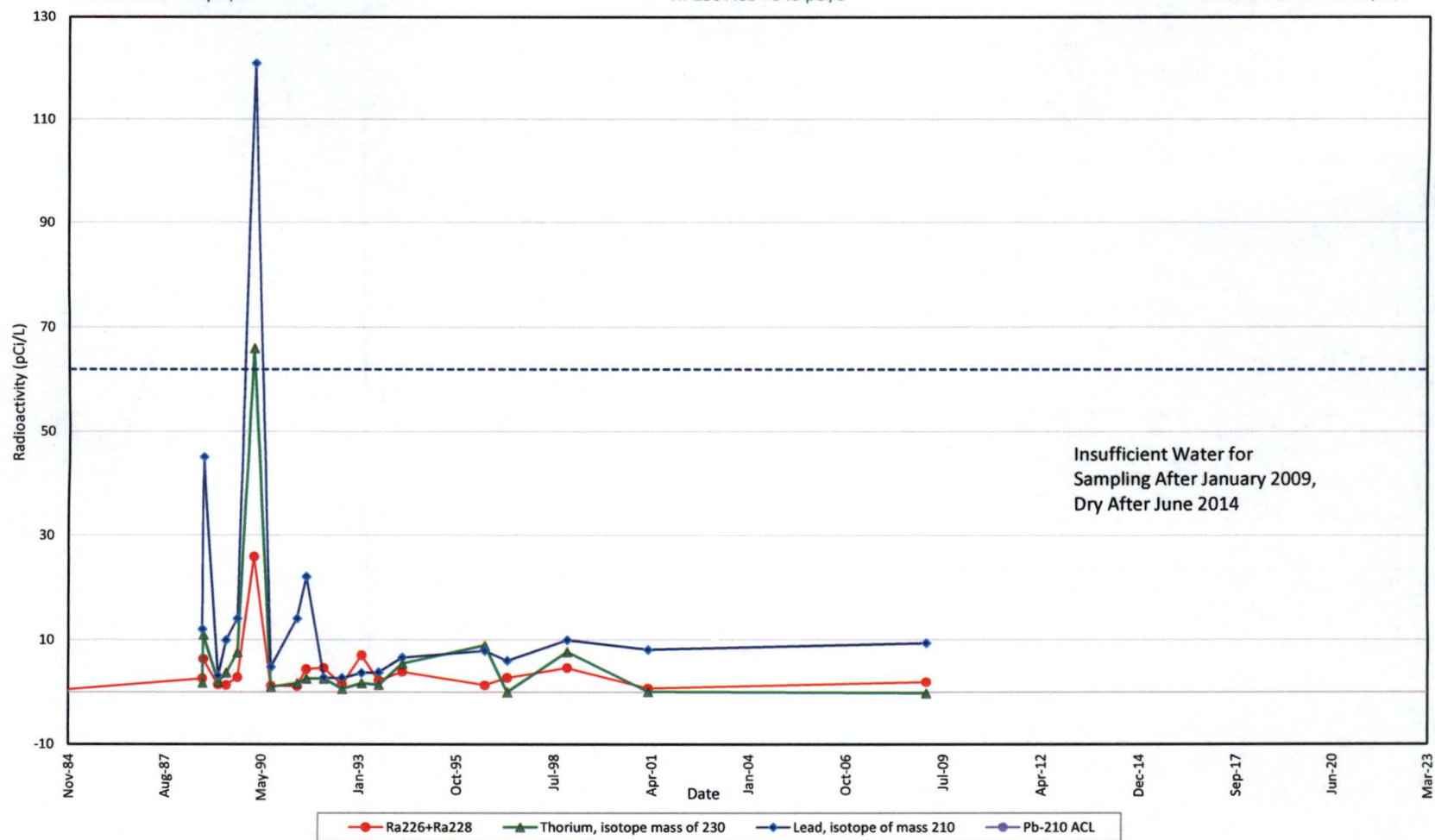


Radionuclides in Monitoring Well 36-01 TRB

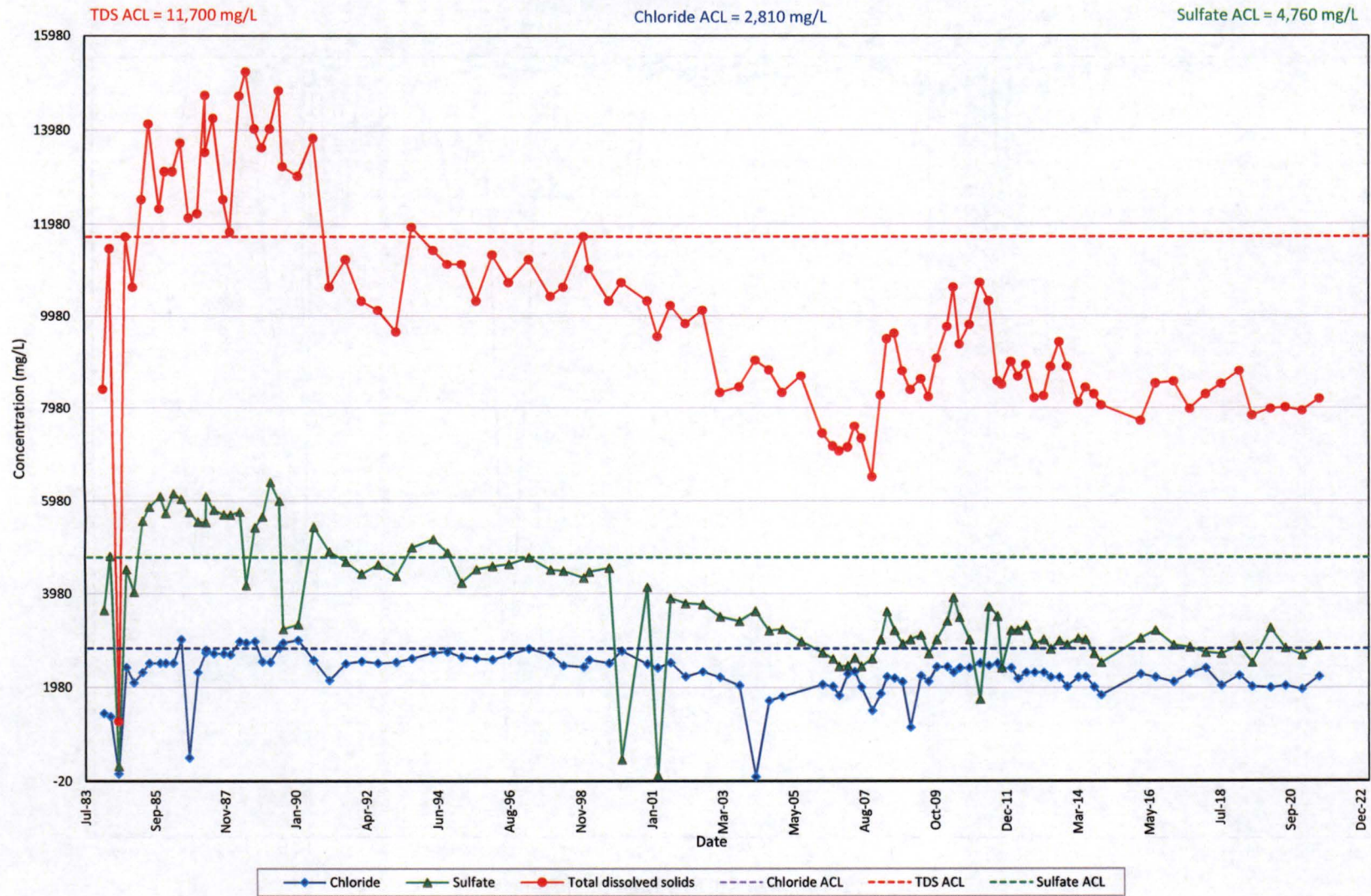
Pb-210 ACL = 62 pCi/L

Th-230 ACL = 945 pCi/L

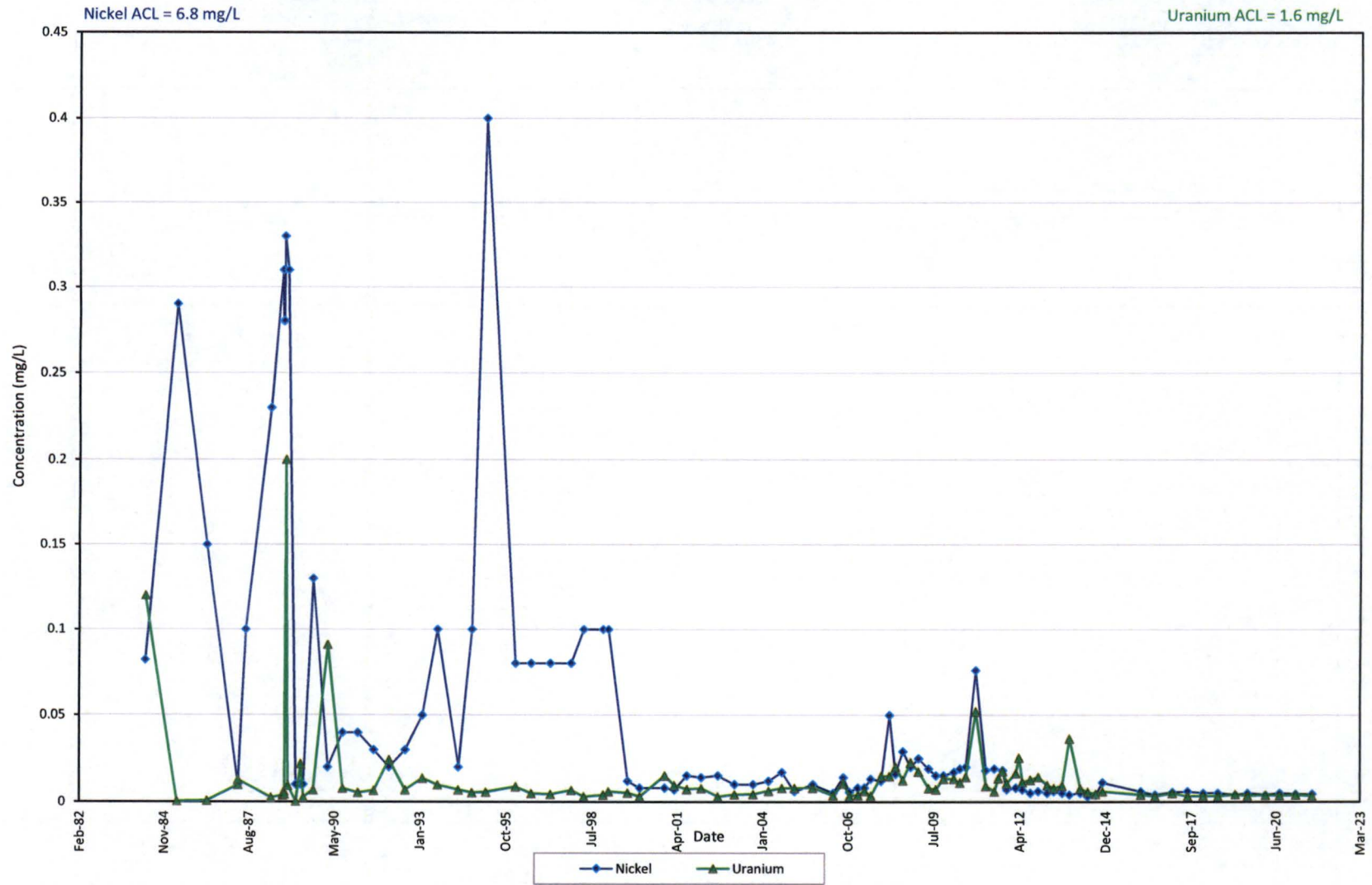
Ra-226+228 ACL = 218 pCi/L



Anions and TDS in Monitoring Well 36-02 TRB

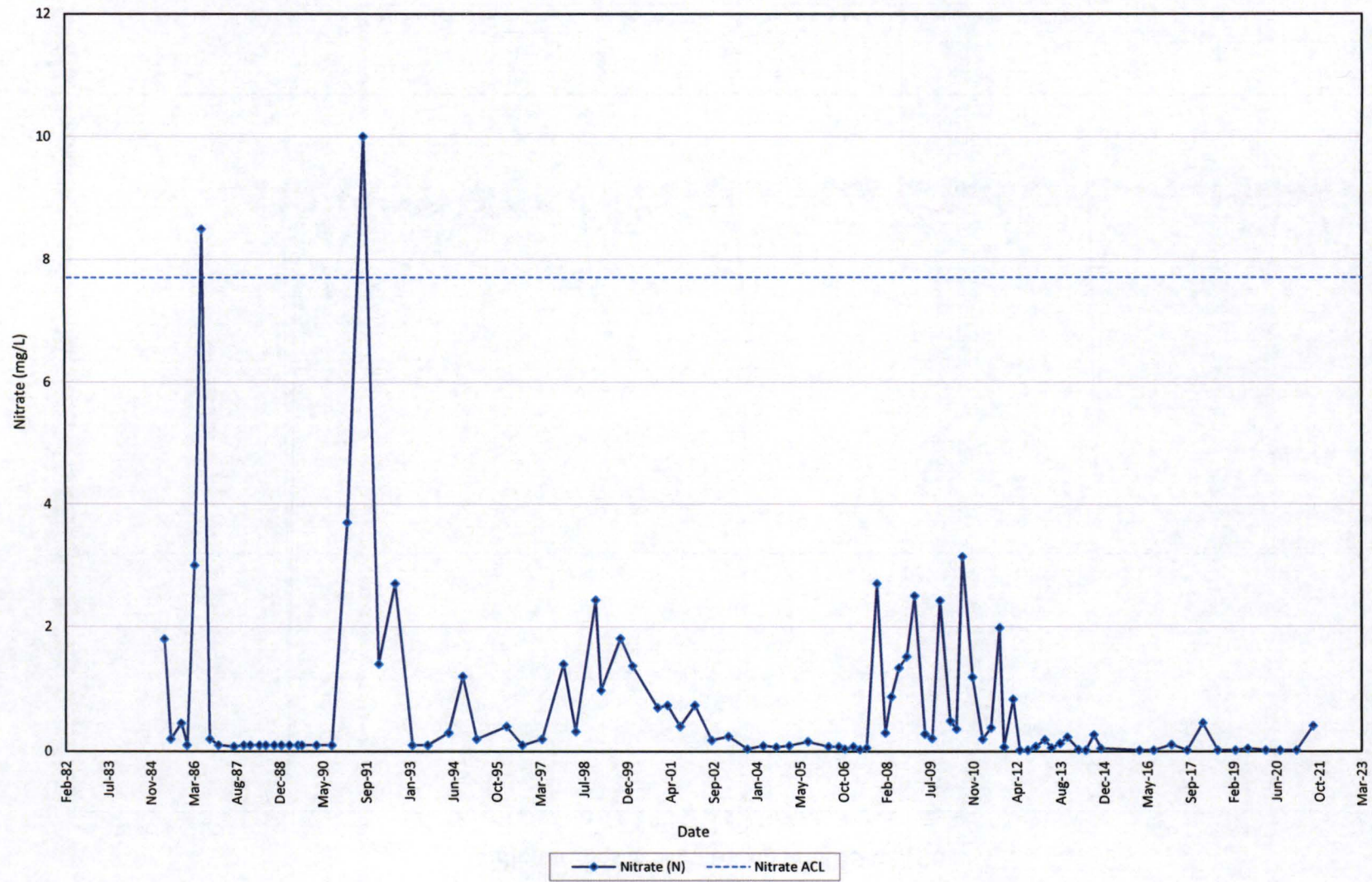


Metals in Monitoring Well 36-02 TRB

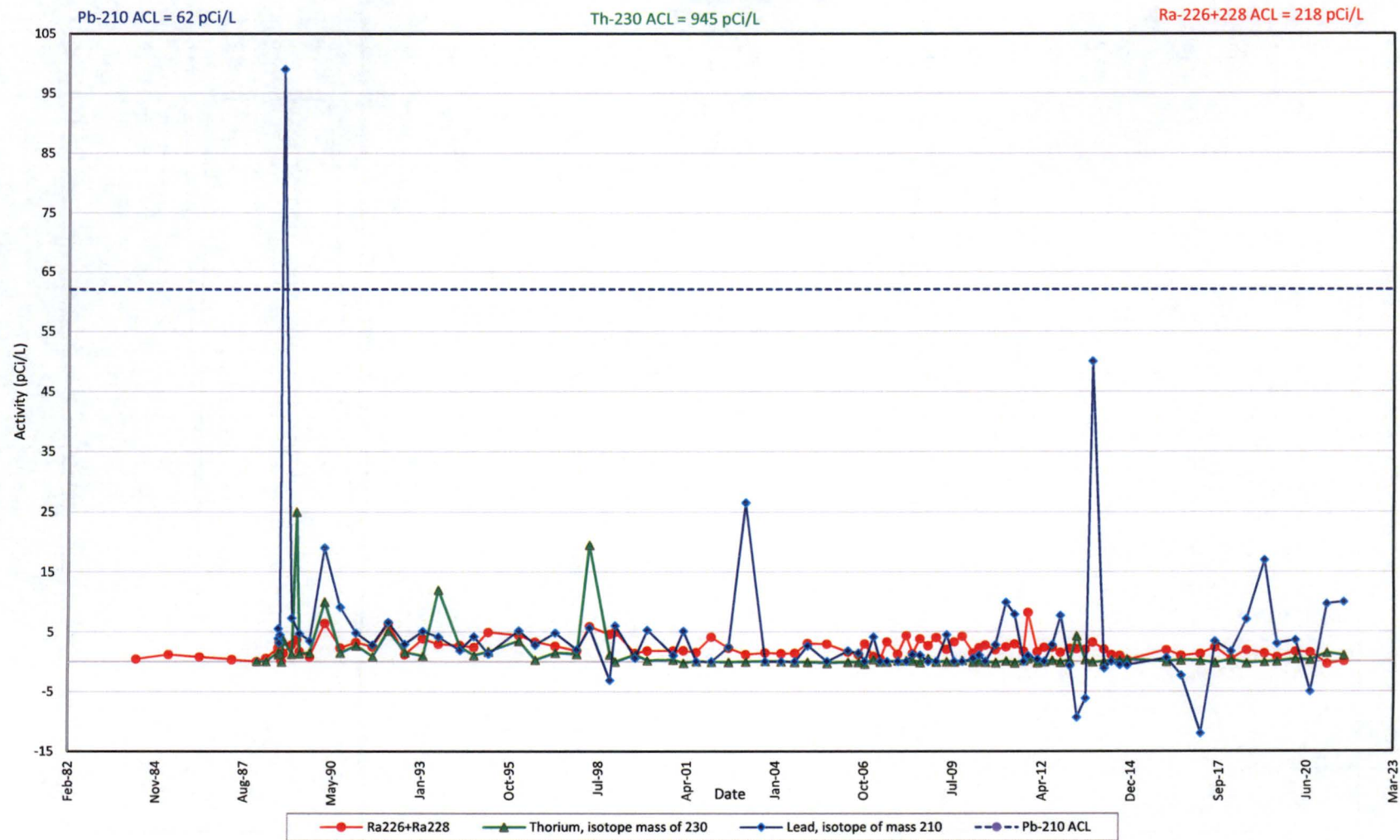


Nitrate ACL = 7.7 mg/L

Nitrate in Monitoring Well 36-02 TRB

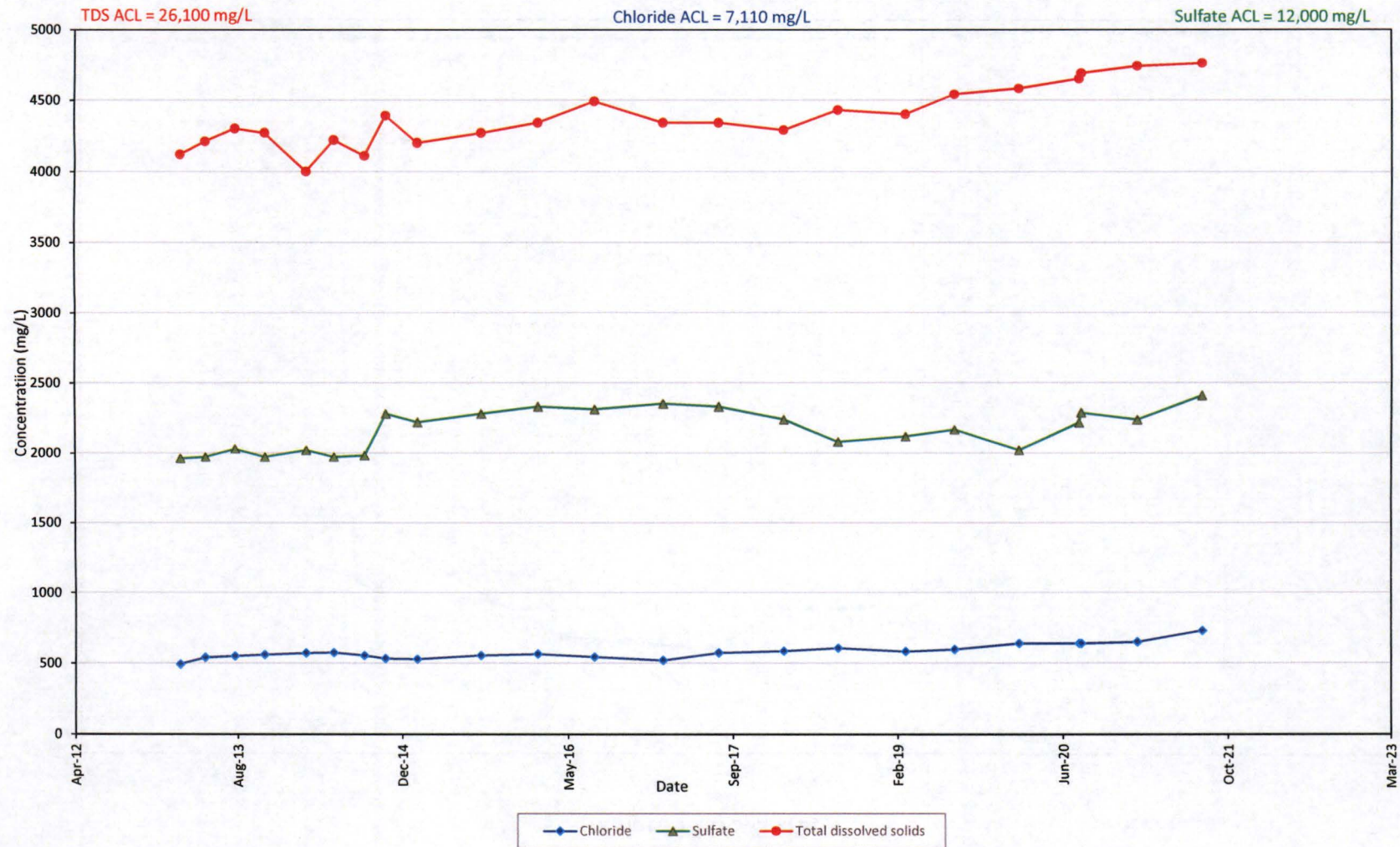


Radionuclides in Monitoring Well 36-02 TRB

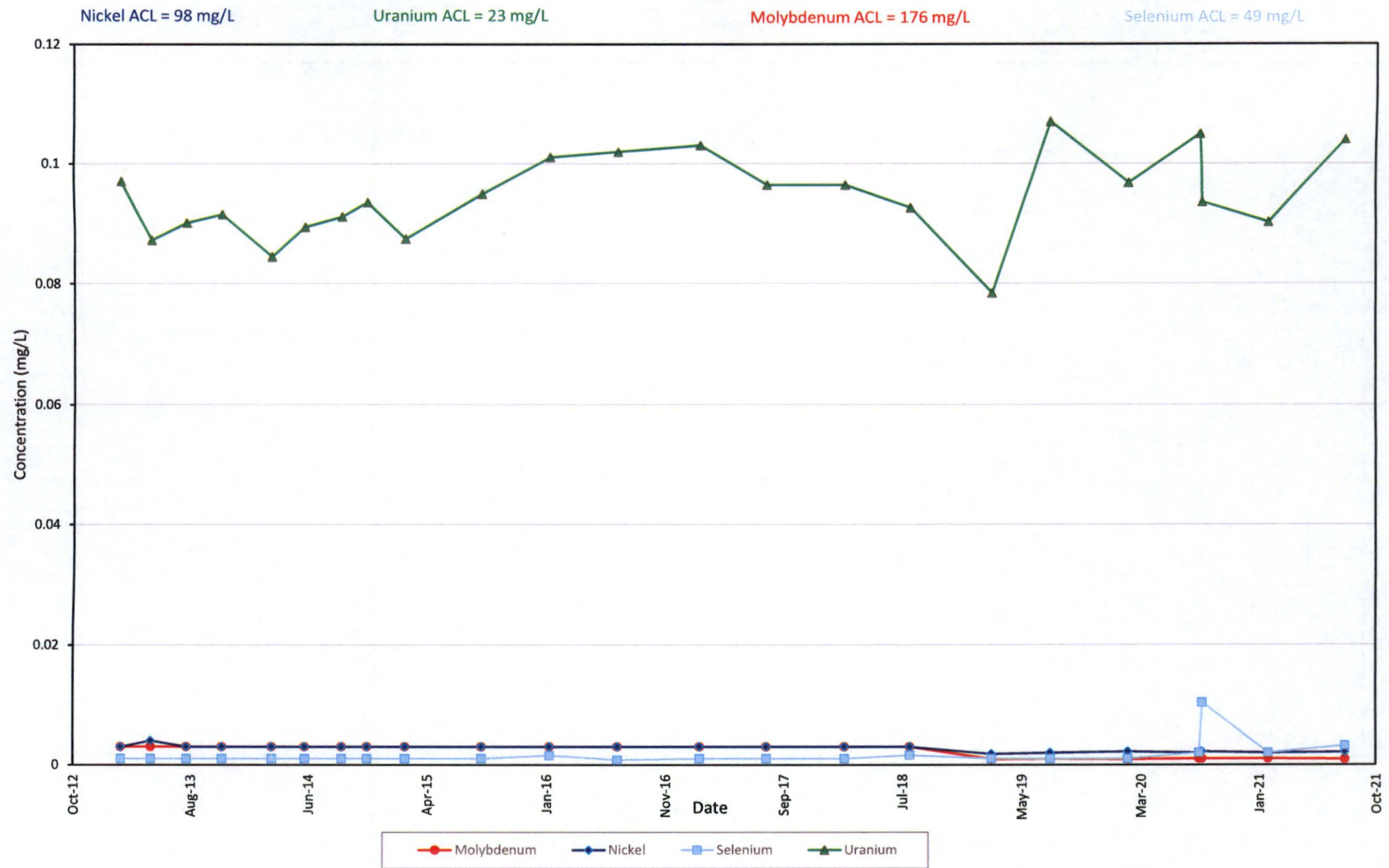


**Stability Monitoring Plan
Time Versus Concentration Plots
Alluvium**

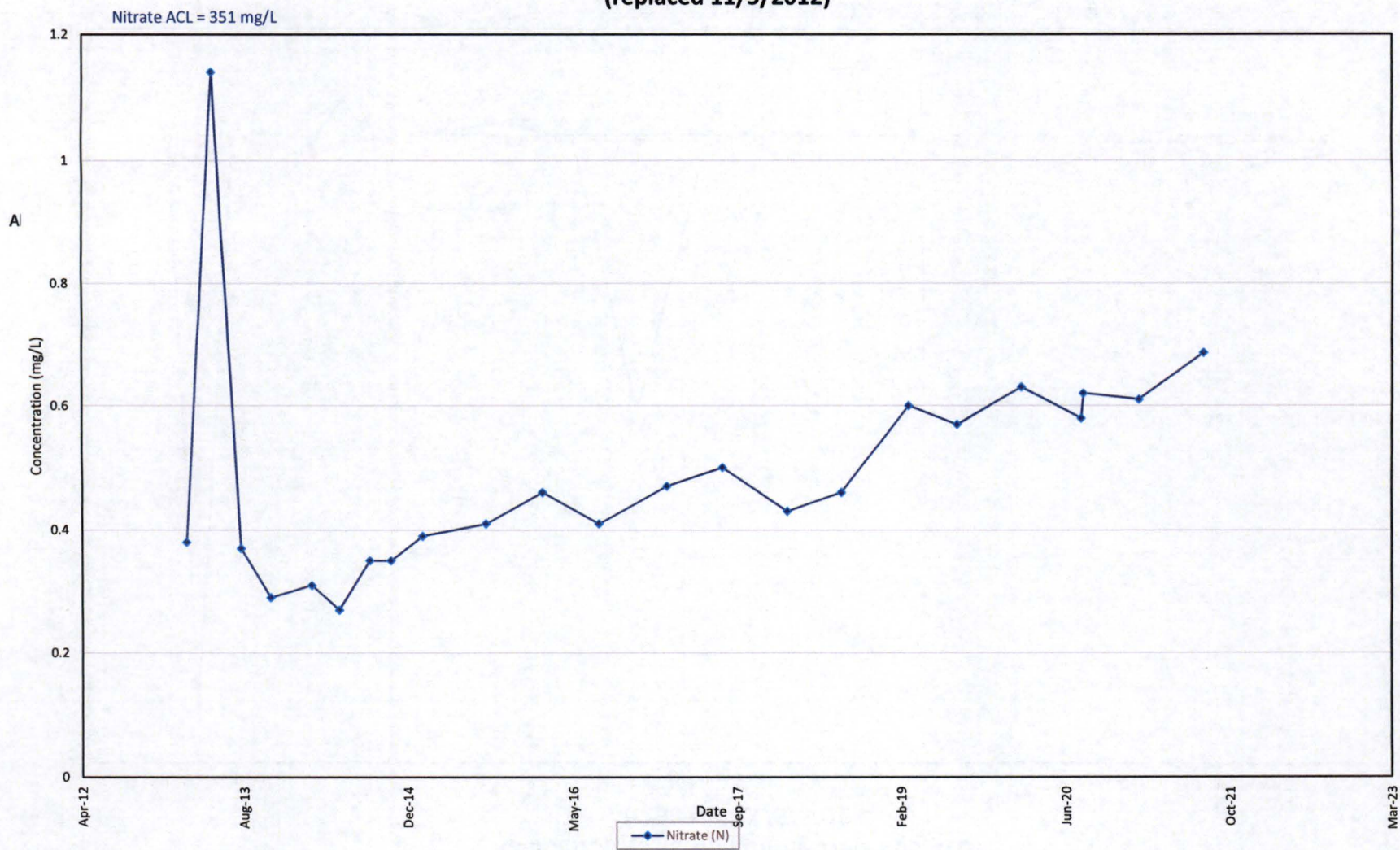
Anions and TDS in Monitoring Well 5-03 ALL-R (replaced 11/5/2012)



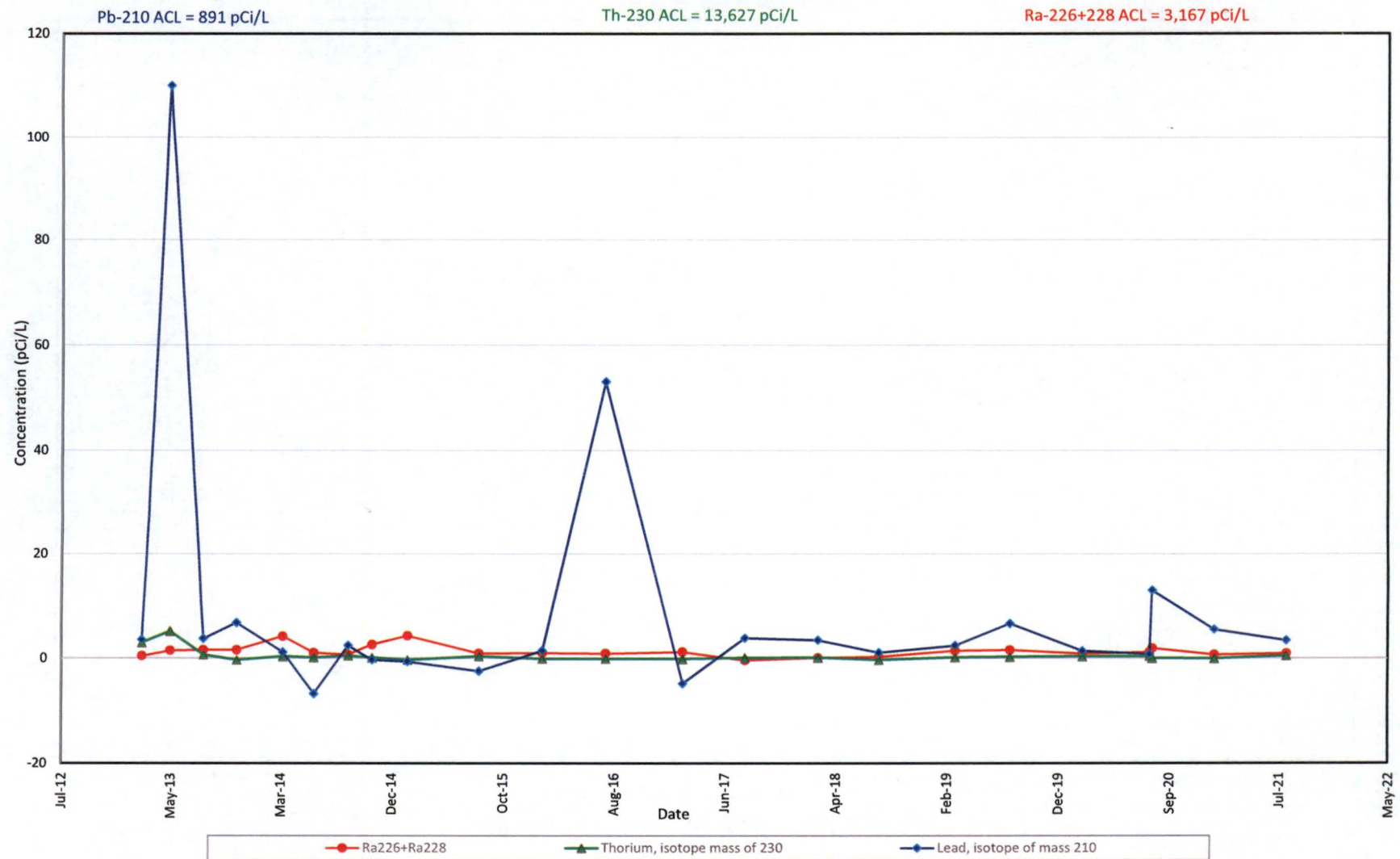
**Metals in Monitoring Well 5-03 ALL-R
(replaced 11/5/2012)**



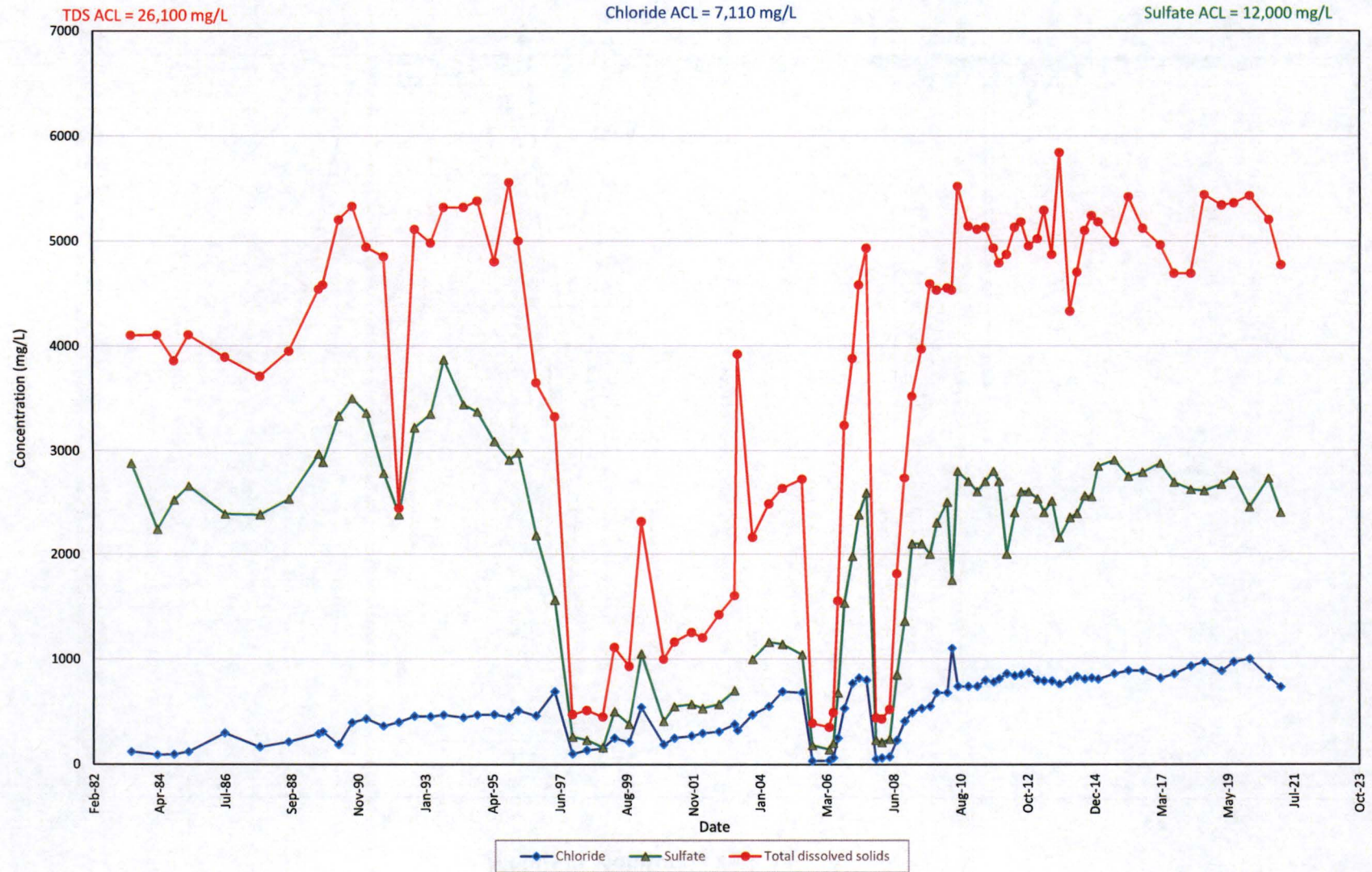
Nitrate in Monitoring Well 5-03 ALL-R
(replaced 11/5/2012)



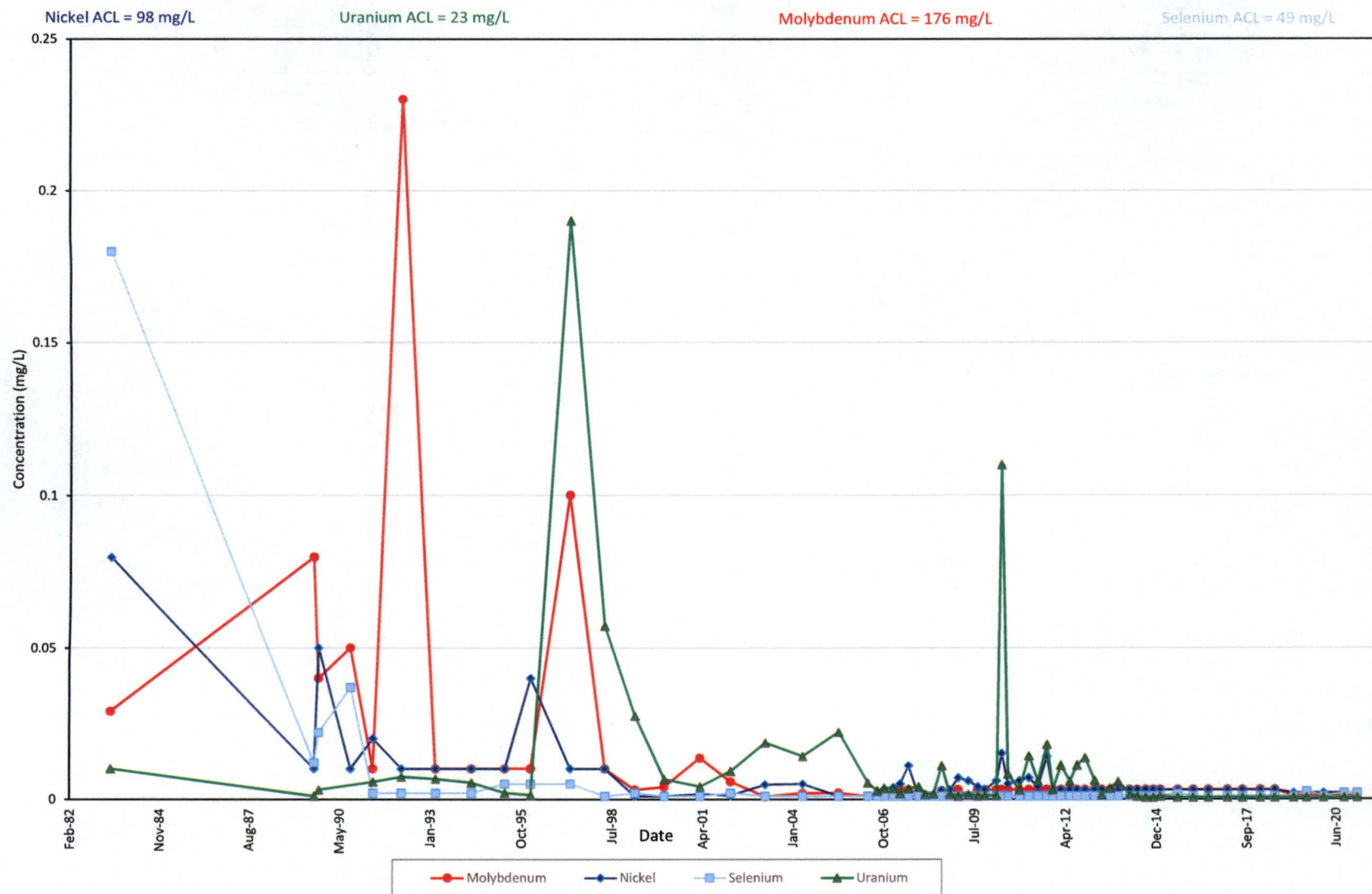
Radionuclides in Monitoring Well 5-03 ALL-R (replaced 11/5/2012)



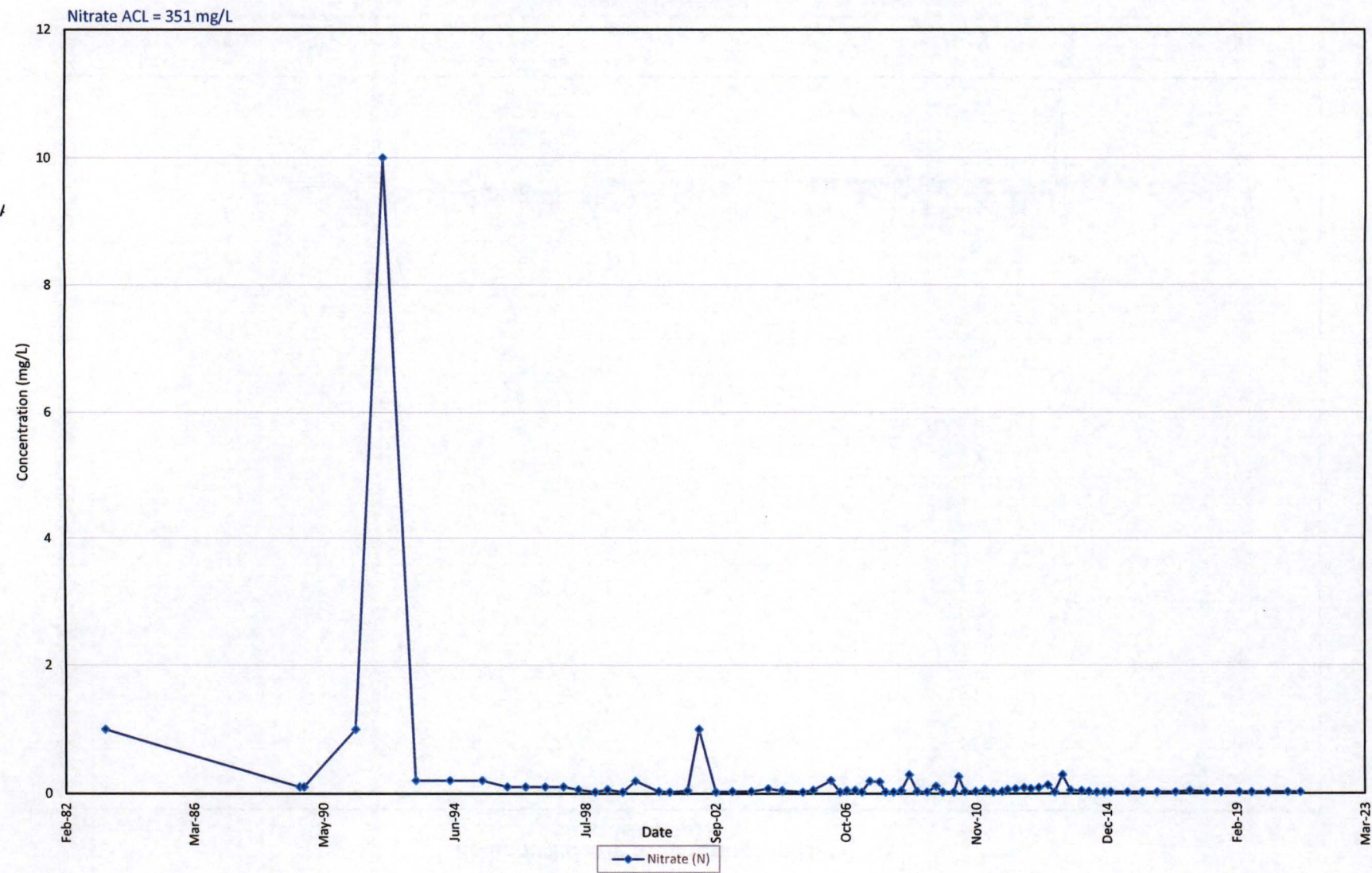
Anions and TDS in monitoring well 5-04 ALL



Metals in Monitoring Well 5-04 ALL



Nitrate in Monitoring Well 5-04 ALL

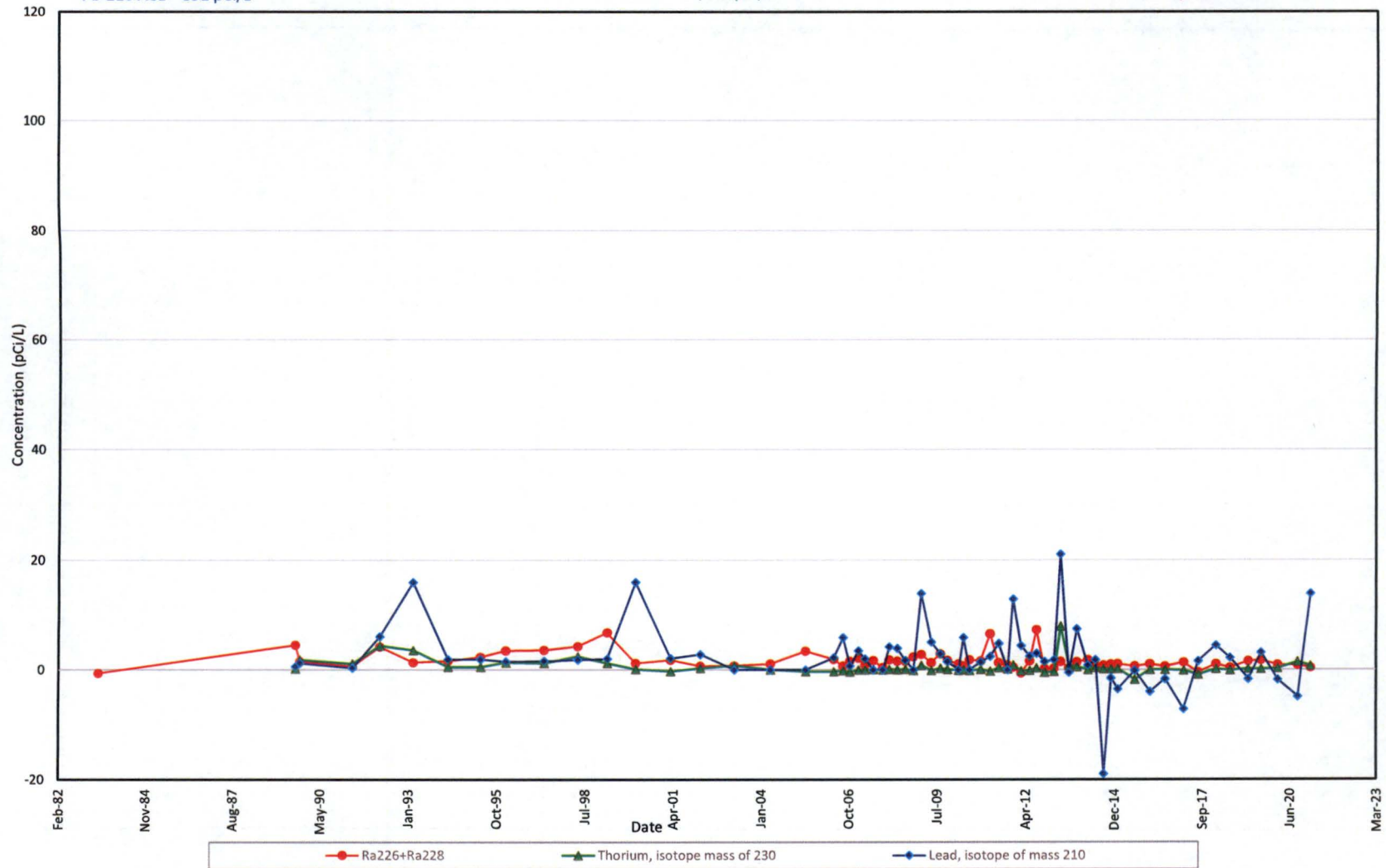


Radionuclides in Monitoring Well 5-04 ALL

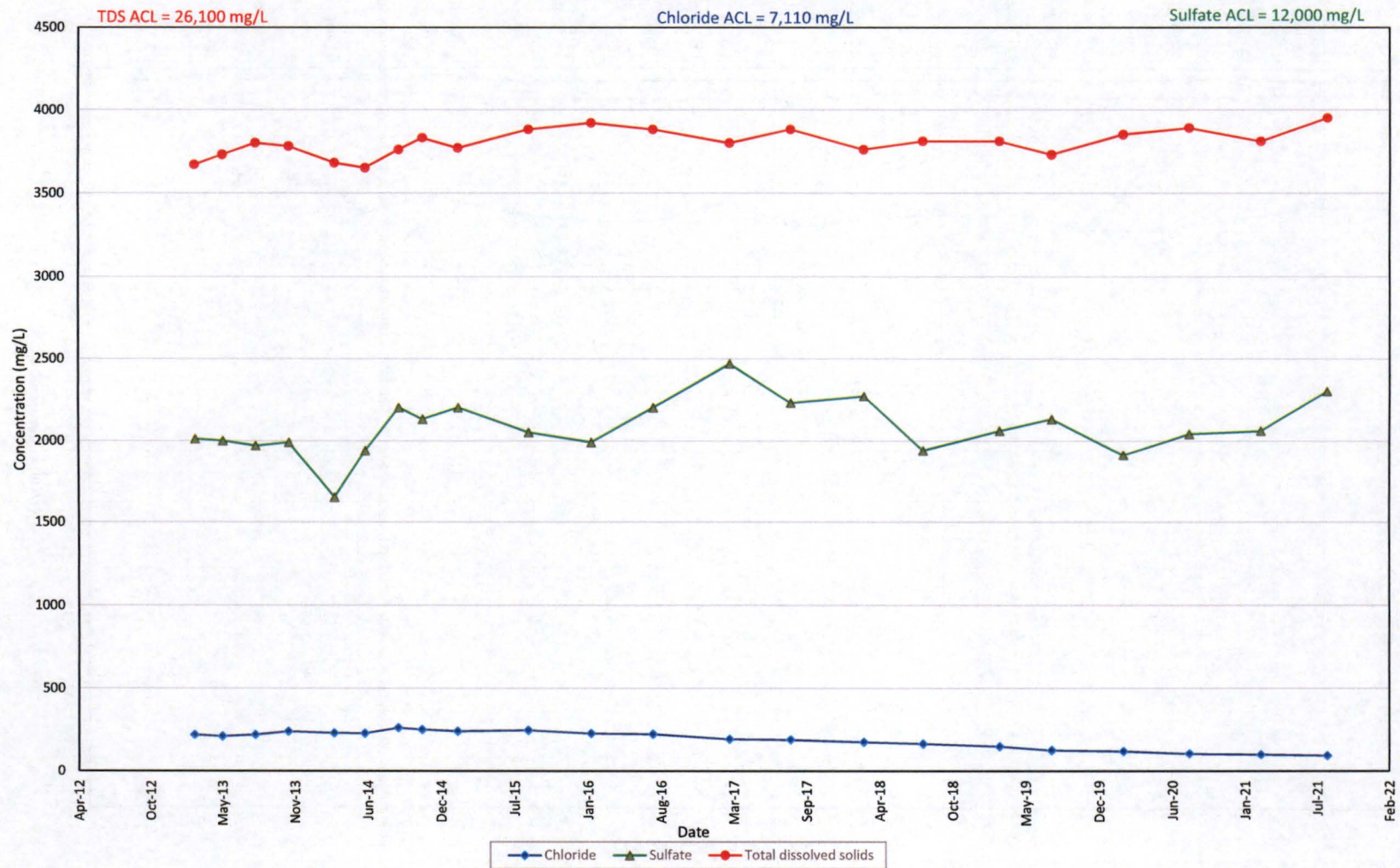
Pb-210 ACL = 891 pCi/L

Th-230 ACL = 13,627 pCi/L

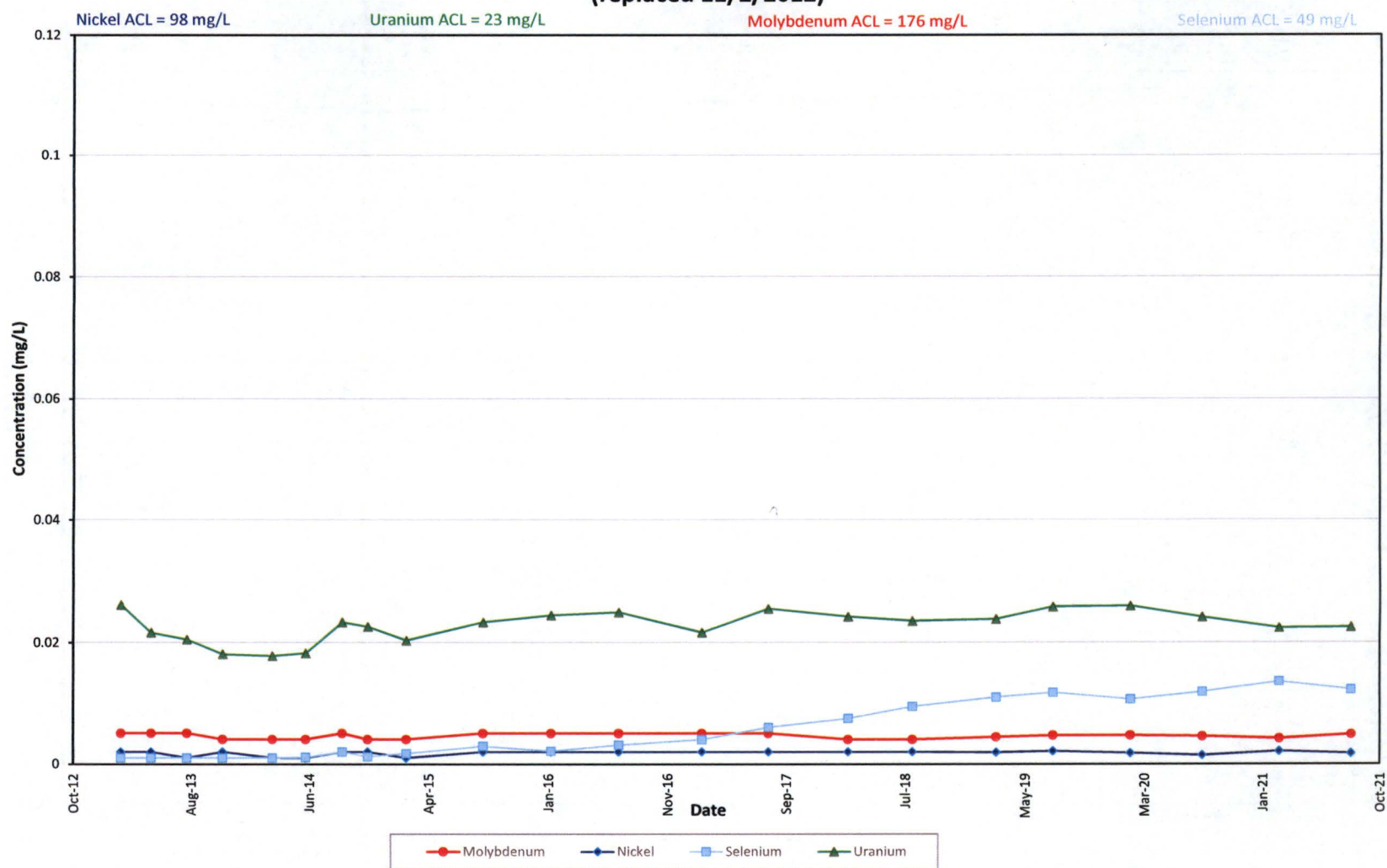
Ra-226+228 ACL = 3,167 pCi/L



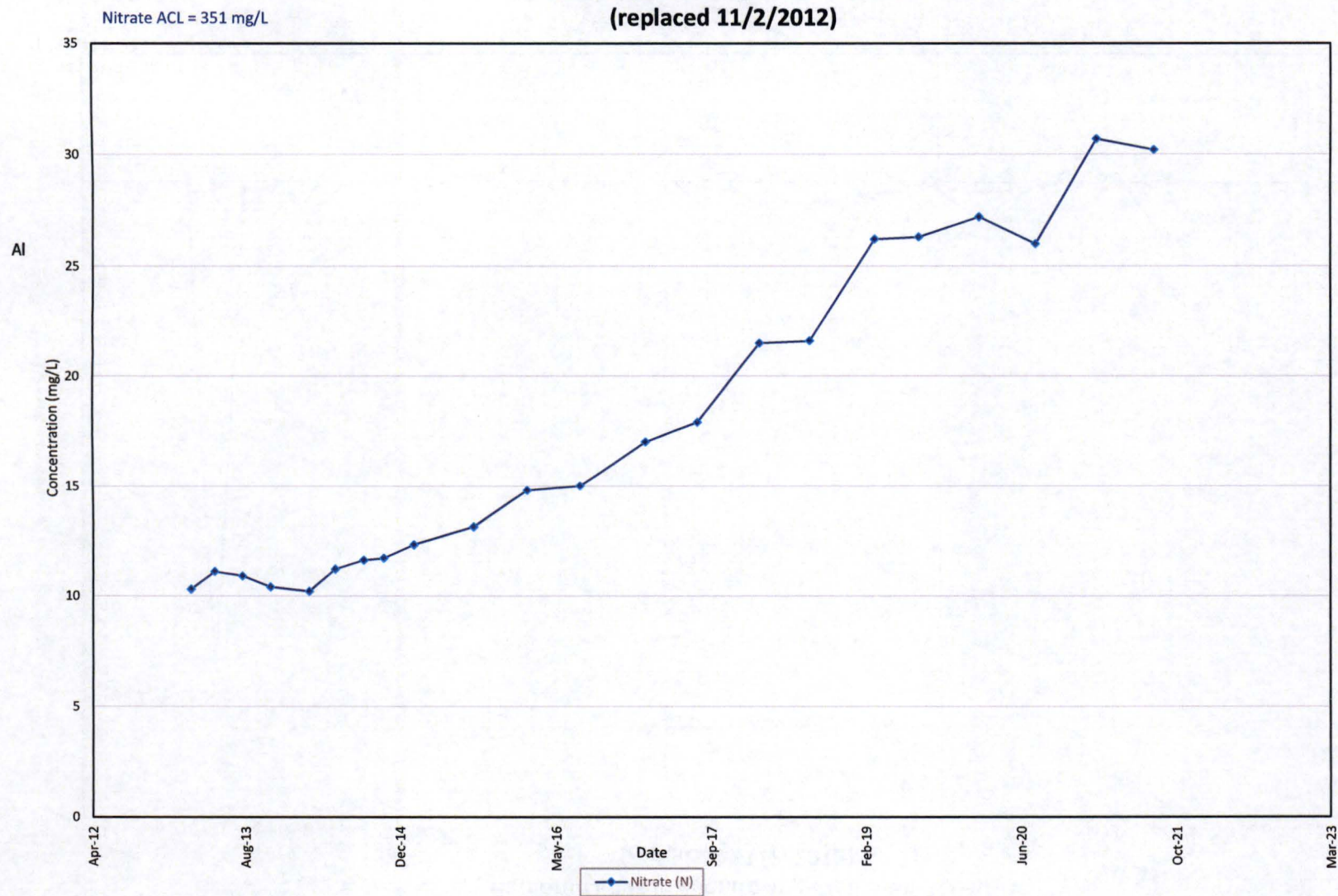
**Anions and TDS in Monitoring Well 5-08 ALL-R
(replaced 11/2/2012)**



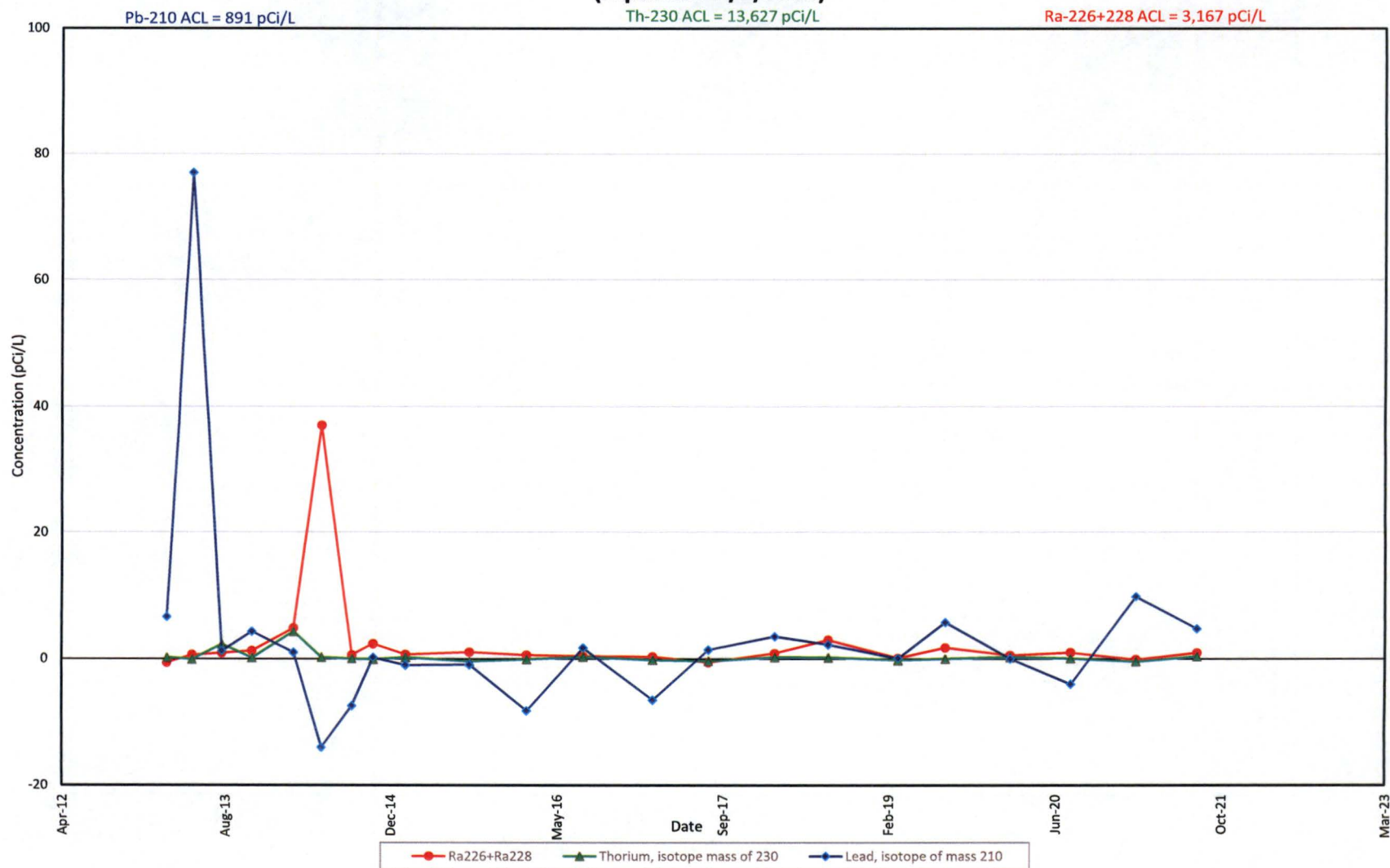
Metals in Monitoring Well 5-08 ALL-R (replaced 11/2/2012)



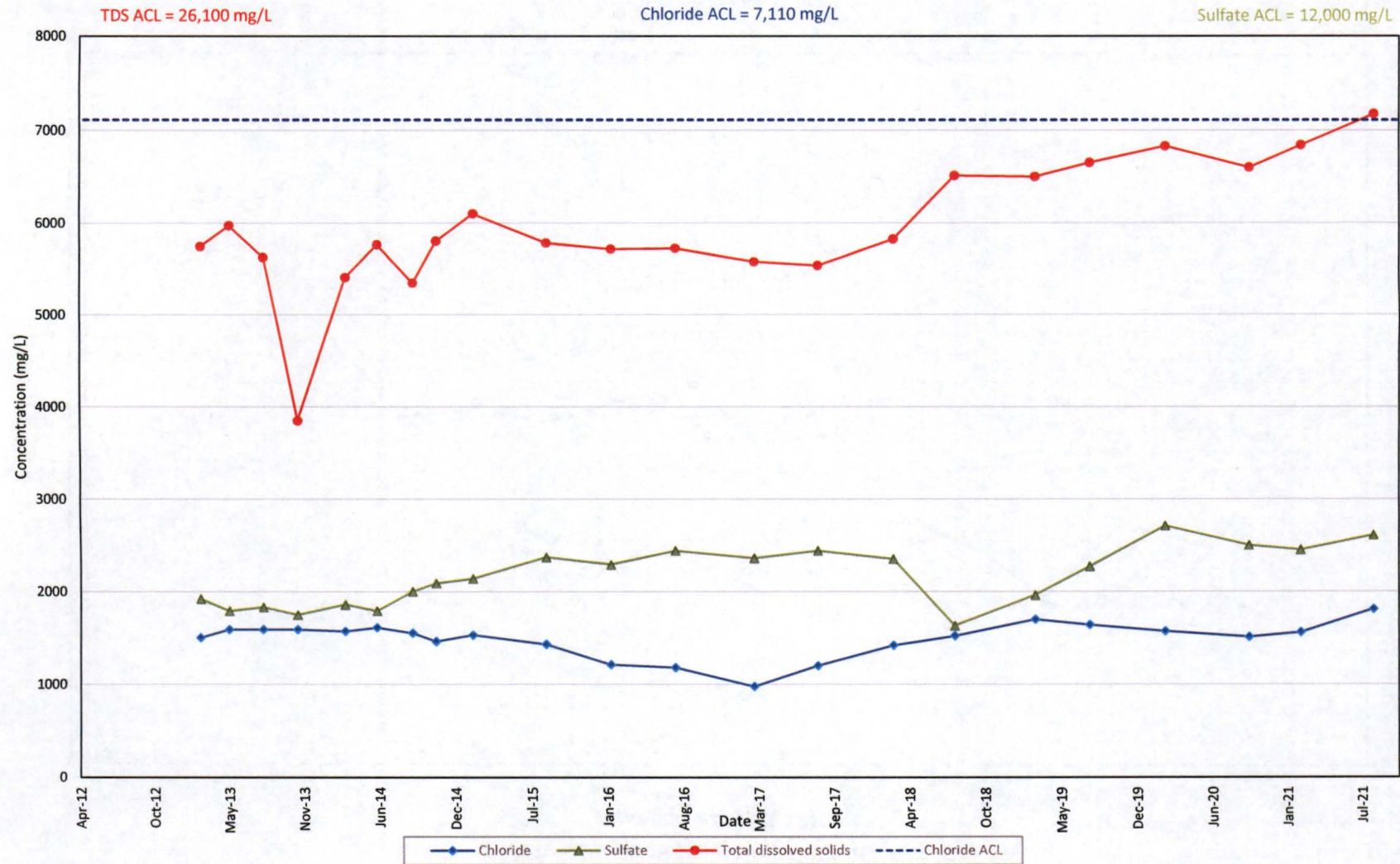
**Nitrate in Monitoring Well 5-08 ALL-R
(replaced 11/2/2012)**



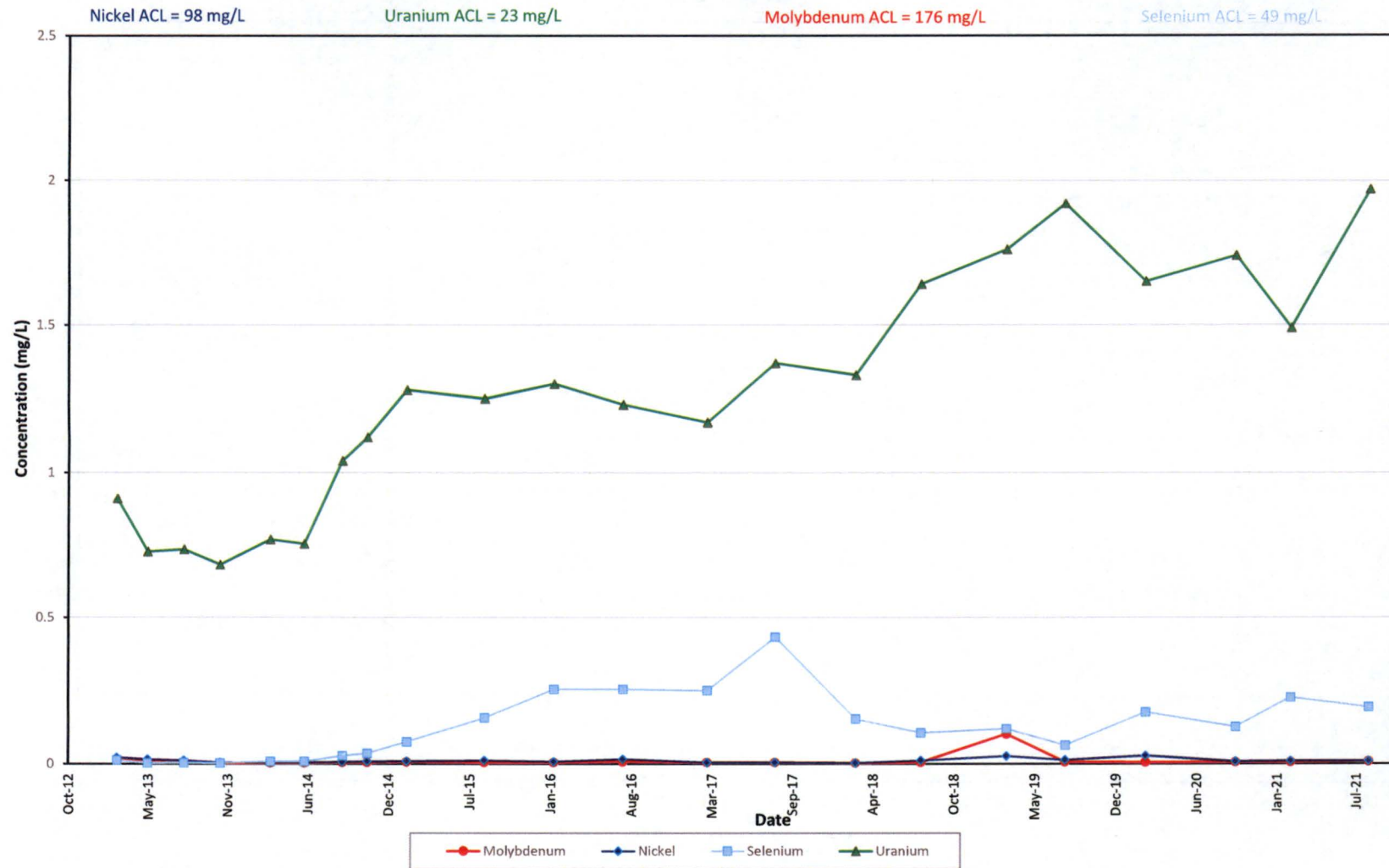
**Radionuclides in Monitoring Well 5-08 ALL-R
(replaced 11/2/2012)**



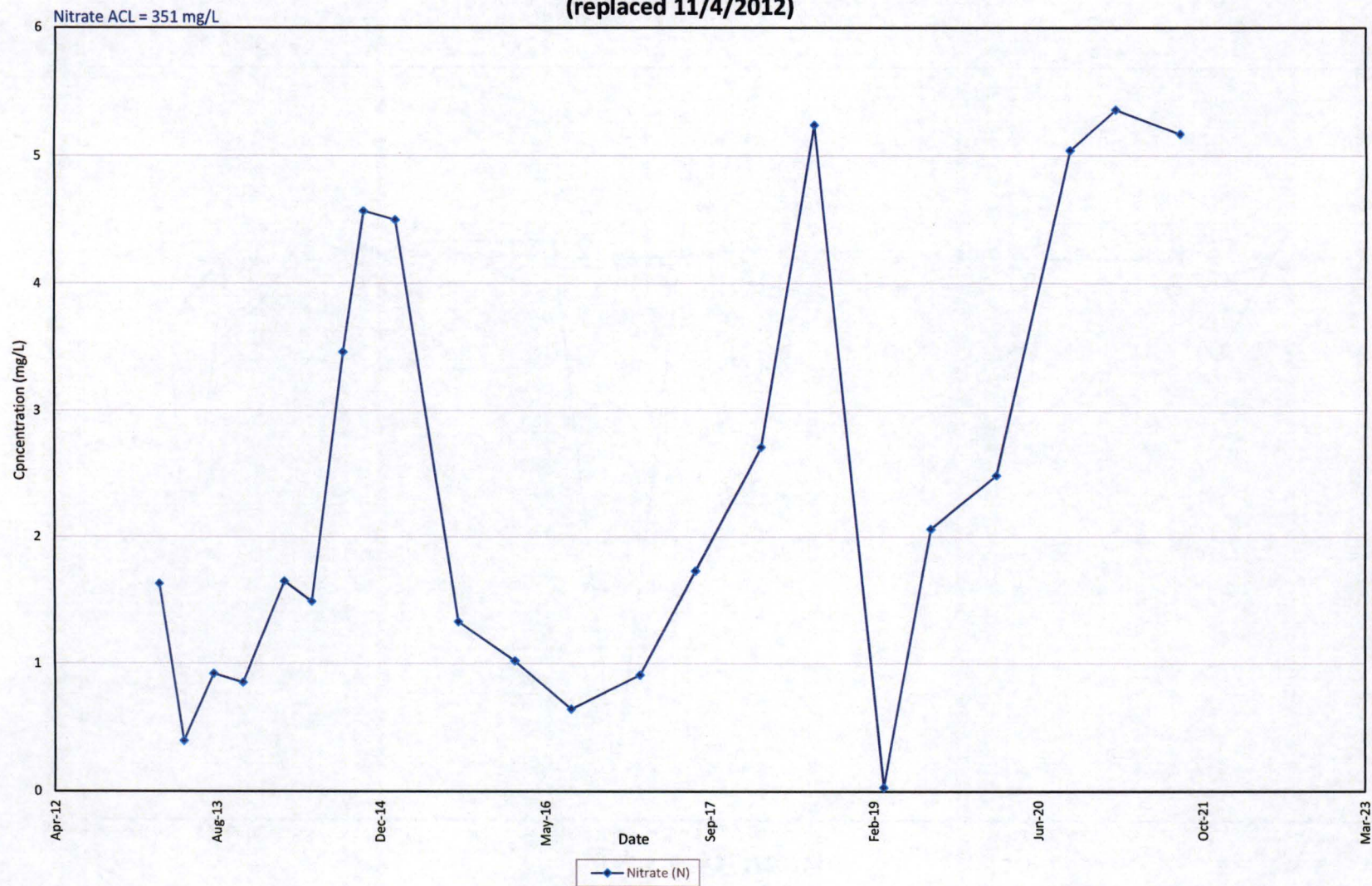
**Anions and TDS in Monitoring Well 5-73 ALL-R
(replaced 11/4/2012)**



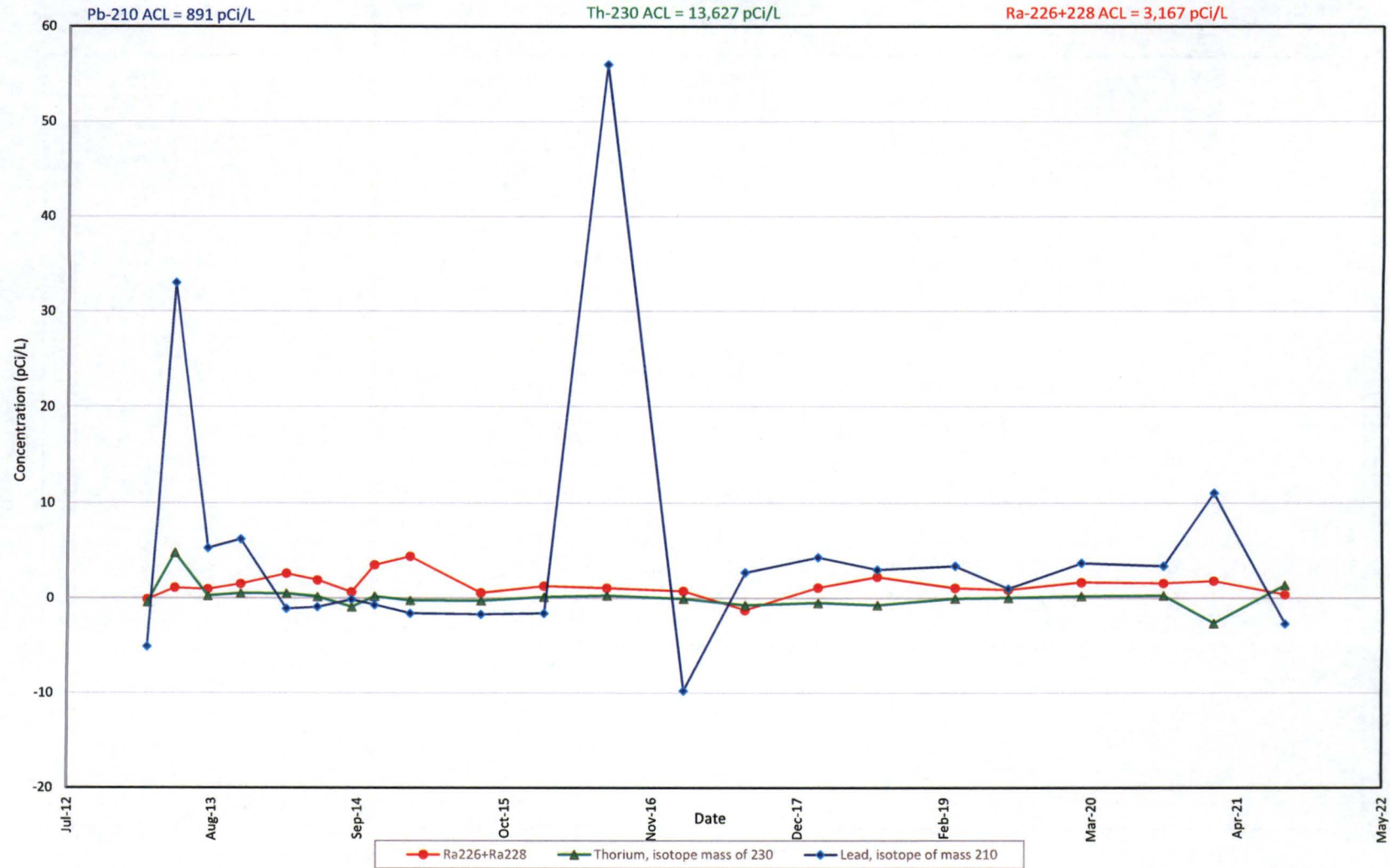
**Metals in Monitoring Well 5-73 ALL-R
(replaced 11/4/2012)**



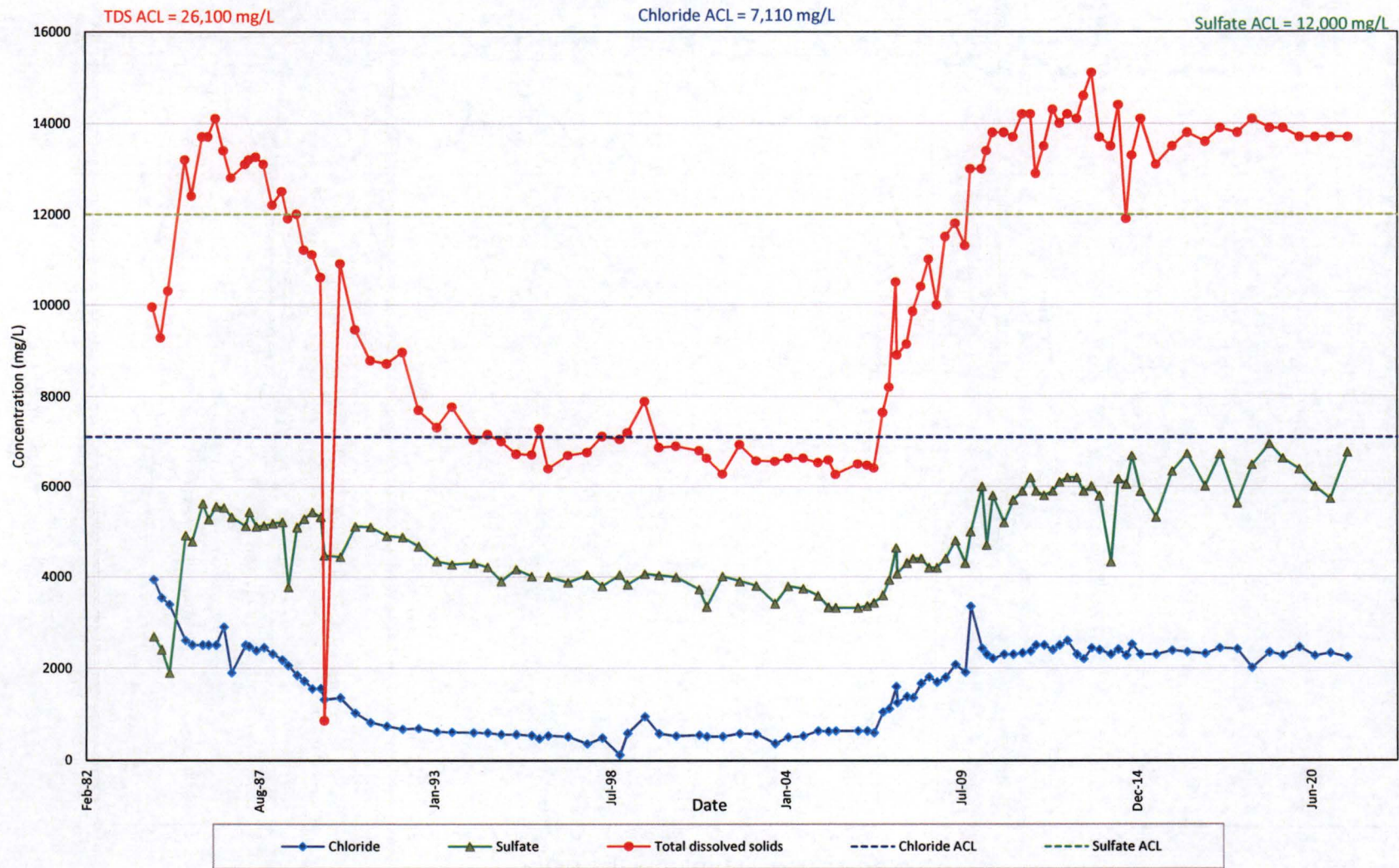
**Nitrate in Monitoring Well 5-73 ALL-R
(replaced 11/4/2012)**



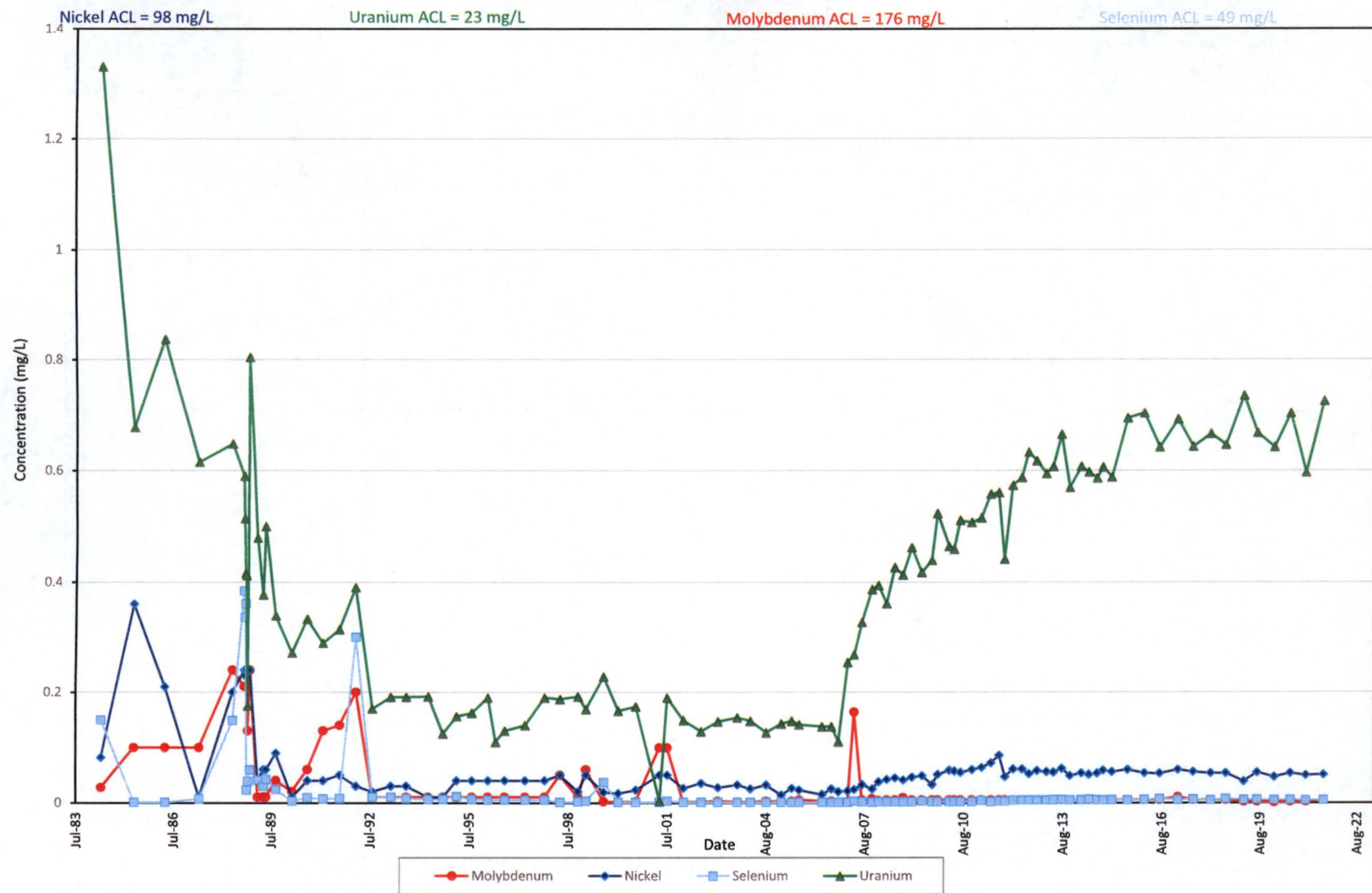
**Radionuclides in Monitoring Well 5-73 ALL-R
(replaced 11/4/2012)**



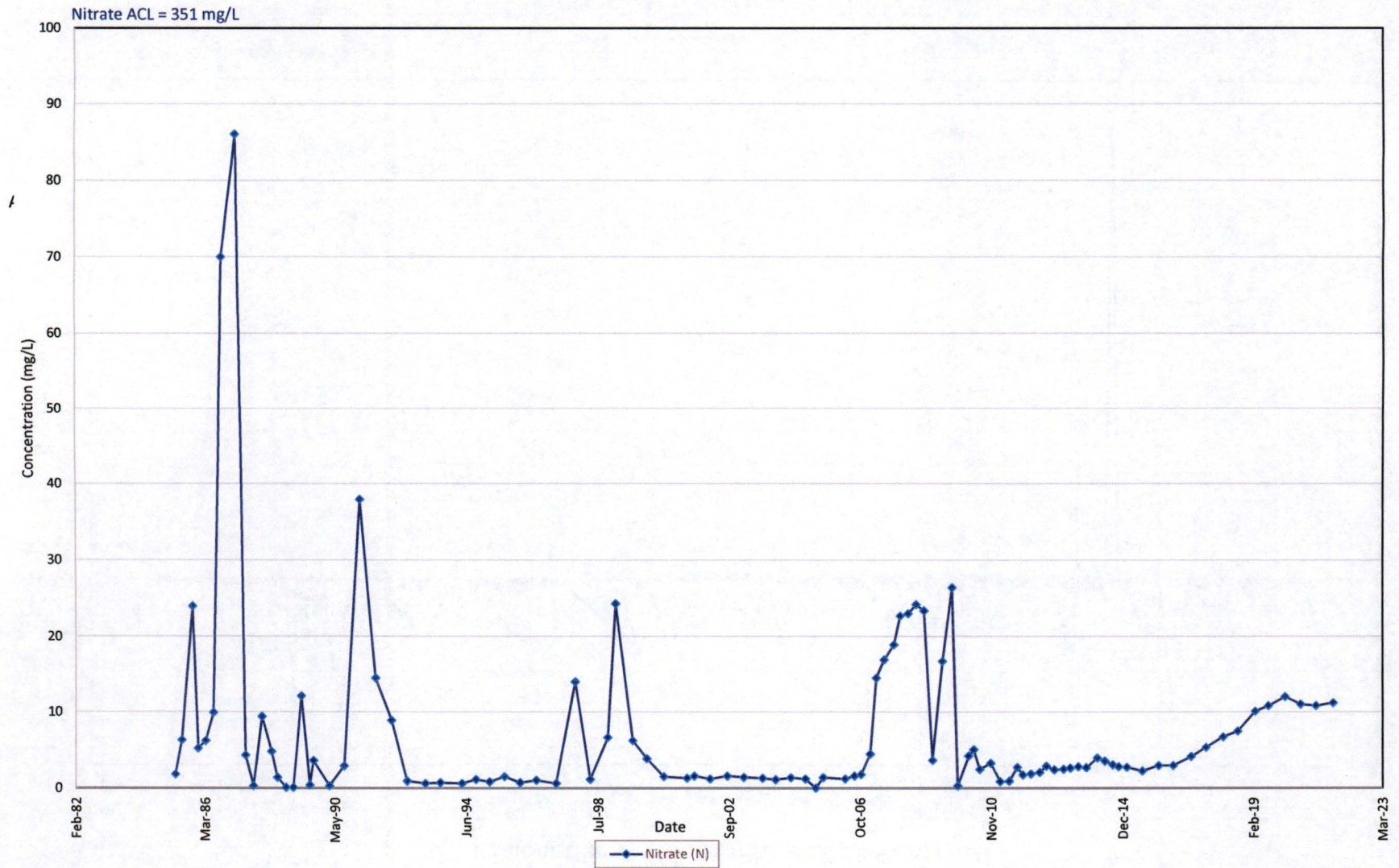
Anions and TDS in Monitoring Well 31-61 ALL



Metals in Monitoring Well 31-61 ALL



Nitrate in Monitoring Well 31-61 ALL

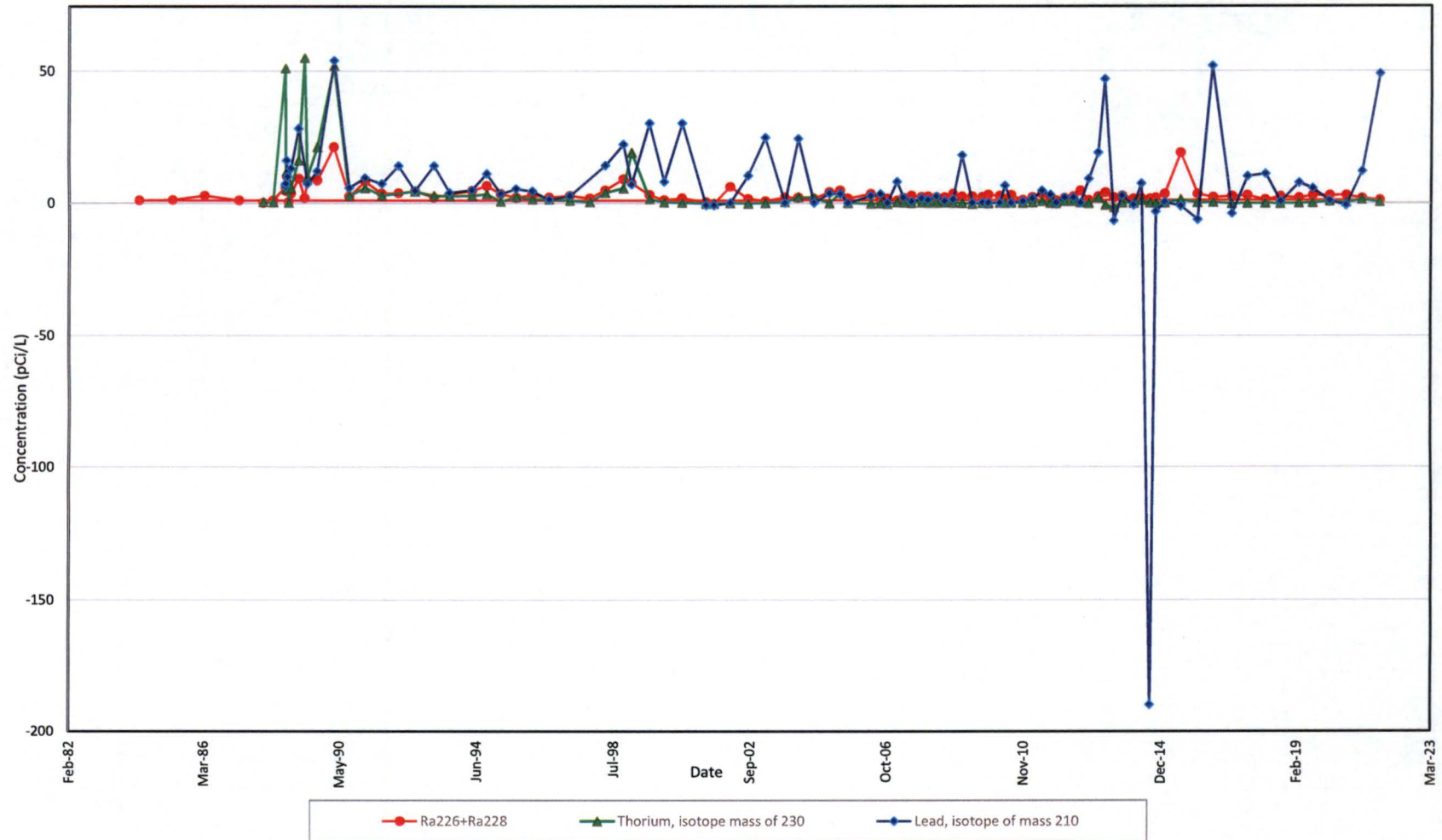


Radionuclides in Monitoring Well 31-61 ALL

Pb-210 ACL = 891 pCi/L

Th-230 ACL = 13,627 pCi/L

Ra-226+228 ACL = 3,167 pCi/L

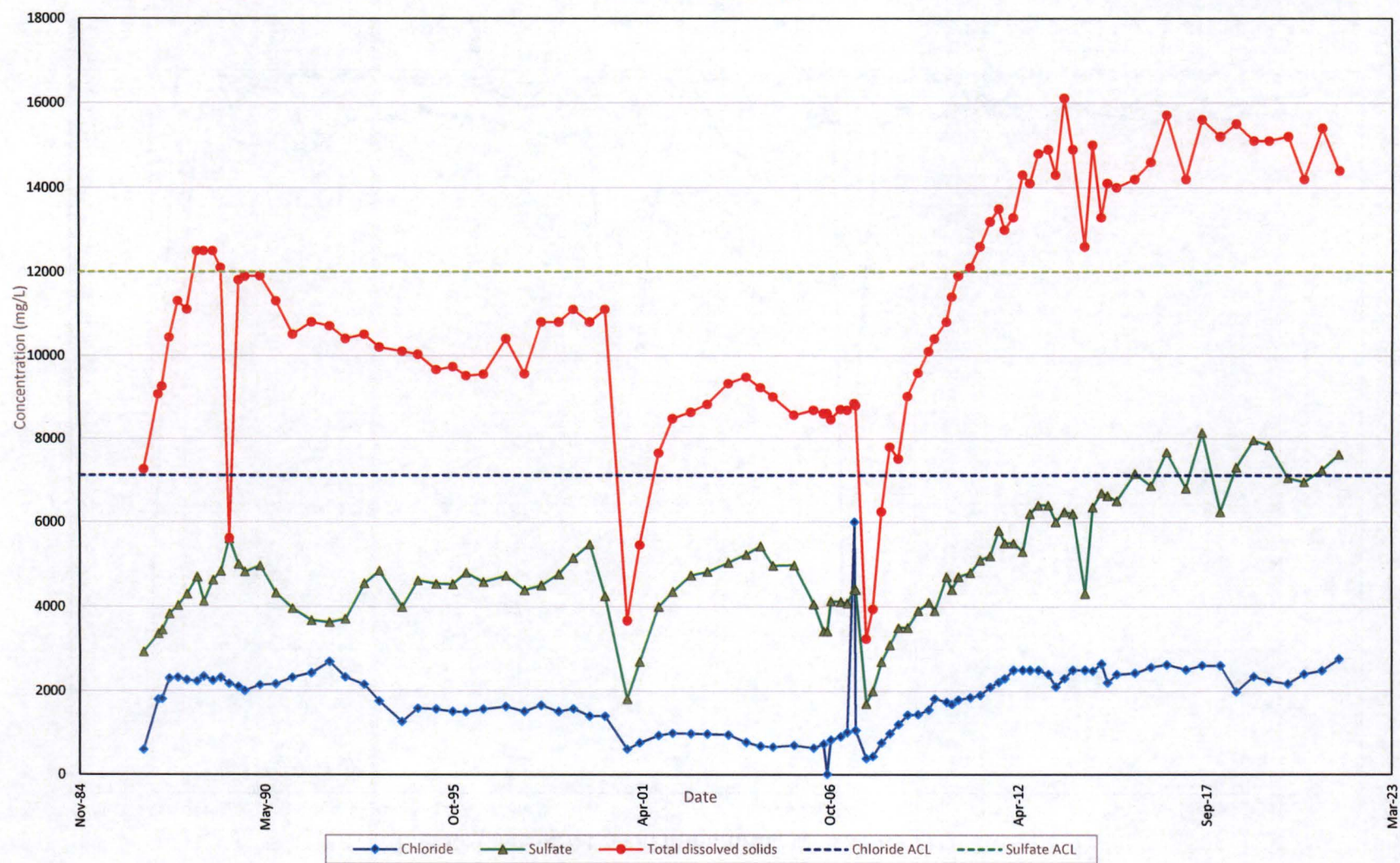


Anions and TDS in Monitoring Well 31-65 ALL

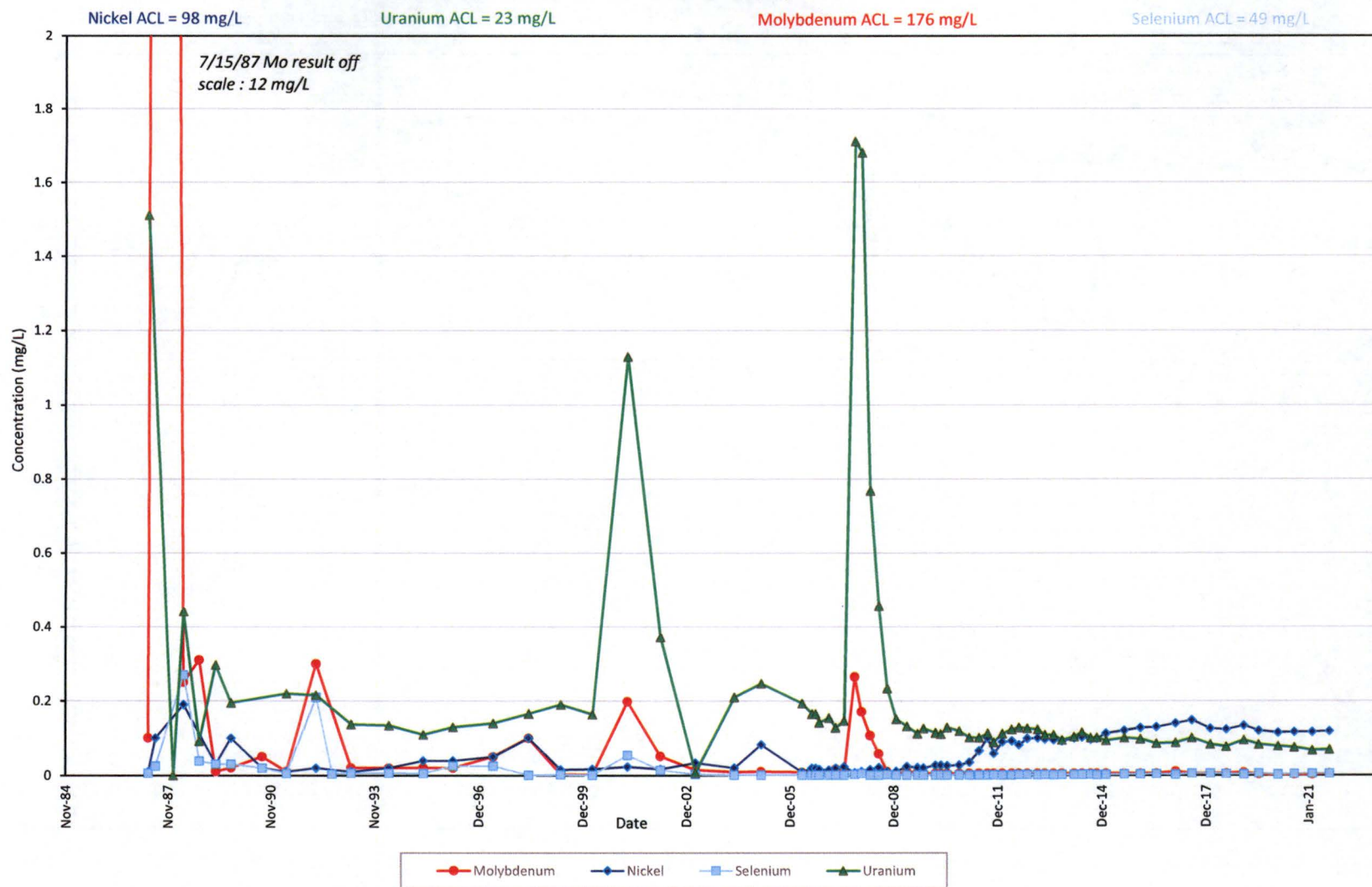
TDS ACL = 26,100 mg/L

Chloride ACL = 7,110 mg/L

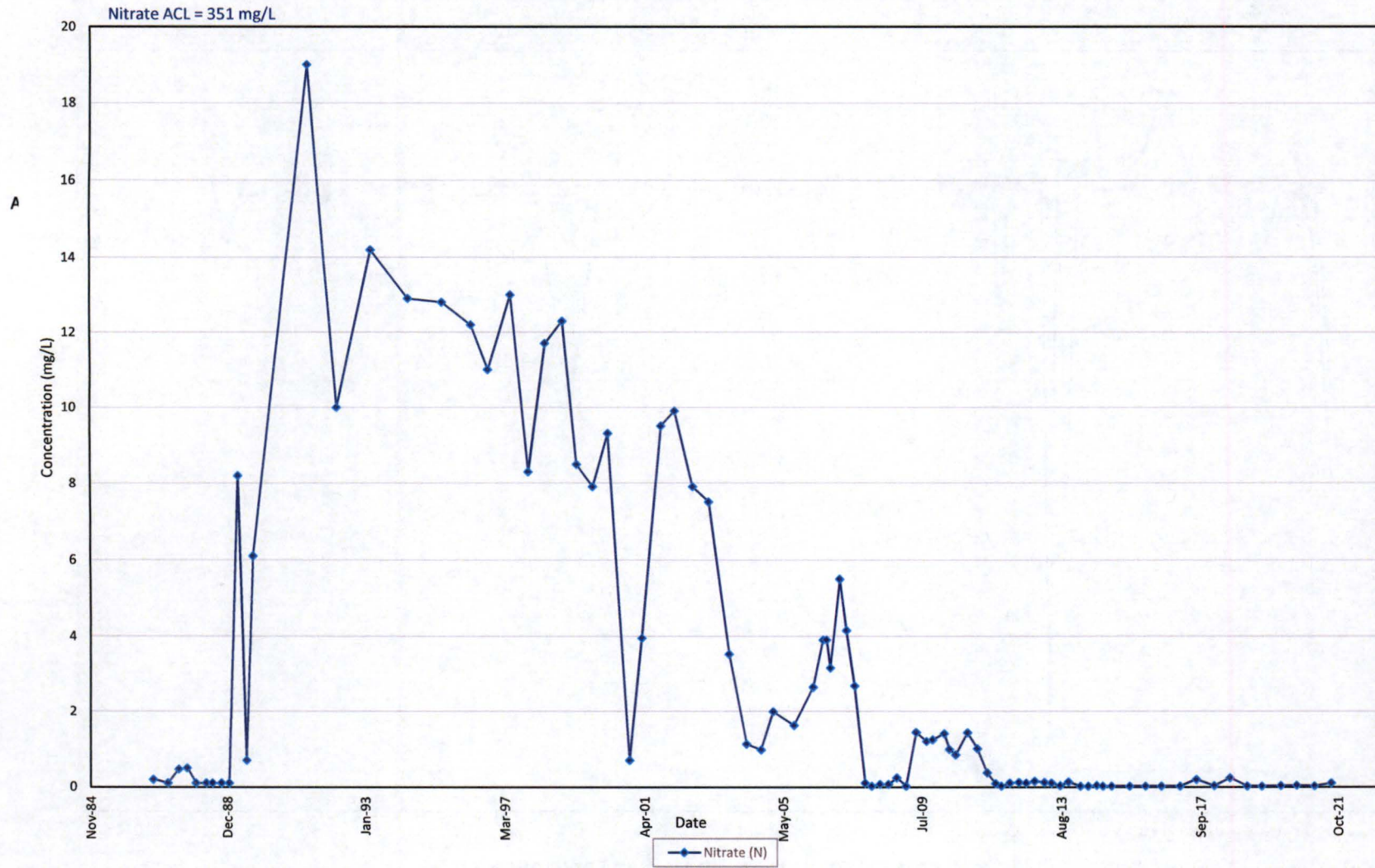
Sulfate ACL = 12,000 mg/L



Metals Concentration in Monitoring Well 31-65 ALL



Nitrate in Monitoring Well 31-65 ALL

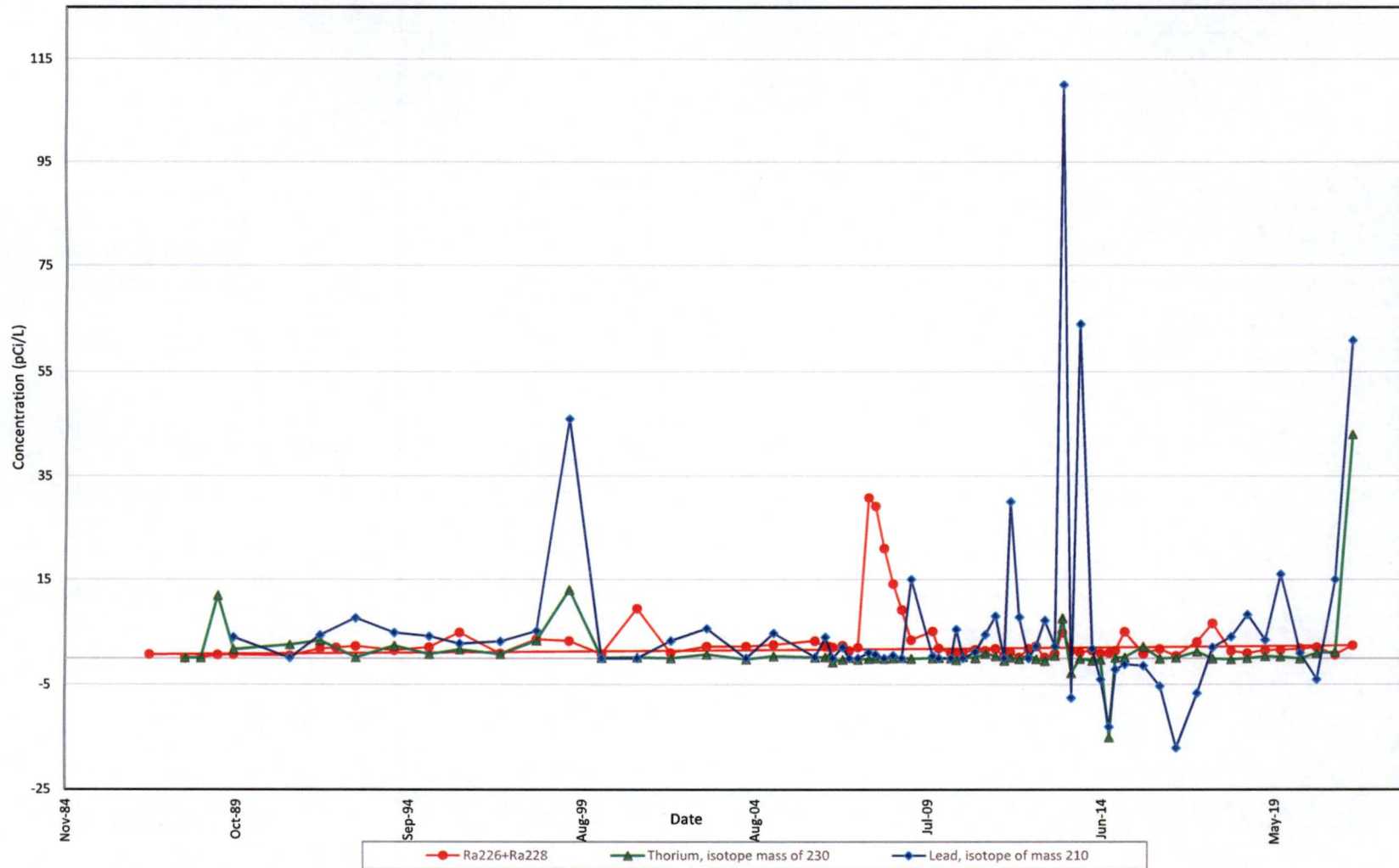


Radionuclides in Monitoring Well 31-65 ALL

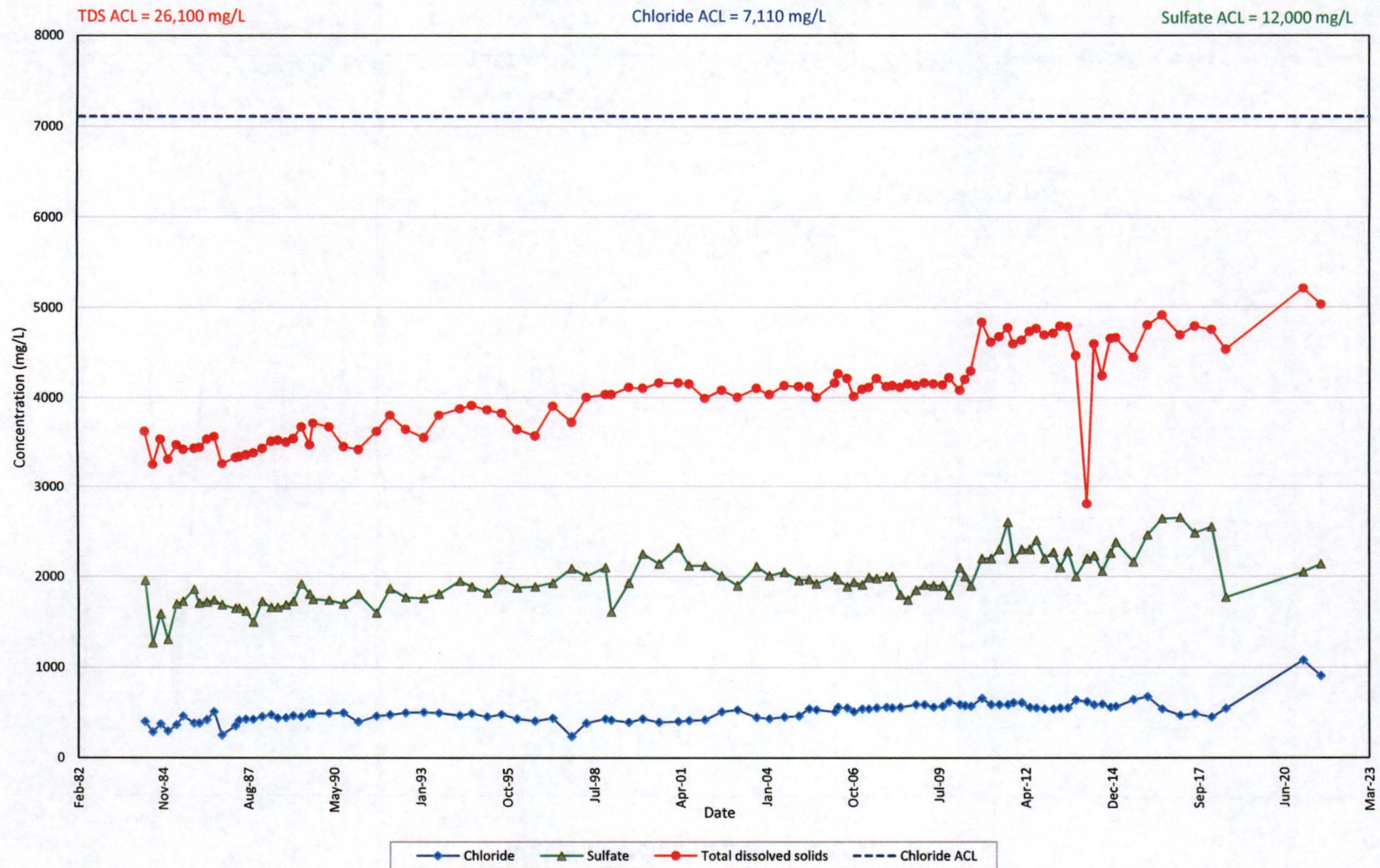
Pb-210 ACL = 891 pCi/L

Th-230 ACL = 13,627 pCi/L

Ra-226+228 ACL = 3,167 pCi/L



Anions and TDS in Monitoring Well 32-59 ALL



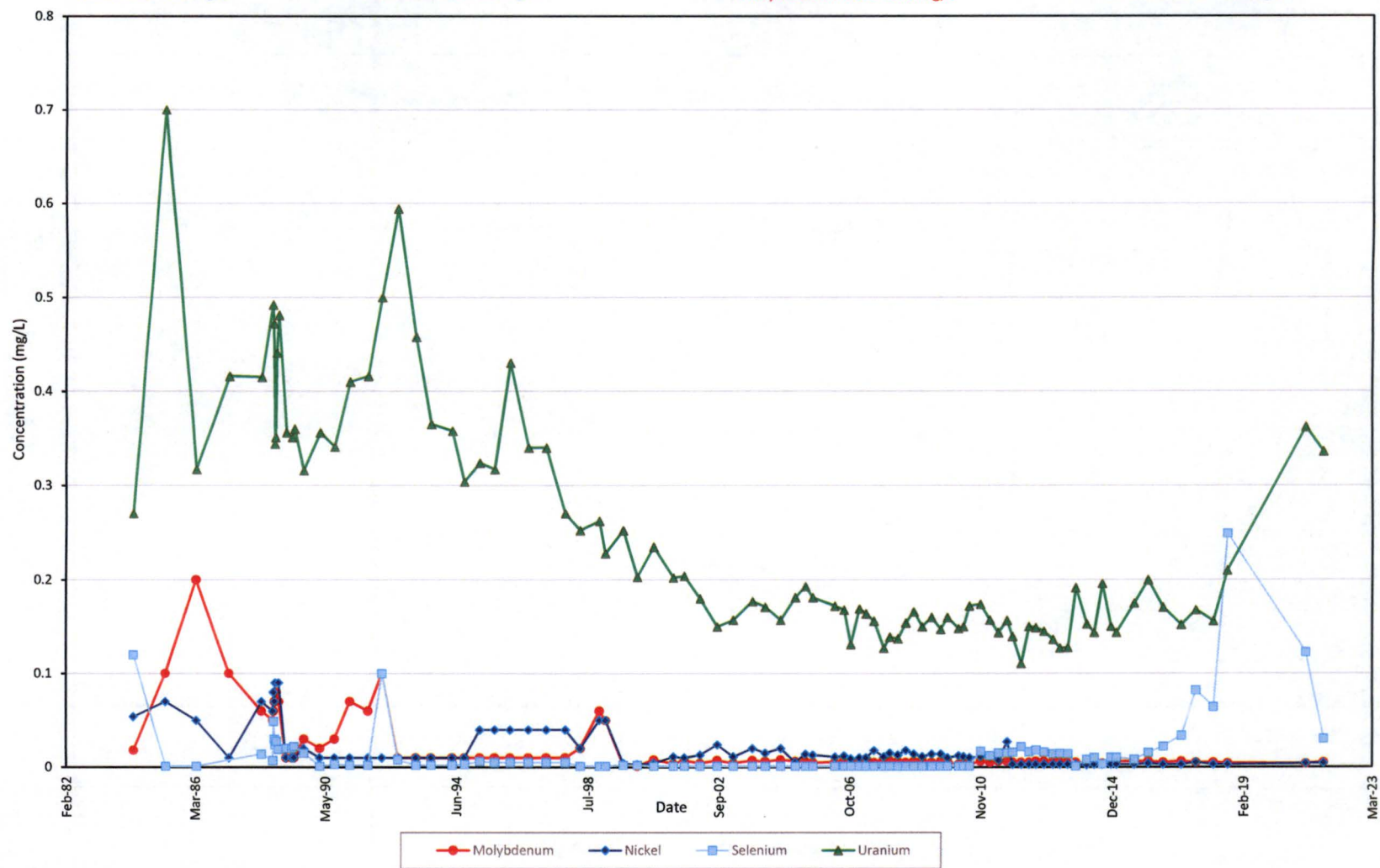
Metals in Monitoring Well 32-59 ALL

Nickel ACL = 98 mg/L

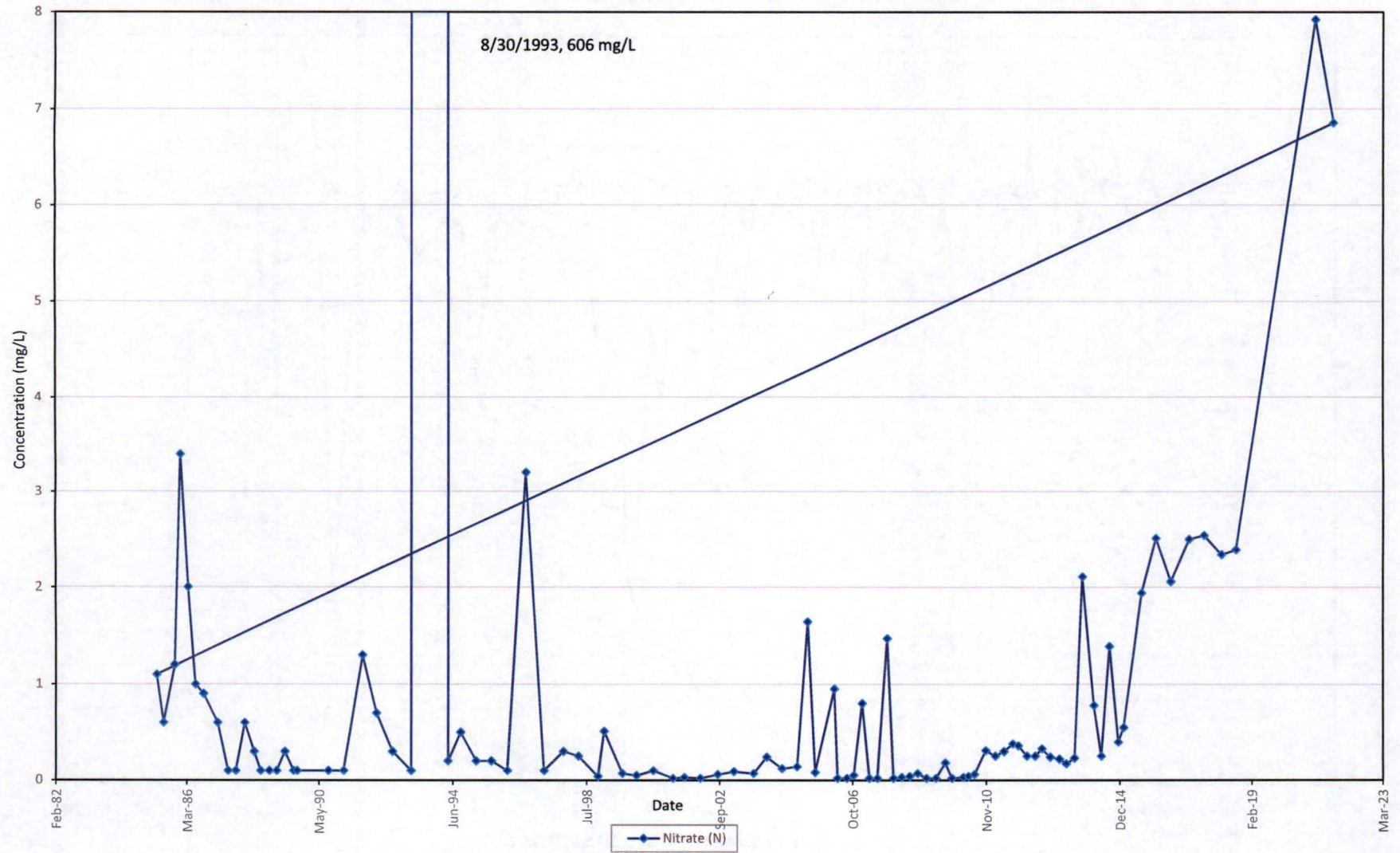
Uranium ACL = 23 mg/L

Molybdenum ACL = 176 mg/L

Selenium ACL = 49 mg/L



Nitrate in Monitoring Well 32-59 ALL

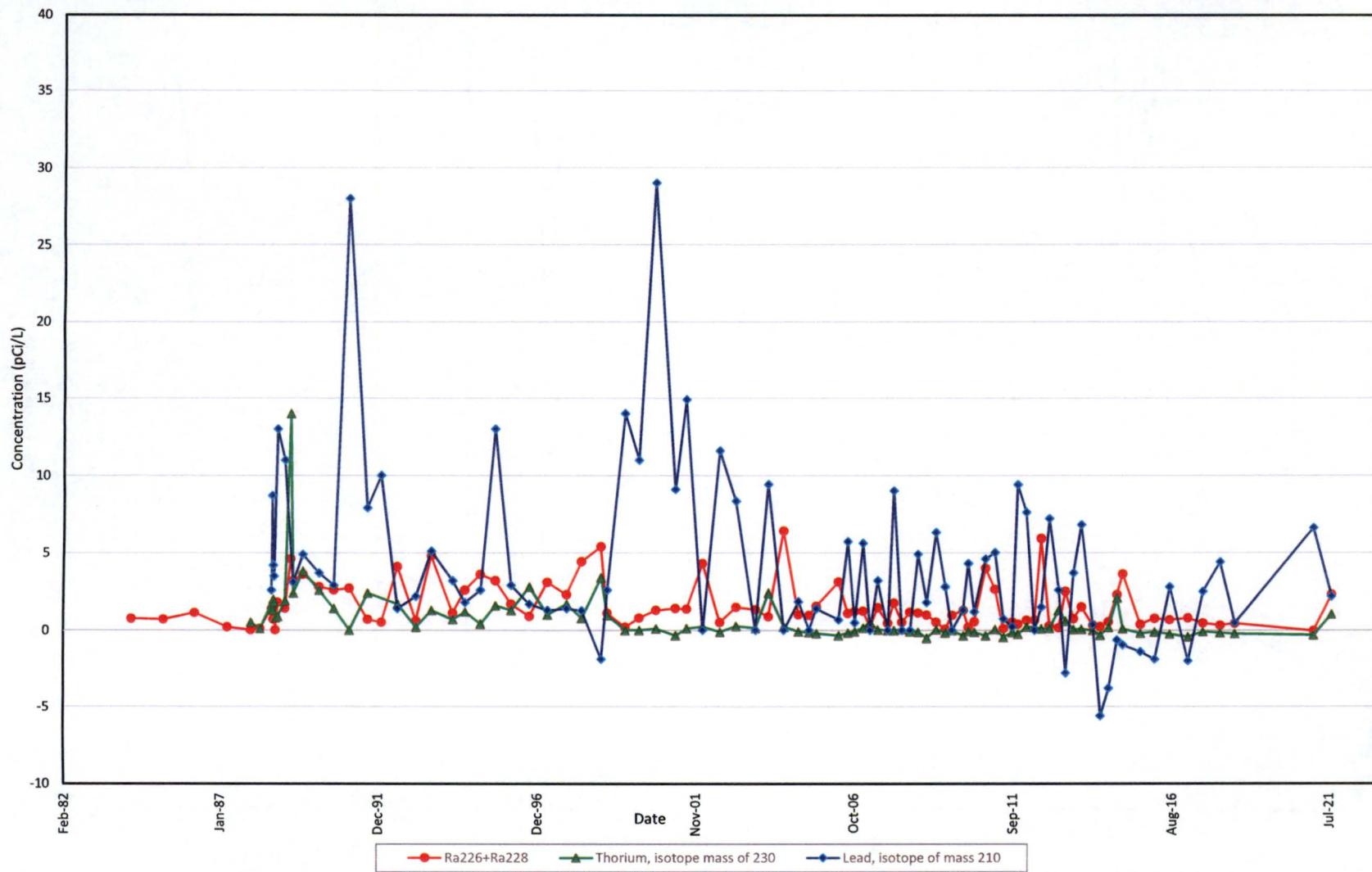


Radionuclides in Monitoring Well 32-59 ALL

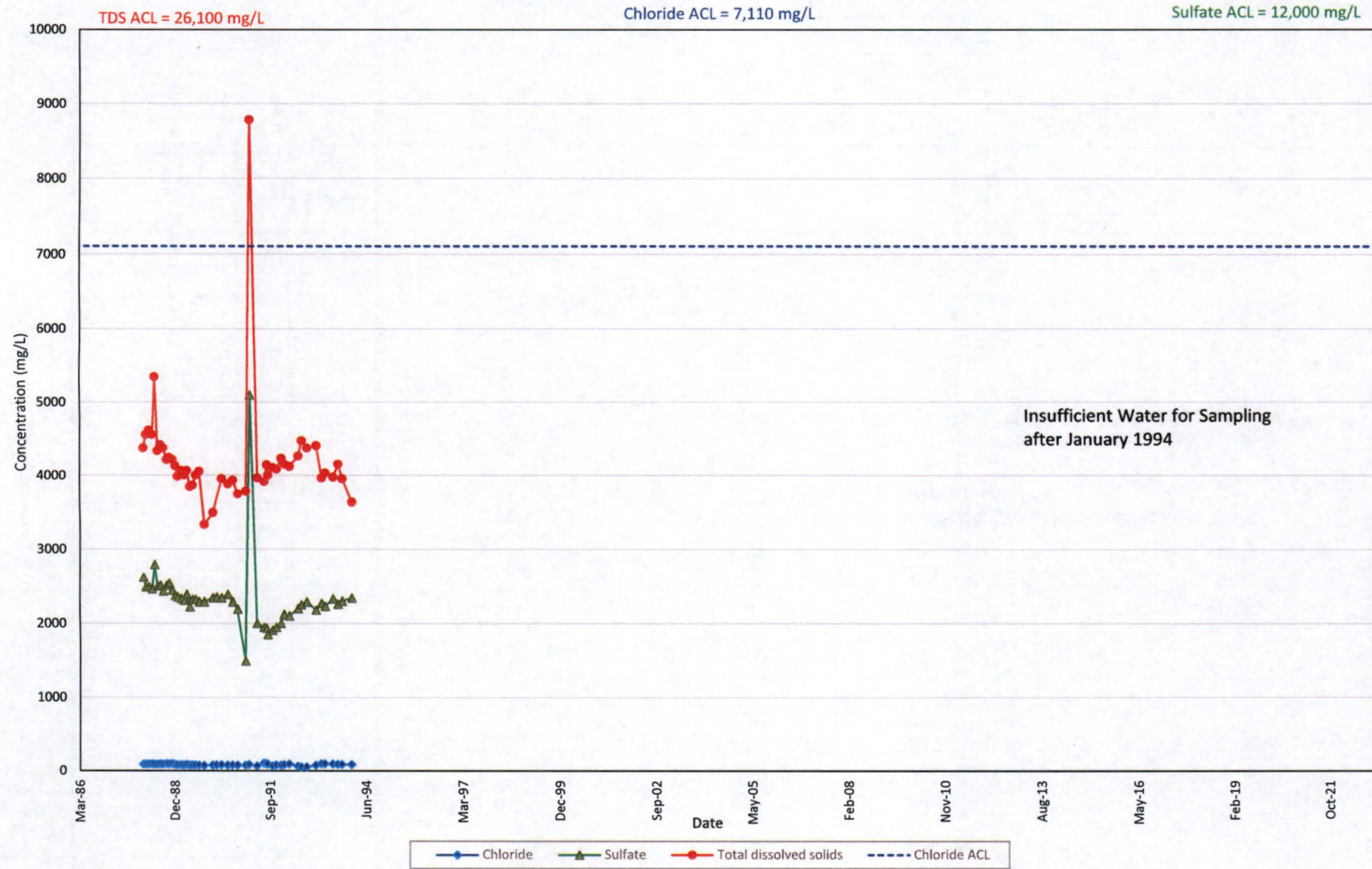
Pb-210 ACL = 891 pCi/L

Th-230 ACL = 13,627 pCi/L

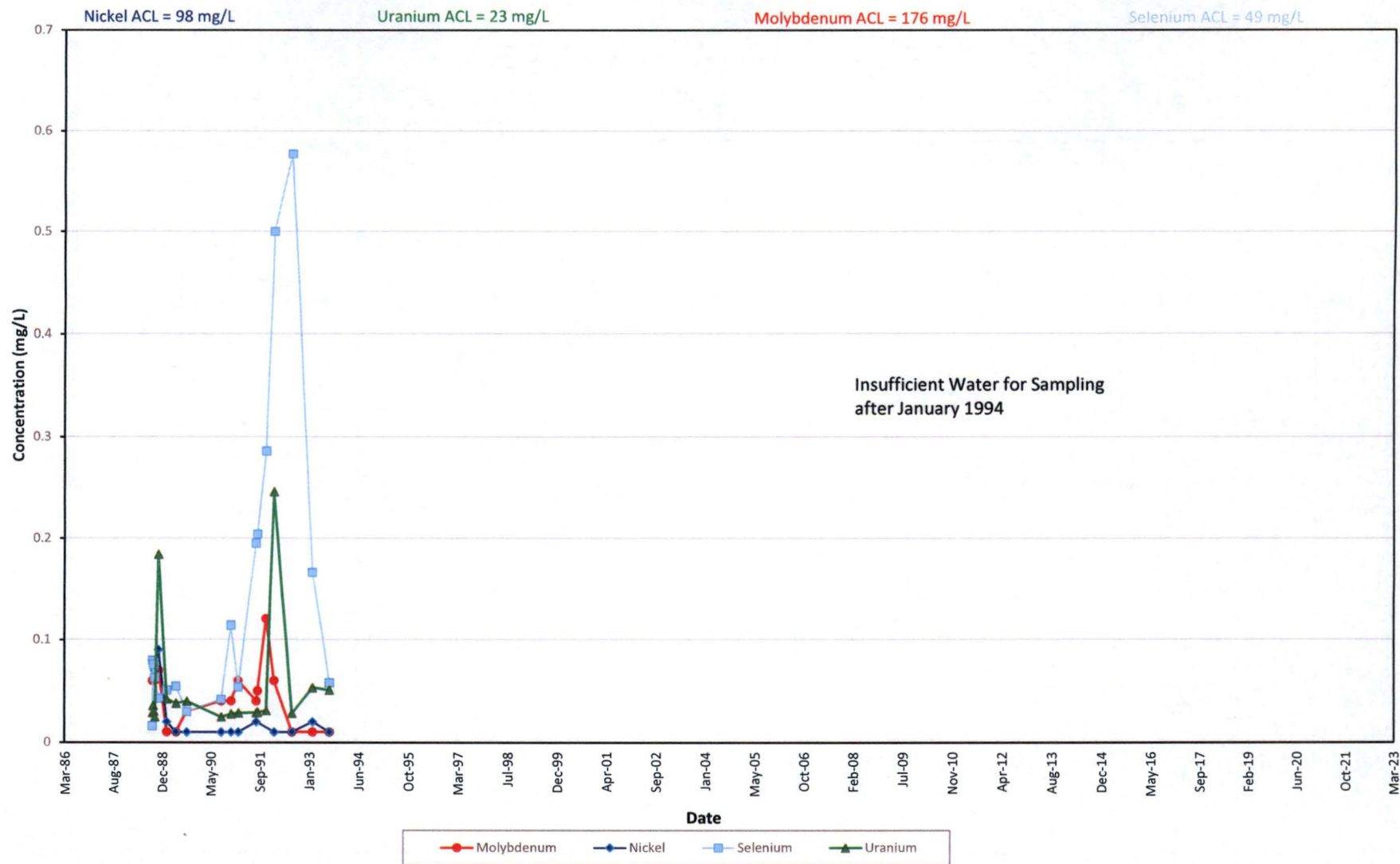
Ra-226+228 ACL = 3,167 pCi/L



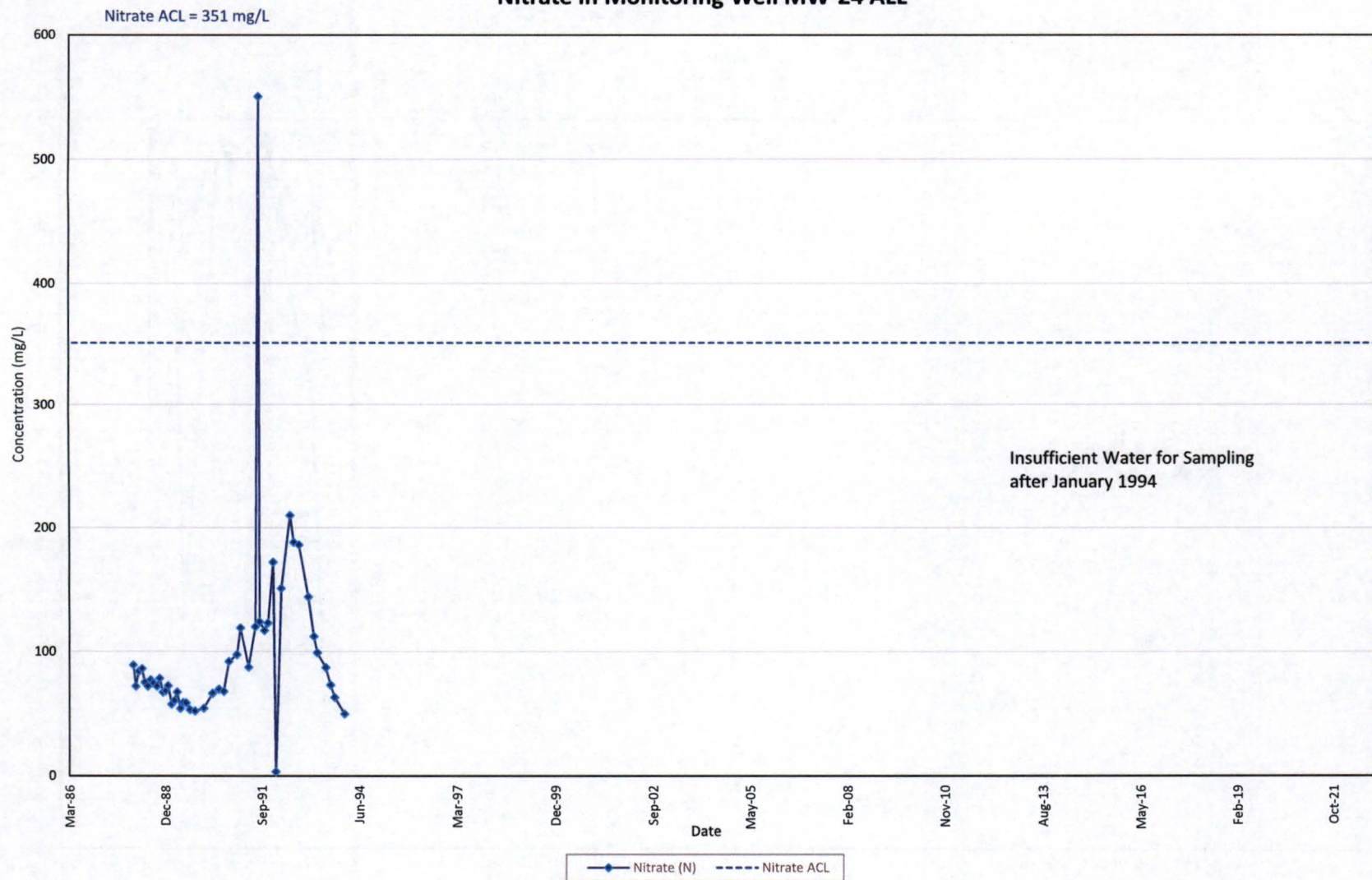
Anions and TDS in Monitoring Well MW-24 ALL



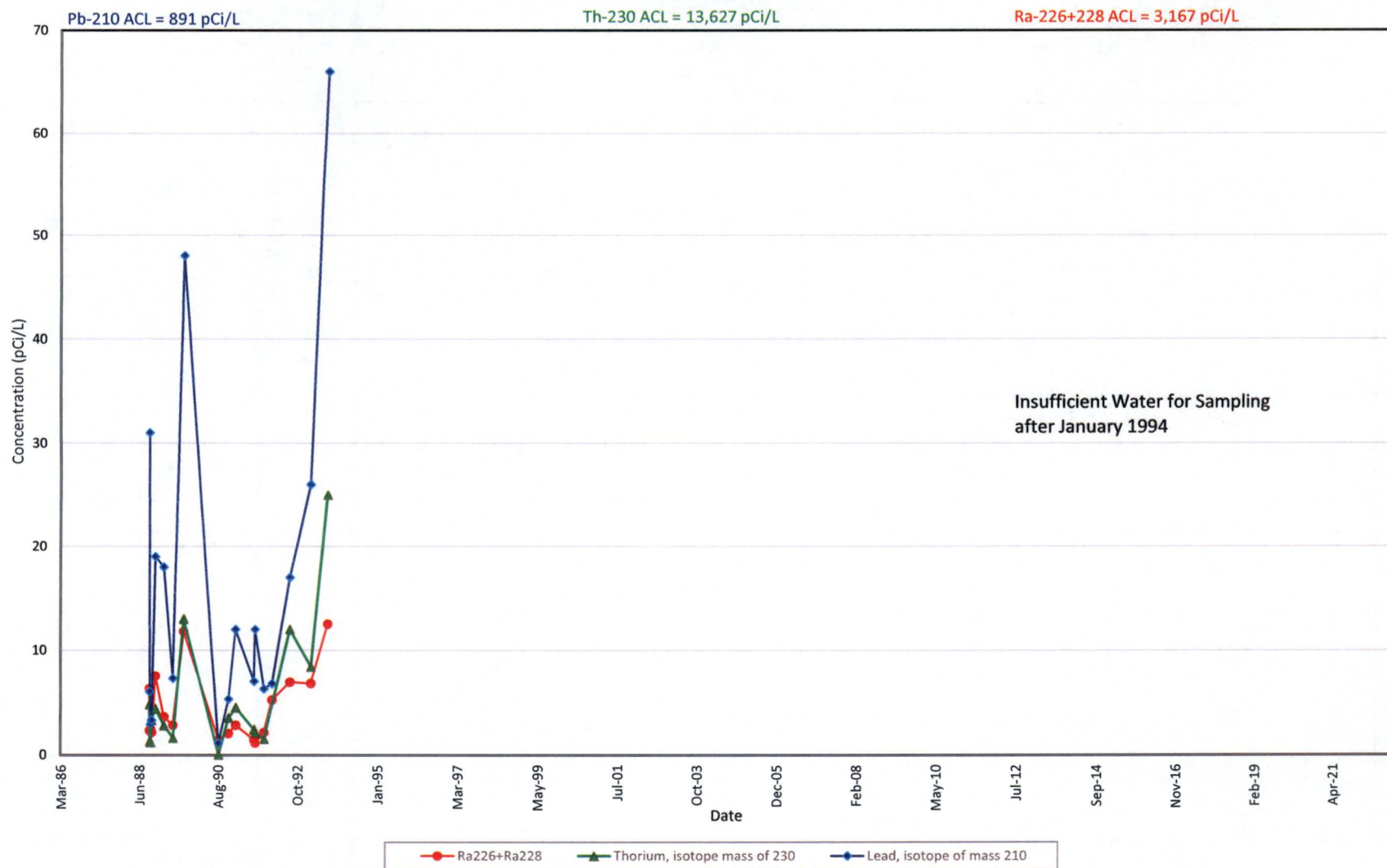
Metals in Monitoring Well MW-24 ALL



Nitrate in Monitoring Well MW-24 ALL



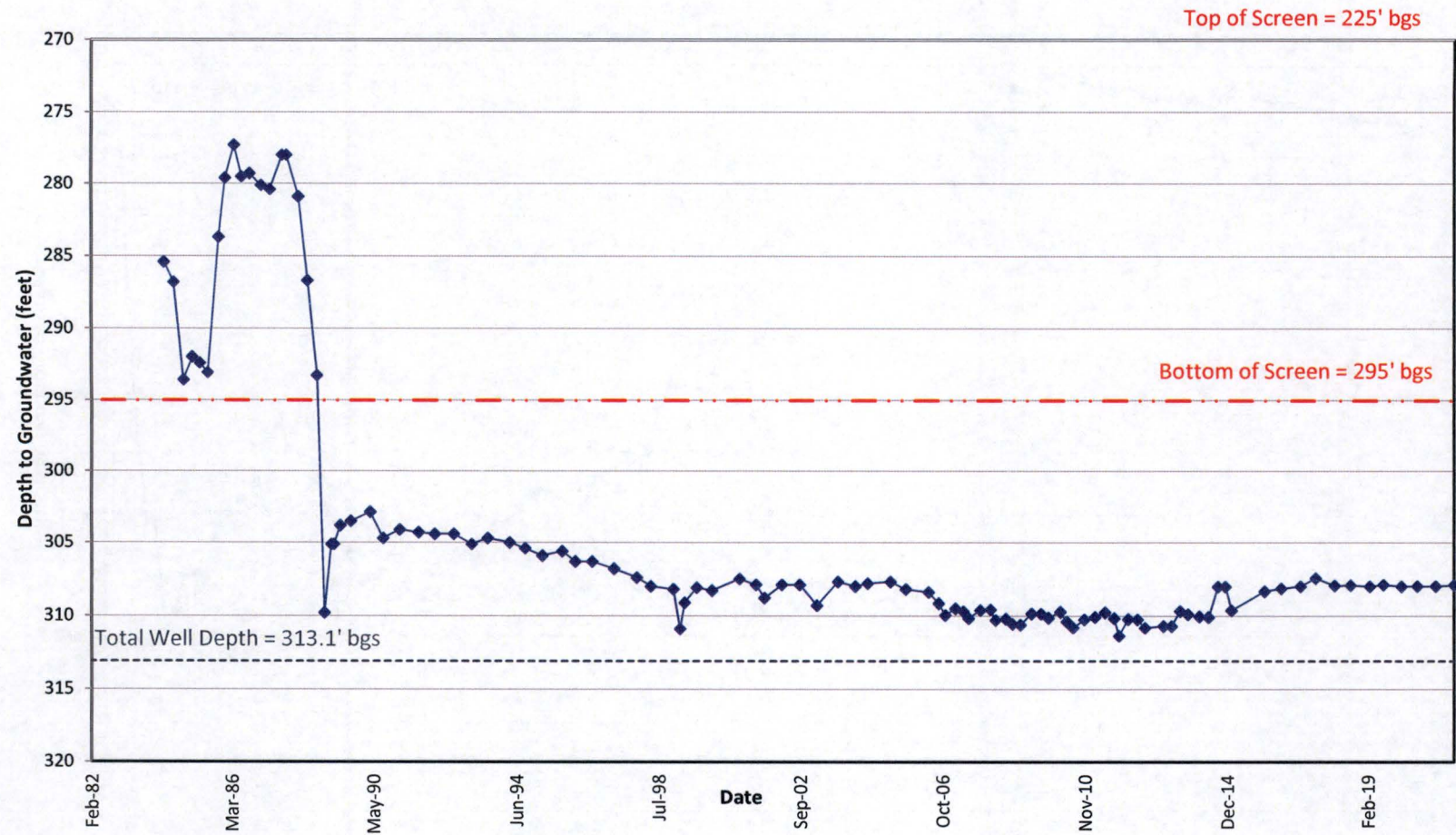
Radionuclides in Monitoring Well MW-24 ALL



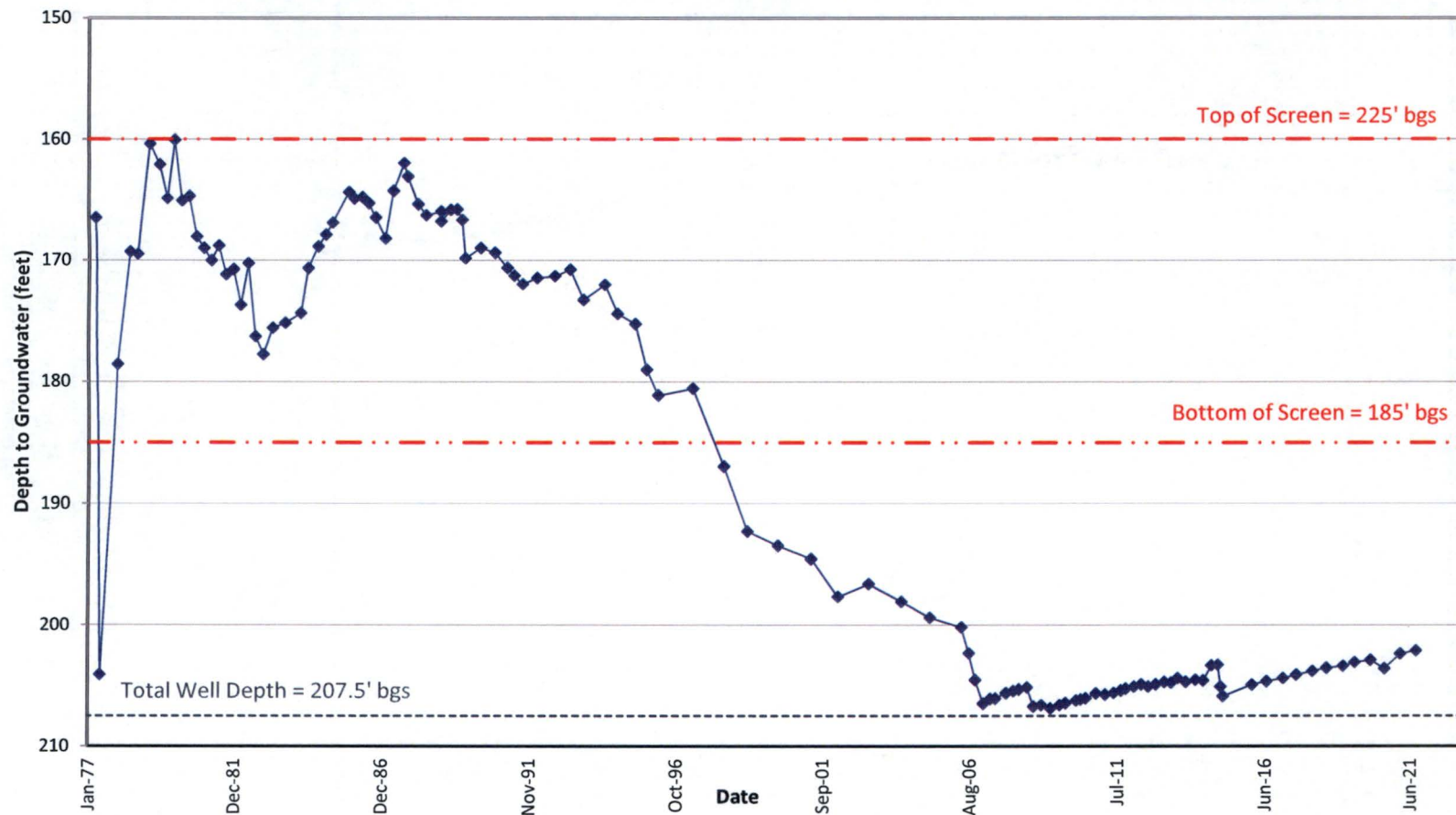
APPENDIX 3

Stability Monitoring Plan
Hydrographs

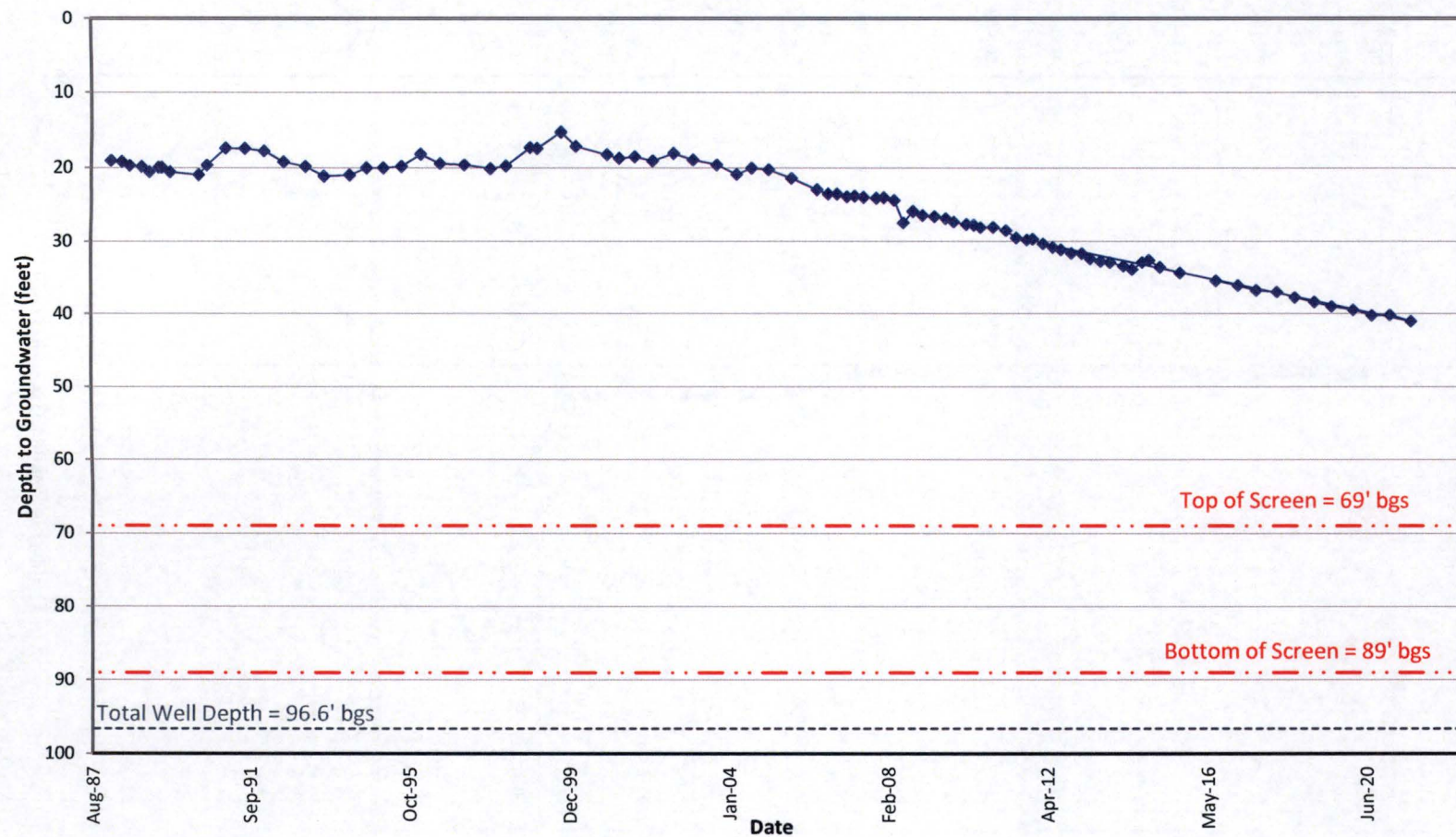
Hydrograph for Dakota Monitoring Well 30-02 KD



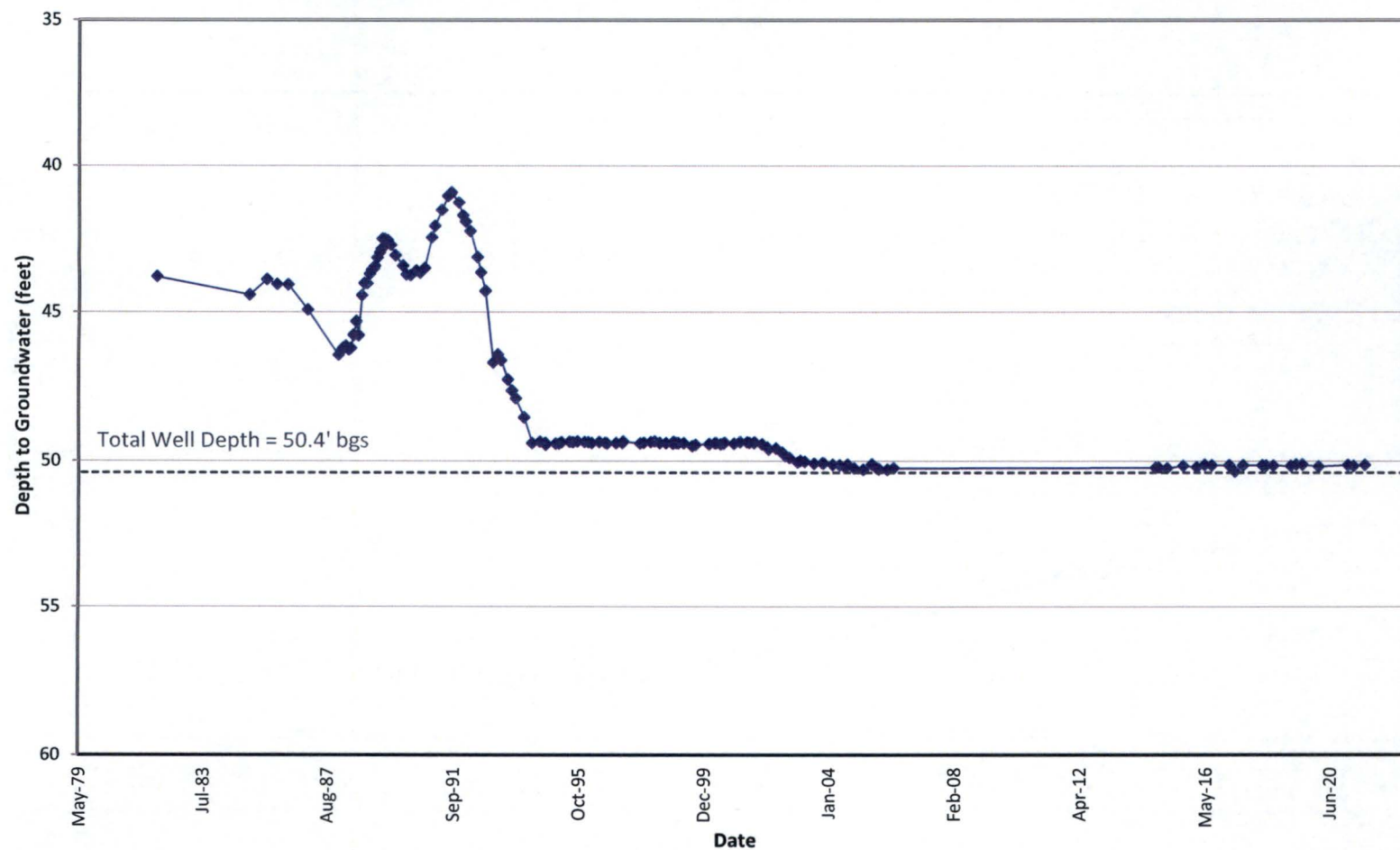
Hydrograph for TRA Monitoring Well 30-01 TRA



Hydrograph for TRB Monitoring Well 31-67 TRB



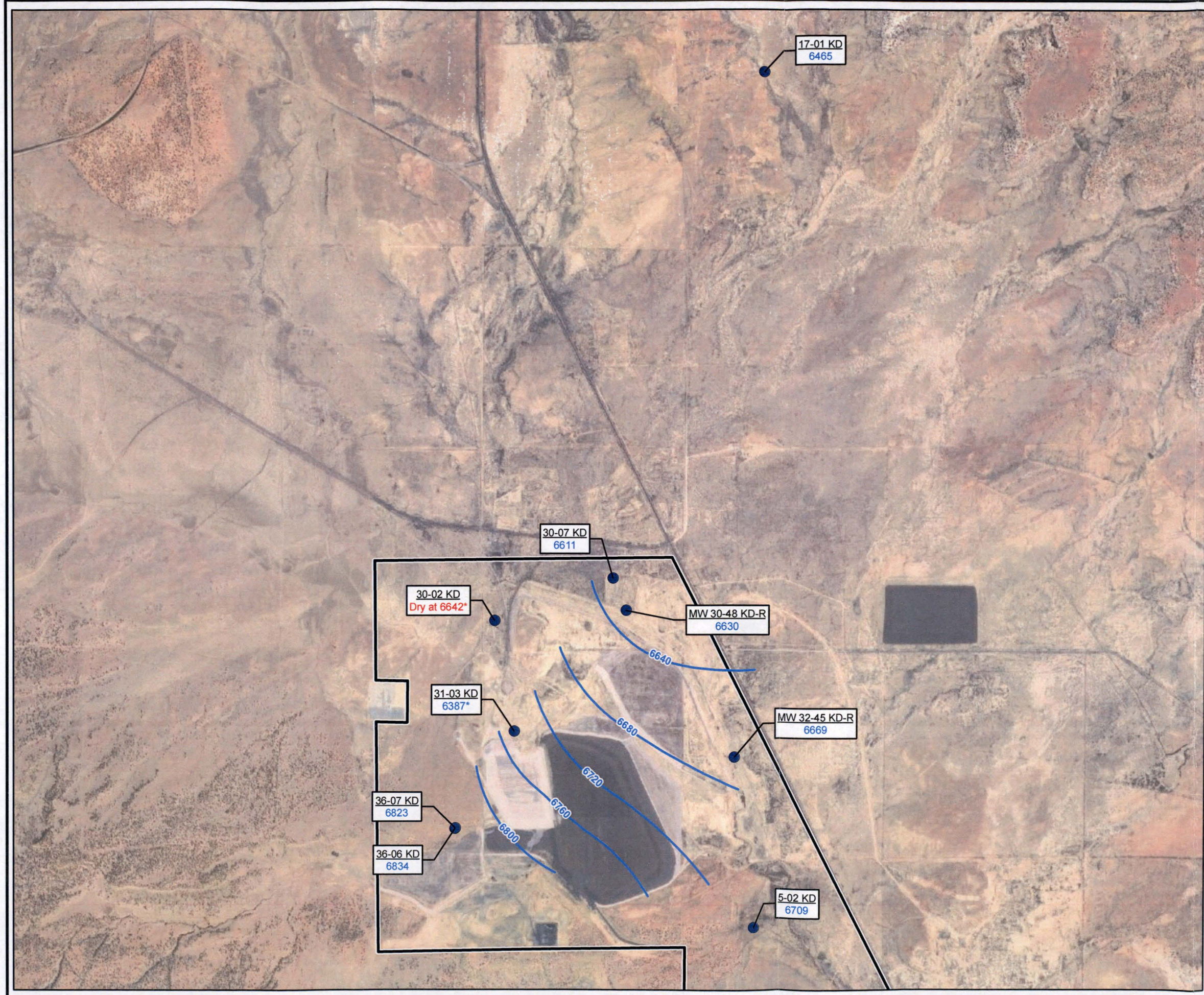
Hydrograph for Alluvial Monitoring Well MW-24 ALL



APPENDIX 4

Stability Monitoring Plan
Potentiometric Surface Maps

T:\ENV\BHPAmbrosia\MXD\NRC Semiannual 2H 2021\Figure 4-1 Dakota Contour Map.mxd 01/19/2022 12:15:26 PM



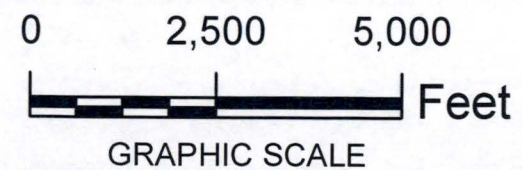
LEGEND

- Dakota Monitoring Well
- KD Potentiometric Surface Elevations (ft amsl)
- ▭ Proposed LTSM Boundary
- Well ID
Groundwater Surface Elevation (ft amsl)
- * Elevation at bottom of screen (Appendix 3). Data not used in contouring.
- * Data not used in contouring.

NOTE:
Groundwater elevation measured in August 2021

Gradient calculation:
(Difference in Groundwater Elevation Between Point of Compliance Well 36-06 KD and 30-07 KD = 6,834 - 6,611 = 223 feet) Divided by (Distance Along a Flow Path Between Point of Compliance Well 36-06 KD and 30-07 KD = 7,731 feet)
= 0.029 feet per foot

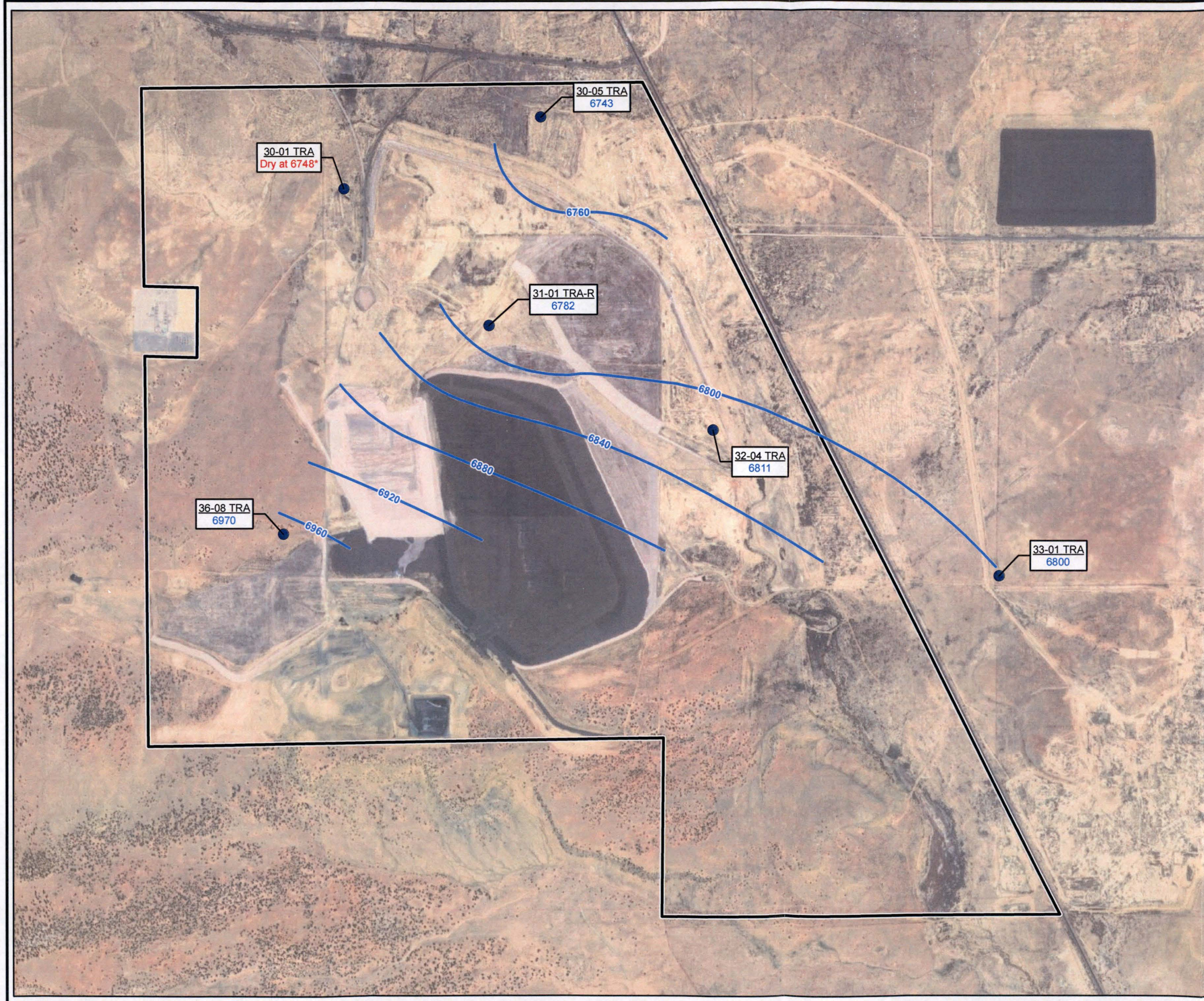
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



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DAKOTA POTENTIOMETRIC
SURFACE ELEVATION ISO-CONTOURS MAP

T:_ENV\BHP\Ambrosia\MXDNRC Semiannual 2H 2021\Figure 4-2 TRA Contour Map.mxd 01/10/2022 4:20:53 PM



LEGEND

- TRA Monitoring Well Location
- TRA Potentiometric Surface Elevations (ft amsl)
- ▭ Proposed LTSM Boundary
- Well ID
Groundwater Surface Elevation (ft amsl)

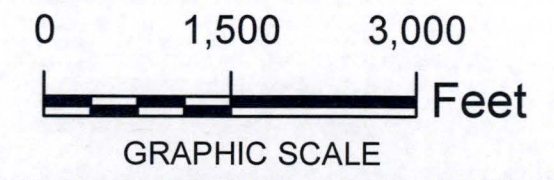
* Elevation at bottom of screen (Appendix 3).
Data not used in contouring.

NOTE:
Groundwater elevation measured in August 2021

Gradient calculation:
(Difference in Groundwater Elevation
Between MW 36-08 TRA and
30-05 TRA = 6,970 - 6,743 = 227 feet)
Divided by (Distance Along a Flow
Path Between MW 36-08 TRA and
30-05 TRA = 7,678 feet)

= 0.030 feet per foot

Source: Esri, Maxar, GeoEye, Earthstar Geographics,
CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,
and the GIS User Community

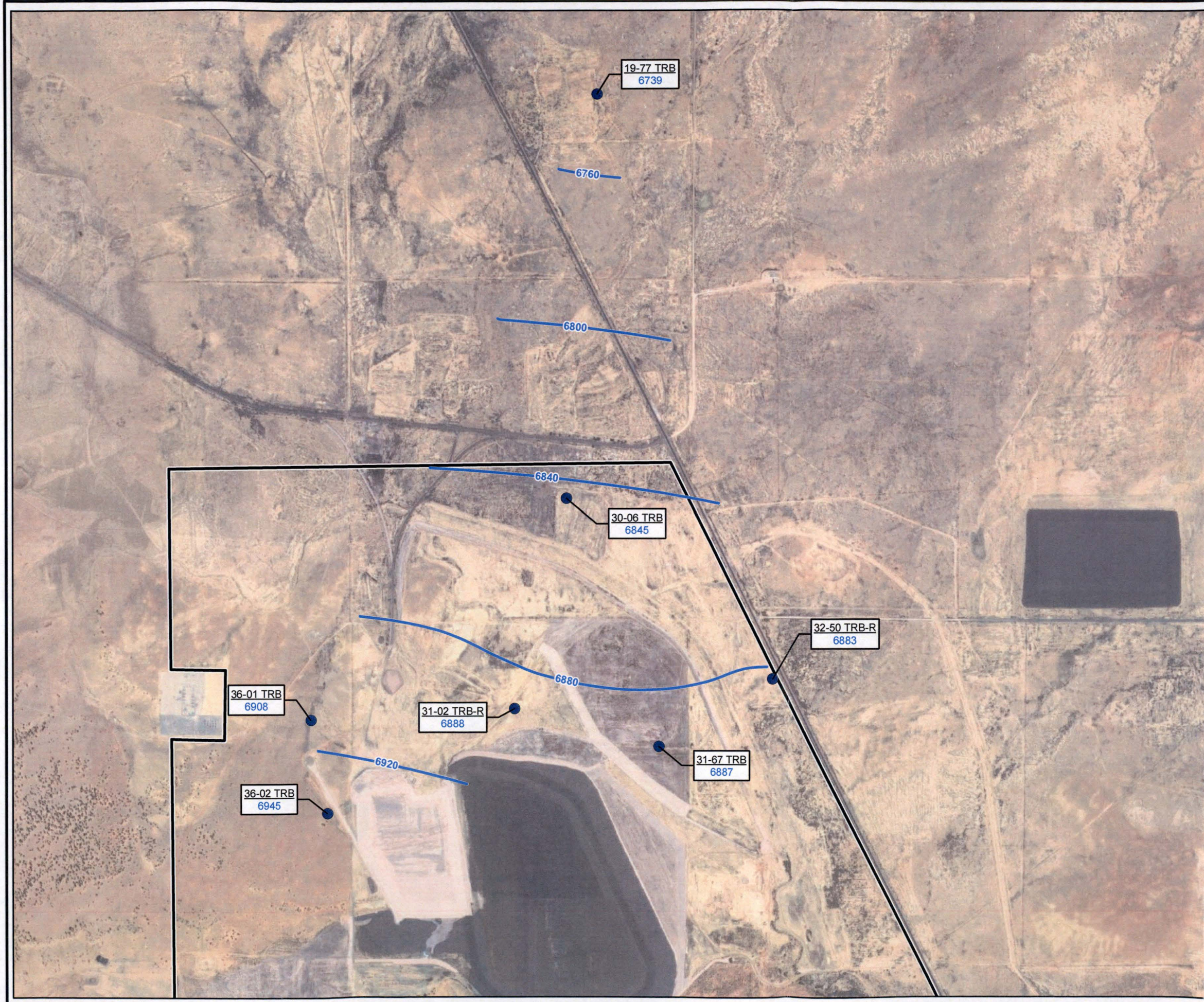


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TRA POTENTIOMETRIC
SURFACE ELEVATION ISO-CONTOURS MAP



T:_ENV\BPAmbrosia\MXDNRC Semiannual 2H 2021\Figure 4-3 TRB Contour Map.mxd 01/07/2022 3:19:30 PM



LEGEND

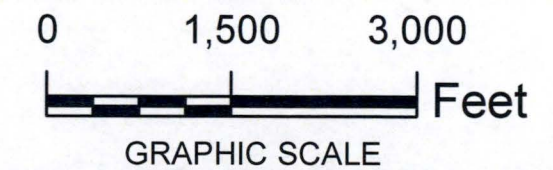
- TRB Monitoring Well Location
- TRB Potentiometric Surface Elevations (ft amsl)
- ▭ Proposed LTSM Boundary
- Well ID
Groundwater Surface Elevation (ft amsl)

NOTE:
Groundwater elevation measured in August 2021

Gradient calculation:
(Difference in Groundwater Elevation
Between Point of Compliance
Well 31-02 TRB-R and far downgradient
Well 19-77 TRB = 6,888 - 6,739 = 149 feet)
Divided by
(Distance Along a Flow Path
Between Point of Compliance
Well 31-02 TRB-R and far downgradient
Well 19-77 TRB = 9,664 feet)

= 0.015 feet per foot

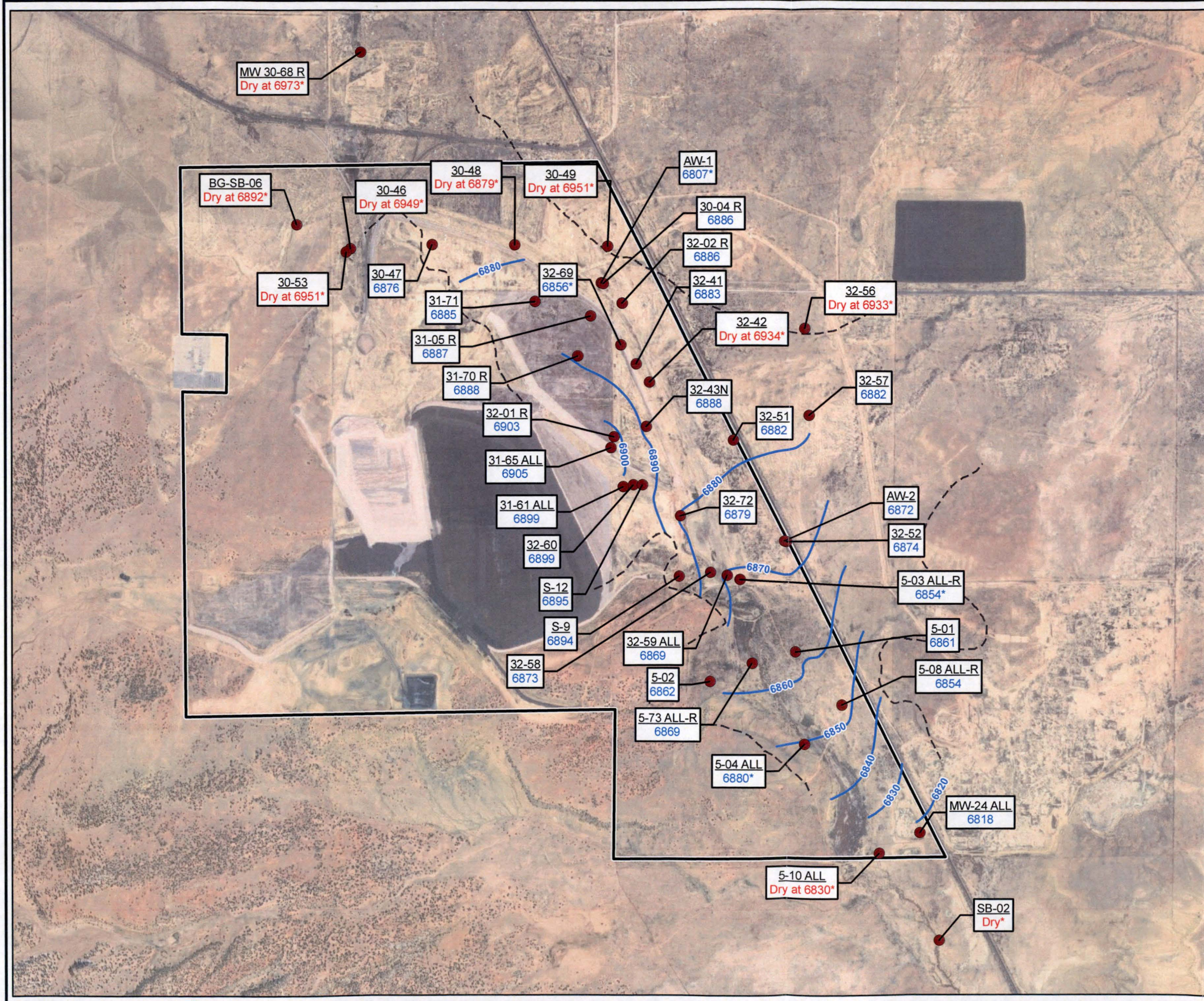
Source: Esri, Maxar, GeoEye, Earthstar Geographics,
CNES/Airbus DS, USDA, USGS, AeroGRID, IGN,
and the GIS User Community



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TRB POTENTIOMETRIC
SURFACE ELEVATION ISO-CONTOURS MAP

T:_ENV\BHP\Ambrosia\MXDNRC Semiannual 2H 2021\Figure 4-4 Alluvial Contour Map.mxd 01/19/2022 1:36:18 PM



LEGEND

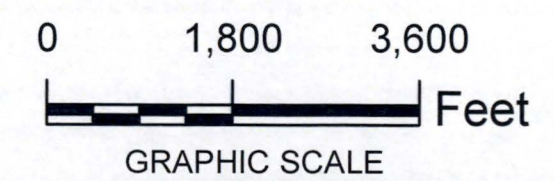
- Alluvial Monitoring Well Location
- Alluvial Groundwater Surface Elevation (ft amsl)
- - - Estimated Boundary of Saturated Alluvium
- ▭ Proposed LTSM Boundary
- Well ID
Groundwater Surface Elevation (ft amsl)
- * Elevation at bottom of screen (Appendix 3). Data not used in contouring.
- * Data not used in contouring.

NOTE:
Groundwater elevation measured in August 2021

Gradient calculation:
(Difference in Groundwater Elevation Between Point of Compliance Well 31-61 ALL and Trend Well 5-08 ALL-R = 6,899 - 6,854 = 45 feet) Divided by (Distance Along a Flow Path Between Point of Compliance Well 31-61 ALL and Trend Well 5-08 ALL-R = 5,802 feet)

= 0.008 feet per foot

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



GRAPHIC SCALE

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GROUNDWATER MONITORING REPORT - 2H 2021

ALLUVIAL POTENTIOMETRIC
SURFACE ELEVATION ISO-CONTOURS MAP

ARCADIS

APPENDIX 5

Analytical Lab Reports and EDDs For License Wells
(Electronic Submittal Only)

APPENDIX 6

Tabulated Analytical Results for
ACL Program Wells

Appendix 6
Analytical Results and Field Measurements for ACL Program Wells



Station Name		30-05 TRA		30-06 TRB		30-07 KD		31-03 KD		32-04 TRA		36-07 KD		36-08 TRA	
Sample Date		8/12/2021	10/5/2021	8/12/2021	10/5/2021	8/12/2021	10/7/2021	8/19/2021	10/6/2021	8/20/2021	10/7/2021	8/19/2021	10/5/2021	8/19/2021	10/6/2021
Parameter	Units														
Depth to Water	ft	213.52	213.76	111.27	111.28	345.27	345.41	325.54	325.64	108.92	109.06	201.96	202.22	53.62	53.82
Total Depth	ft	234.45	248.4	135.58	135.72	365.69	364.6	345.25	NM	118.2	118.17	206.43	206.2	70.1	70.17
Groundwater Elevation	ft amsl	6743.17	6742.93	6845.48	6845.47	6611.01	6610.87	6386.79	6386.69	6811.4	6811.26	6822.73	6822.47	6970.13	6969.93
Dissolved Oxygen	mg/L	0.41	0.32	0.74	0.5	0.63	0.58	0.61	0.58	1.85	1.90	0.59	0.87	0.25	0.23
Oxidation Reduction Potential	mv	-46.6	37.6	71	133.9	-84.9	-82.1	-15.1	-7.0	189.4	270.4	-29.7	-63.5	195.5	216.8
pH	s.u.	7.68	7.33	6.81	6.54	6.86	6.52	6.7	6.57	6.96	6.74	6.08	5.92	6.3	6.15
Specific Conductivity	µS/cm	2,175	2,727	5,664	7,031	3,833	4,879	7,707	7,886	2,142	2,251	5,391	5,500	20,793	21,319
Temperature	degrees C	14.3	13.6	13.2	13.8	15.2	14.6	17	15.3	13.8	13.5	17	17.2	14.3	13.7
Alkalinity (as CaCO3)	mg/L	174	158	598	606	281	312	269	290	140	145	284	287	575	574
Aluminum	mg/L	<0.05	<0.1	<0.25	<0.5	<0.05	<0.25	<0.05	<0.25	<0.05	<0.05	<0.05	<0.25	<0.05	<1
Arsenic	mg/L	0.00461	0.00424	0.00047 B	<0.001	0.00198	0.00172 B	0.0130	0.0118	0.00125	0.00108	0.00228	0.00381 B	0.00067 B	0.00449 B
Barium	mg/L	0.0238 B	<0.014	0.0211 B	<0.07	0.0222 B	<0.175	0.0258 B	0.0370 B	0.0138 B	0.0145 B	0.0236 B	<0.035	0.0153 B	<0.14
Bicarbonate (as CaCO3)	mg/L	174	158	598	606	281	312	269	290	140	145	284	287	575	574
Boron	mg/L	0.428	0.375	0.443	0.320 B	0.201	0.232 B	0.055 B	0.153 B	0.404	0.380	0.191	<0.15	0.394	0.664 B
Cadmium	mg/L	<0.00005	<0.0001	0.000089 B	<0.00025	<0.00005	<0.00025	0.000576	0.000489 B	<0.00005	0.000071 B	0.000097 B	<0.00025	0.00249 B	0.00259 B
Calcium	mg/L	162	162	584	596	652	626	703	701	176	165	649	656	463	467
Carbonate (as CaCO3)	mg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<20	<20	<2	<2
Cation-Anion Balance	%	1.6	-1.6	1.6	-1.1	3.3	-1.7	0.5	-1.1	4.0	0	1.5	-1.4	6.2	1.4
Chloride	mg/L	42.5	42.2	744	758	409	417	1,500	1,480	25.7	26.0 B	791	805	733	696
Chromium	mg/L	<0.0005	<0.001	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0025	<0.0005	<0.0005	<0.002	<0.01	<0.0005	<0.01
Cobalt	mg/L	<0.02	<0.04	<0.02	<0.2	<0.02	<0.1	<0.02	<0.1	<0.02	<0.02	<0.02	<0.1	0.069	<0.4
Copper	mg/L	<0.01	<0.02	<0.01	<0.1	<0.01	<0.05	<0.01	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	<0.2
Fluoride	mg/L	0.250	<1	0.076 B	<2.5	0.122 B	<2.5	<2.5	<2.5	<0.5	<1	<2.5	<1	<10	<10
Hydroxide (as CaCO3)	mg/L	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Iron	mg/L	0.094 B	<0.12	0.164	<0.6	1.13	0.971	2.30	2.19	<0.06	<0.06	14.2	8.07	<0.06	<1.2
Lead	mg/L	<0.0001	<0.0002	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0005	<0.002	<0.002
Magnesium	mg/L	67.5	64.9	537	489	160	144	399	363	58.6	53.8	231	217	5710	5080
Manganese	mg/L	0.186	0.143	0.445	0.334 B	2.45	2.34	6.90	6.75	<0.01	<0.01	12.1	12.8	8.97	9.19
Mercury	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Molybdenum	mg/L	0.0159	0.0155	0.00242	0.00260	0.00334	0.0110	2.12	1.77	0.0119	0.0112	0.00203	0.00499	0.00492 B	0.0300
Nickel	mg/L	0.00167	0.00158 B	0.00715	0.00686	0.00099 B	<0.002	0.00469	0.00637	0.00074 B	0.00099 B	0.01000	0.0179	0.0834	0.131
Nitrate/Nitrite (as N)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.059	0.146	0.113	0.030 B	<0.02	117	<0.02
Pb-210	pCi/L	2.5	0.18	NA	7.2	3	1.6	0	0	1.6	0	3.7	1.4	110	-2.8
Potassium	mg/L	8.44	8.17	15.5	14.9	12	11.5	16.6	15.8	8.22	7.4	16.6	15.4	21.6	23
Ra-226	pCi/L	0.41	0.64	1.8	1.5	2	2	4.5	9.3	<0.09	<0.34	0.99	2.2	1.1	2.2
Ra-226+Ra-228	pCi/L	2.41	3.44*	6.9	7.3	6	7.7	11.9	35.3	1.79*	2.34*	5.09	6.4	7.5	13.2
Ra-228	pCi/L	2	<2.8	5.1	5.8	4	5.7	7.4	26	<1.7	<2	4.1	4.2	6.4	11
Th-230	pCi/L	0.654	0.924	0.511	0.726	0.55	1.3	0.358	0.483	0.723	0.514 [†]	1.01	0.564	1.85	1.37
Thallium	mg/L	<0.0001	<0.0002	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0005	<0.0001	<0.0001	<0.0001	<0.0005	<0.002	<0.002
Selenium	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.124	0.116
Silver	mg/L	<0.01	<0.02	<0.01	<0.1	<0.01	<0.05	<0.01	<0.05	<0.01	<0.01	<0.01	<0.05	<0.01	0.732
Sodium	mg/L	384	372	552	540	376	349	638	622	268	250	360	352	452	417
Sulfate	mg/L	1,190	1,260	2,940	3,000	2,010	2,030	2,310	2,290	984	975	1,840	1,990	20,000	19,800
Sum of Anions	mEq/L	30	31	95	96	59	61	96	95	24	24	67	70	452	447
Sum of Cations	mEq/L	31	30.0	98.0	94	63	59.0	97.0	93	26	24	69	68	512	460
TDS (calculated)	mg/L	1,960	2,010	5,740	5,770	3,790	3,770	5,740	5,660	1,610	1,570	4,090	4,230	27,700	26,800
TDS (ratio - meas/calc)	Unitless	1.08	1.04	1.10	1.10	1.00	1.06	1.04	1.04	1.07	1.10	1.06	1.00	1.16	1.13
Total Dissolved Solids	mg/L	2,110	2,100	6,330 H	6,330 H	3,780	4,010	5,950 H	5,900	1,720	1,730	4,340 H	4,240	32,200 H	30,200
Uranium	mg/L	0.00327	0.00330	0.0704	0.0723	0.00083	0.00096 B	0.0113	0.0131	0.00582	0.00650	0.0296	0.0366	0.0146	0.0211
Zinc	mg/L	<0.02	<0.04	<0.02	<0.2	<0.02	<0.1	<0.02	<0.1	0.094	<0.02	<0.02	<0.1	0.123	<0.4

Notes:

ACL program alluvial well 5-10 ALL was dry on 8/23/21 and 10/8/21, therefore no analytical data are presented
* = either Ra-226, Ra-228, or both were not detected above the lower level of detection (LLD); in this case, the LLD was used in lieu of the reported result.

[†] The laboratory could not perform Th-230 analysis on 32-04 TRA sample collected 10/9/21; the well was resampled on 12/9/21 and the corresponding result is shown.

< = the parameter is less than the associated minimum detection limit (MDL) or lower limit of detection (LLD)

B = analyte was detected at a value between MDL and practical quantitation limit (PQL).

The associated value is an estimated quantity.

H = analysis exceeded method hold time

NA = not analyzed

NM = not measured

% = percent

µS/cm = microsiemen per centimeter

amsl = above mean sea level

degrees C = degrees Celsius

ft = feet

mEq/L = milliequivalent per liter

mg/L = milligram per liter

mv = millivolts

pCi/L = picocurie per liter

s.u. = standard units

TDS = total dissolved solids



APPENDIX 7

Laboratory Analytical Reports and EDDs For ACL Program Wells

(Electronic Submittal Only)

February 1, 2022

**Rio Algom Mining LLC
Ambrosia Lake West Facility
Groundwater Stability Monitoring Report
Second Half of 2021
Appendices 5 and 7**