

CCR Annual Groundwater Monitoring Report - 2017

TS Power Plant

Eureka County, Nevada



**Newmont Nevada Energy Investment, LLC
TS Power Plant
450 TS Power Plant Road
Battle Mountain, NV 89445**

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1. Groundwater Monitoring System

The groundwater monitoring system has been designed to reflect local groundwater hydrology and ensure that monitoring wells are properly located to accomplish the requirement to detect and assess any potential impacts to groundwater resulting from operation and closure of the CCR landfill. Initial geotechnical evaluations of the area were conducted as part of TSPP permitting and are incorporated in the Class III Landfill Permit Application¹ submitted to NDEP – Bureau of Waste (NDEP-BWM).

This initial evaluation consisted of reviewing prior geophysical data and installing several test borings with temporary piezometers in the footprint of the proposed landfill. Based on a prior gravimetric survey, it was determined that the thickness of saturated alluvium in the area is at least 1,000 feet. Depth to groundwater in proximity to the landfill site was 17 to 36 feet below ground surface. Data indicated a very shallow gradient of 0.00086 ft/ft to the southwest. Lithologic units encountered in the area consisted of silt to gravel. Hydraulic conductivity of these materials may be quite variable and could range from 1×10^{-2} cm/sec to 1×10^{-5} cm/sec. Based on available data, the average rate of groundwater flow was conservatively estimated at 81 ft/yr.

Based on the geotechnical investigation and the landfill footprint, a groundwater monitoring system consisting of three (3) monitor wells; one up gradient and two downgradient, was proposed in the landfill application. NDEP-BWM accepted the monitoring system design, which was incorporated in the Class III Landfill Permit issued in 2005. Consistent with conditions of the permit, a groundwater monitoring system consisting of the following monitoring wells was constructed (refer to Figure 1):

- TSMW-1 is located approximately 2,000 feet northeast of Cell 1. It is an upgradient well constructed to establish background groundwater chemistry. TSMW-1 has been monitored since 4th Quarter, 2005.
- TSMW-3 is a downgradient well located immediately west of Cell 1. TSMW-3 has been monitored since 1st Quarter, 2008.
- TSMW-4 is a downgradient well located south of Cell 1, adjacent to the Cell 1 collection pond. TSMW-4 has been monitored since 1st Quarter, 2008.

¹ 2005, Revised Class III Landfill Application, TS Power Plant, Eureka County, Nevada, March 2005, submitted by AMEC Earth and Environmental, Inc.

The CCR Rule requires that a groundwater monitoring system for an existing CCR landfill consist of a minimum of one upgradient and three downgradient wells (§257.91(c)(1)). To comply with this requirement, an additional downgradient monitor well (TSMW-8) was installed in 2015. The well is located immediately west of Cell 2. TSMW-8 has been monitored since 4th Quarter, 2015. The location of the monitor wells is indicated on Figure 1. A summary of monitor well locations, depth and depth to water is included as Table 1. Based on calculations for groundwater gradient and flow rate, the location of the monitor wells relative to the landfill are such that any impacts to groundwater would be detected in a timely manner.

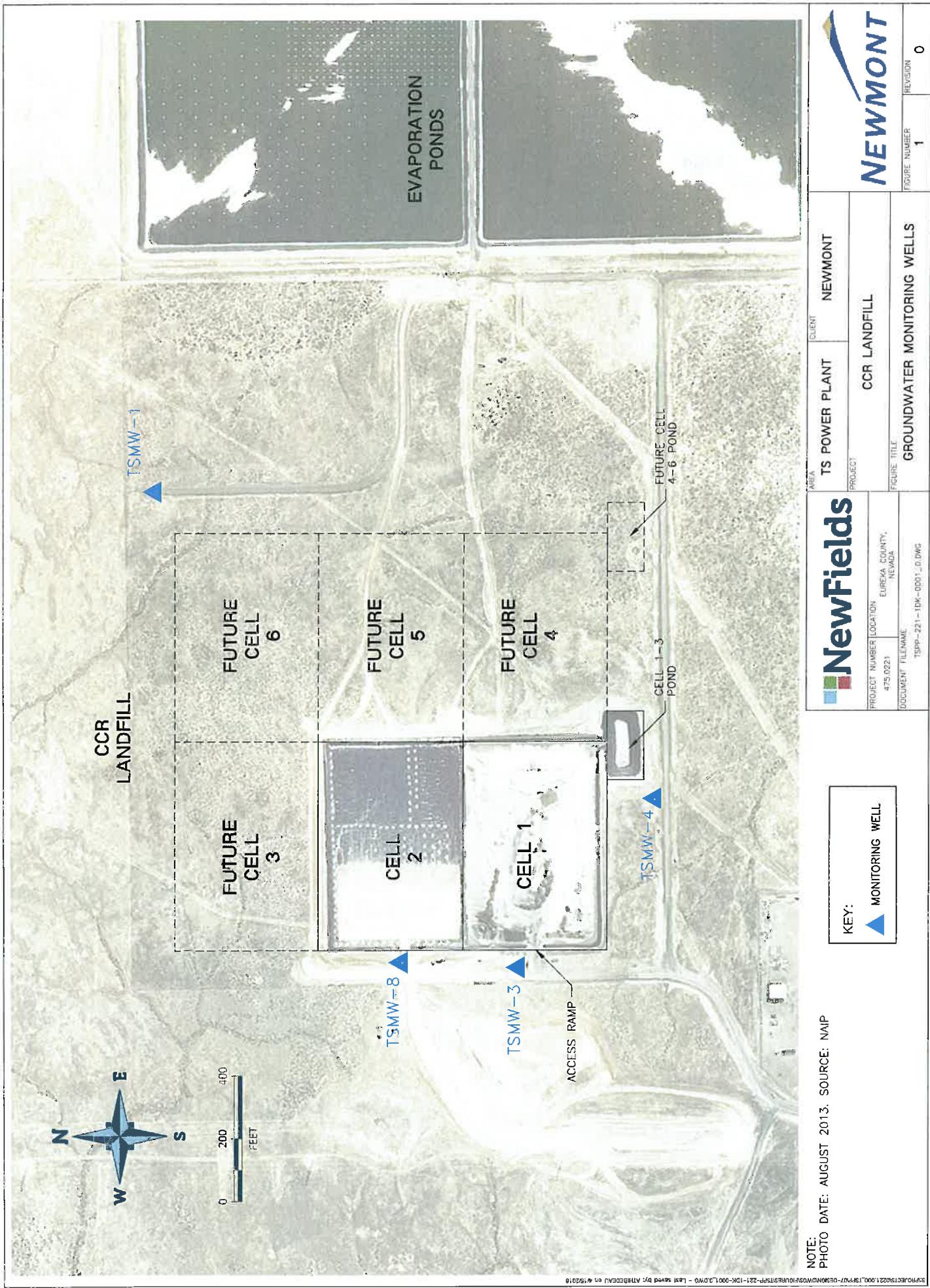


Table 1 - TS Power Plant CCR Landfill Groundwater Monitor Wells

Well No.	Coordinates ¹	Elevation (amsl)	Depth (ft)	Depth to Water (ft) ²	Water Elevation	Completion	Type
TSMW-1	462,246.4 N 493,250.4 E	4644.34	55	29.5	4614.84	2005	Upgradient - Background
TSMW-3	461,097.1 N 491,724.9 E	4651.5	50	39.3	4612.2	2007	Downgradient
TSMW-4	460,662 N 492,251.5 E	4642.12	60	29.2	4612.92	2007	Downgradient
TSMW-8	461,426.2 N 491,731.9 E	4651.89	58	39.2	4612.69	2015	Downgradient

Notes: 1 - local coordinate system
2 -22 Oct, 2015 measurement

The groundwater monitoring system includes the minimum number of wells required by the CCR rule. Considering the design and footprint (12 acres) of the existing CCR landfill and the local groundwater hydrology, the monitoring system is sufficient to demonstrate compliance with the CCR performance standard.

2. Groundwater Monitoring

Groundwater monitoring is conducted in accordance with the requirements of Class III Permit SW270REV01 and the CCR Rule. The combination of requirements involves groundwater monitoring for three suites of analytes (Table 2):

Permit SW270REV01 - Groundwater samples are tested for the following constituents: total dissolved solids, pH, conductivity, arsenic, barium, beryllium, cadmium, lead, nickel, selenium, silver and total organic carbon. Quarterly monitoring under conditions of the landfill permit has been conducted since: 2005 for TSMW-1; 2008 for TSMW-3 and 4; and 2015 for

TSMW-8. Monitoring data is reported to NDEP-BWM as part of a semi-annual landfill report. Historical data is archived in the landfill operating record.

CCR Detection Monitoring (§257.94) - The CCR rule prescribes requirements for a Detection Monitoring Program that must be conducted through the active life of a CCR landfill and the post-closure period. Analytes associated with the Detection Monitoring program are specified in §257, Appendix III and listed in Table 2. The CCR Rule requires semi-annual detection monitoring; however, for consistency with the existing monitoring program, detection monitoring is conducted on a quarterly basis. Detection monitoring of all monitor wells began in 4th Quarter, 2015. At least eight (8) independent samples from each monitoring have been conducted from each detection monitoring well..

CCR Assessment Monitoring (§257.95) - The CCR rule prescribes requirements for an Assessment Monitoring Program that must be established if detection monitoring demonstrates a statistically significant increase over background levels for one or more constituents. Analytes associated with the Assessment Monitoring program are specified in §257, Appendix IV and listed in Table 2. In order to establish background levels, there is also a requirement that eight (8) independent samples from each monitoring well be collected and analyzed for the assessment monitoring constituents. As indicated in Table 2, due to an overlap of requirements, a number of assessment monitoring constituents are monitored as part of the landfill permit monitoring program and have been monitored since 2008. Assessment monitoring for the remaining constituents has been conducted since 4th Quarter, 2015.

Table 2 - TS Power Plant Ash Landfill - Groundwater Monitoring Constituents and History

Constituent	Landfill Permit Requirement ¹	CCR Detection Monitoring ²	CCR Assessment Monitoring ³	Quarterly Monitoring Start
Depth to Water	X			2008
Arsenic	X		X	2008
Barium	X		X	2008
Beryllium	X		X	2008
Cadmium	X		X	2008
Chromium	X		X	2008
Lead	X		X	2008
Nickel	X			2008
Selenium	X		X	2008
Silver	X			2008
Total Organic Carbon	X			2008
pH	X	X		2008
TDS	X	X		2008
Spec. Conductivity	X			2008
Mercury	X		X	2008
Boron		X		2015
Calcium		X		2015
Chloride		X		2015
Fluoride		X	X	2015
Sulfate		X		2015
Antimony			X	2015
Cobalt			X	2015
Lithium			X	2015
Molybdenum			X	2015
Thallium			X	2015
Radium 226/228			X	2015

1 - Class III Permit SW270REV01

2 - 40 CFR Part 257, Appendix III

3 - 40 CFR Part 257, Appendix IV

2.1. Sampling Procedures

Monitor well sampling is conducted on a quarterly basis by experienced technicians from Newmont Mining Corporation's hydrology department. Procedures associated with sampling are described in TSPP's *Water Sampling and Monitoring Procedures* (March 2010) . This procedure manual contains detailed documentation regarding the collection and recording of

field data, calibration of instrumentation, collection and preservation of groundwater samples, quality control and chain of custody procedures. Analysis are conducted at a Nevada-certified laboratory using approved EPA methods.

2.2. Statistical Evaluation of Groundwater Data

The CCR Groundwater Monitoring Plan (2016) includes a description of methodology used to statistically evaluate groundwater data. As part of the ongoing groundwater monitoring program, existing groundwater data was evaluated to determine the upper background limit values (UBL). The UBL are calculated as the 95th upper tolerance limit with 95% coverage. In other words, this value represents an upper limit below which 95% of future measured concentrations will occur with a 95% statistical confidence. In calculating the UBL, statistical methods specific to the identified underlying population distribution of the data being analyzed are used. In order to calculate UBL values, a minimum of eight (8) data points are required in the dataset. The USEPA has developed the ProUCL software package that was used for the statistical analysis.

Table 3 summarizes the UBL for individual constituents that were determined from the existing groundwater data set. In all cases, at least eight (8) data points were available for the evaluation.

Any measured groundwater concentrations above the UBL indicates a potential change in groundwater quality; possibly resulting from current activities. Evaluation of future measured concentrations against background will be based on the following approach:

- An initial observed exceedance in groundwater concentration above the UBL potentially represents a statistically significant increase in concentrations above background. However, this initial exceedance will not result in any action beyond continued monitoring of the sample location.
- If the sample location continues to exceed the UBL for three consecutive sampling periods then an assessment monitoring program (§257.95) will be instituted and if necessary a corrective action plan will be designed and implemented. Notification that an assessment monitoring program has been established will be made in accordance with §257.106.

Table 3 - Upper Background Limit of Constituents in Landfill Monitor Wells*

Well ID	TDS	Arsenic	Barium	Boron	Calcium	Chloride	Fluoride
TSMW-1	872	0.013	0.039	0.382	106.2	135.7	1.178
TSMW-3	865	0.0134	0.2	0.33	112.5	156.2	1.069
TSMW-4	867.3	0.0149	0.054	0.623	84.14	124.8	0.89
TSMW-8	825.1	0.0156	0.066	0.235	75.5	157.8	1.142

Well ID	Lithium	Ra 226	Ra 228	Ra226 + Ra 228	Selenium	Sulfate	TOC
TSMW-1	0.0978	0.37	1.8	1.9	0.0074	277.8	39.1
TSMW-3	0.0994	0.3	1.7	1.9	0.0084	296.7	12.78
TSMW-4	0.0903	0.25	1.5	1.5	0.0087	238.4	45.5
TSMW-8	0.0888	0.33	1.7	1.7	0.00796	212.5	

* 95% Upper Tolerance Limit with 95% coverage

3.0 Groundwater Analytical Data

Groundwater monitoring data for the CCR monitor wells is compiled in Appendix A. The compilation includes the following:

- A hydrograph chart indicating groundwater elevations in the monitor wells for the period of sampling.
- Spreadsheets indicating groundwater constituent data for quarterly sampling during the most recent three (3) year period (2015-2017).
- A visual representation of constituent concentrations in individual monitor wells over the three year sampling period. These data are presented in a control chart format and includes the calculated UBL for the monitored constituent.
- A tabulation of monitored constituents that are consistently below the analytical detection limit.

3.1 Detection Monitoring Results

The CCR rule prescribes requirements for a Detection Monitoring Program that must be conducted through the active life of a CCR landfill and the post-closure period. Analytes

associated with the Detection Monitoring program are specified in §257, Appendix III and include: Total Dissolved Solids, pH, Boron, Calcium, Chloride, Fluoride and Sulfate.

Monitoring results during the period 2015-2017 indicate all detection monitoring constituents occurred at concentrations below the calculated UBL. Based on the results, assessment monitoring has not been triggered and will not be conducted going forward, unless warranted by future detection monitoring results.

3.2 Assessment Monitoring Results

In order to obtain baseline data for the assessment monitoring constituents, the CCR Rule requires initial monitoring (eight sampling events) for assessment monitoring constituents. These constituents are listed in Table 2. The baseline data is included in the Appendix A data package.

The following assessment constituents were at or below the analytical detection limit in all samples collected: beryllium, cadmium, lead, molybdenum, mercury, antimony, cobalt, thallium.

All assessment monitoring constituents were below upper background limit with 2 exceptions:

- MW-1 (up gradient), 3 May, 2017, slightly exceeded the barium UBL in one sampling event.
- MW-4, 19 May, 2015, slightly exceeded the arsenic UBL in one sampling event.

Based on these data, additional testing for assessment monitoring constituents will not be conducted going forward, unless triggered by detection monitoring results.

3.3 Landfill Permit Monitoring Results

Monitored constituents under the facility landfill permit largely overlap with detection and assessment monitoring analytes (Table 2). With the exception of the two monitoring results described above, all Landfill Permit constituents were below their respective UBL's. The following constituents were below the analytical detection limit in all samples collected: beryllium, cadmium, lead, nickel, silver, mercury.

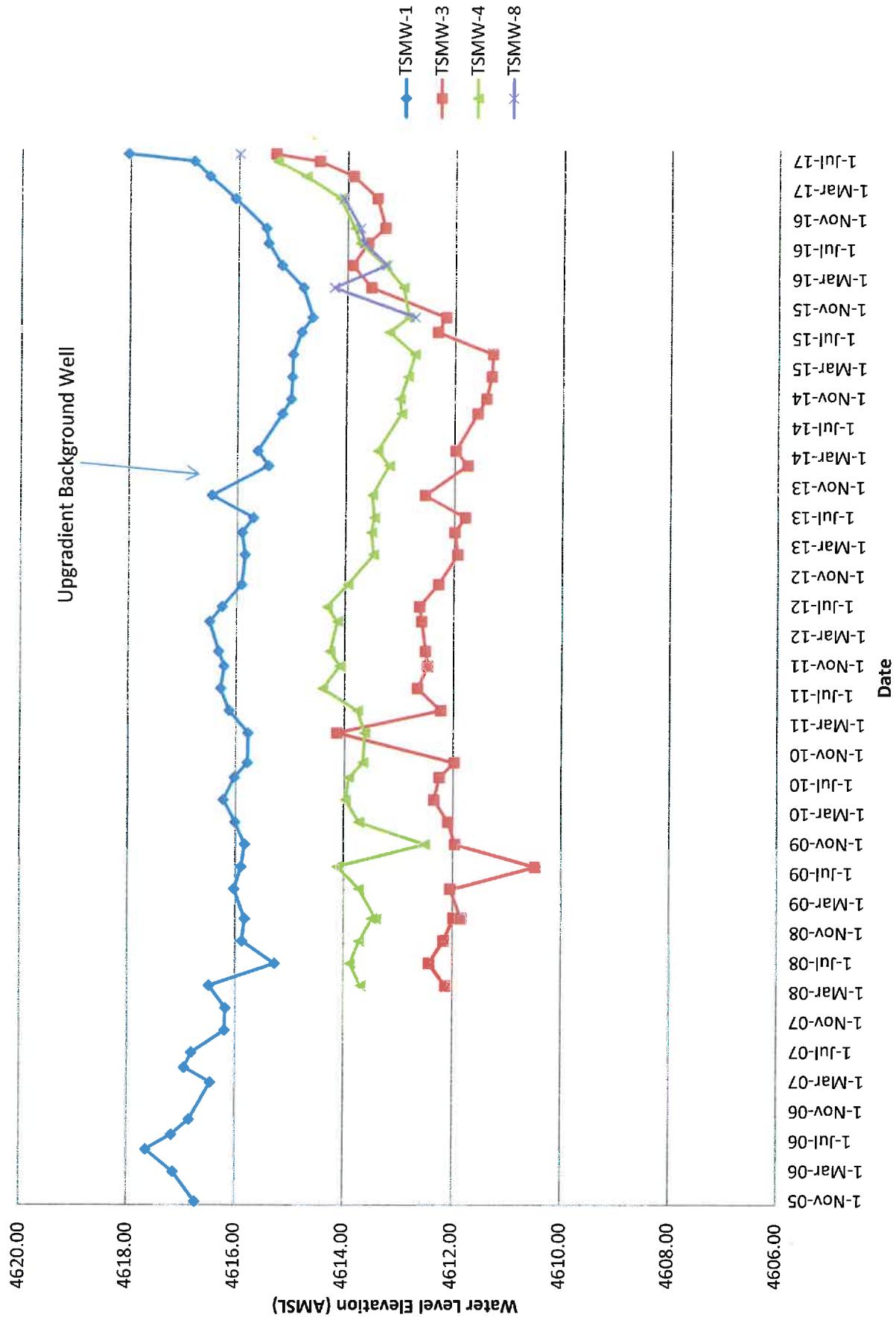
4.0 Corrective Measures

Based on the groundwater monitoring results presented herein no corrective measures are required for the facility.

Appendix A

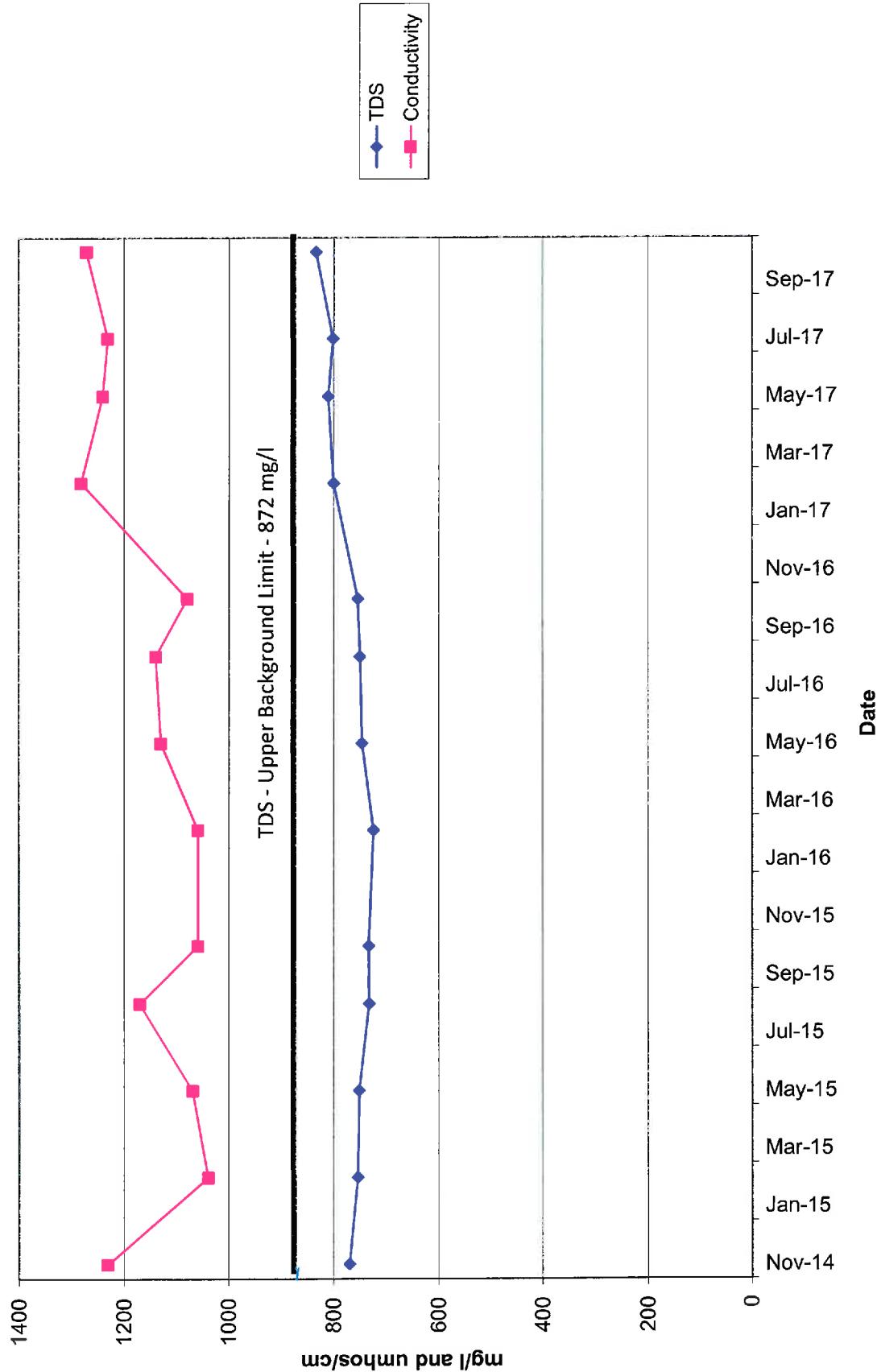
CCR Groundwater Monitoring Results (2015-2017)

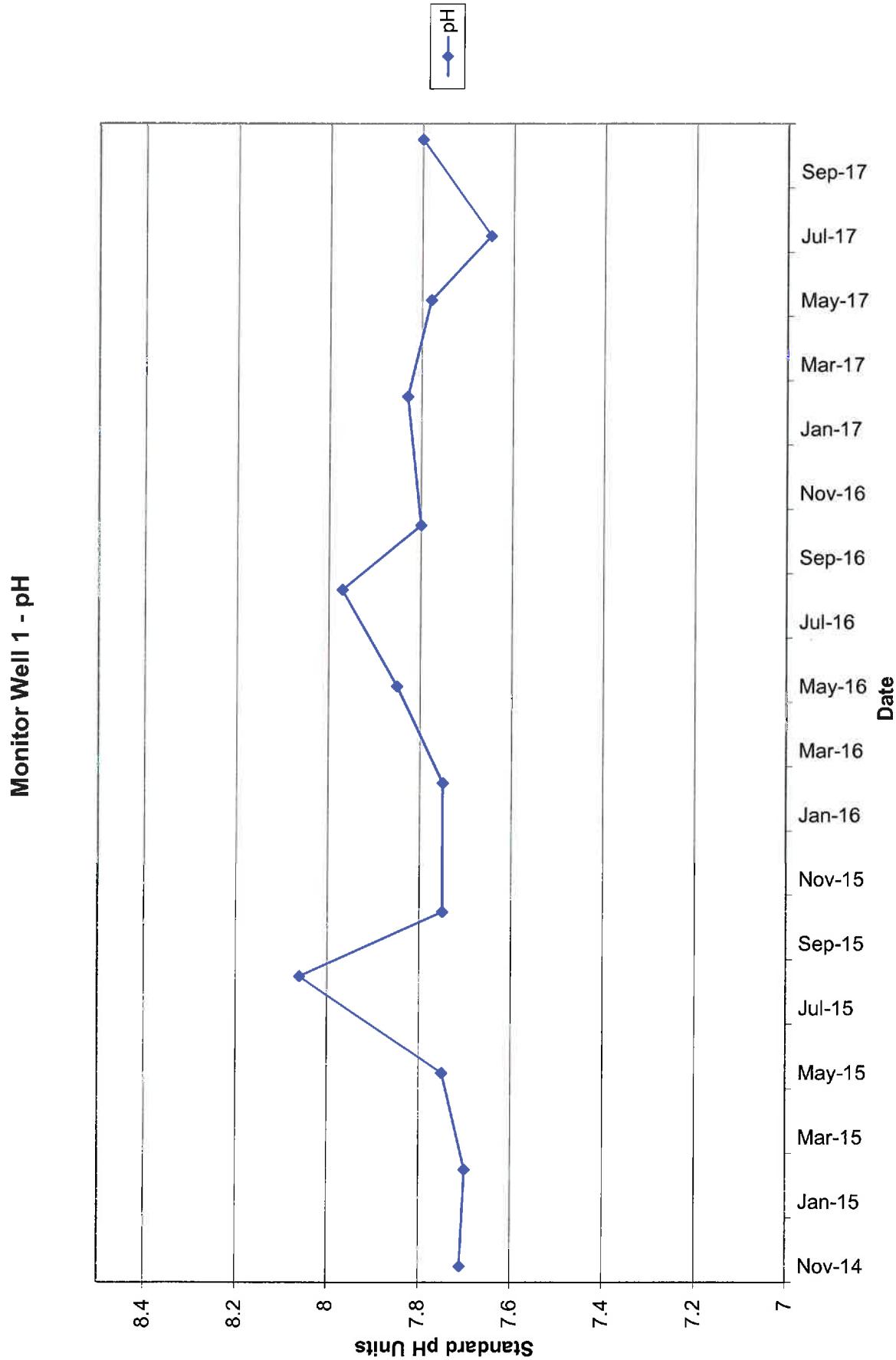
TSPP Ash Landfill - Monitor Well Hydrographs



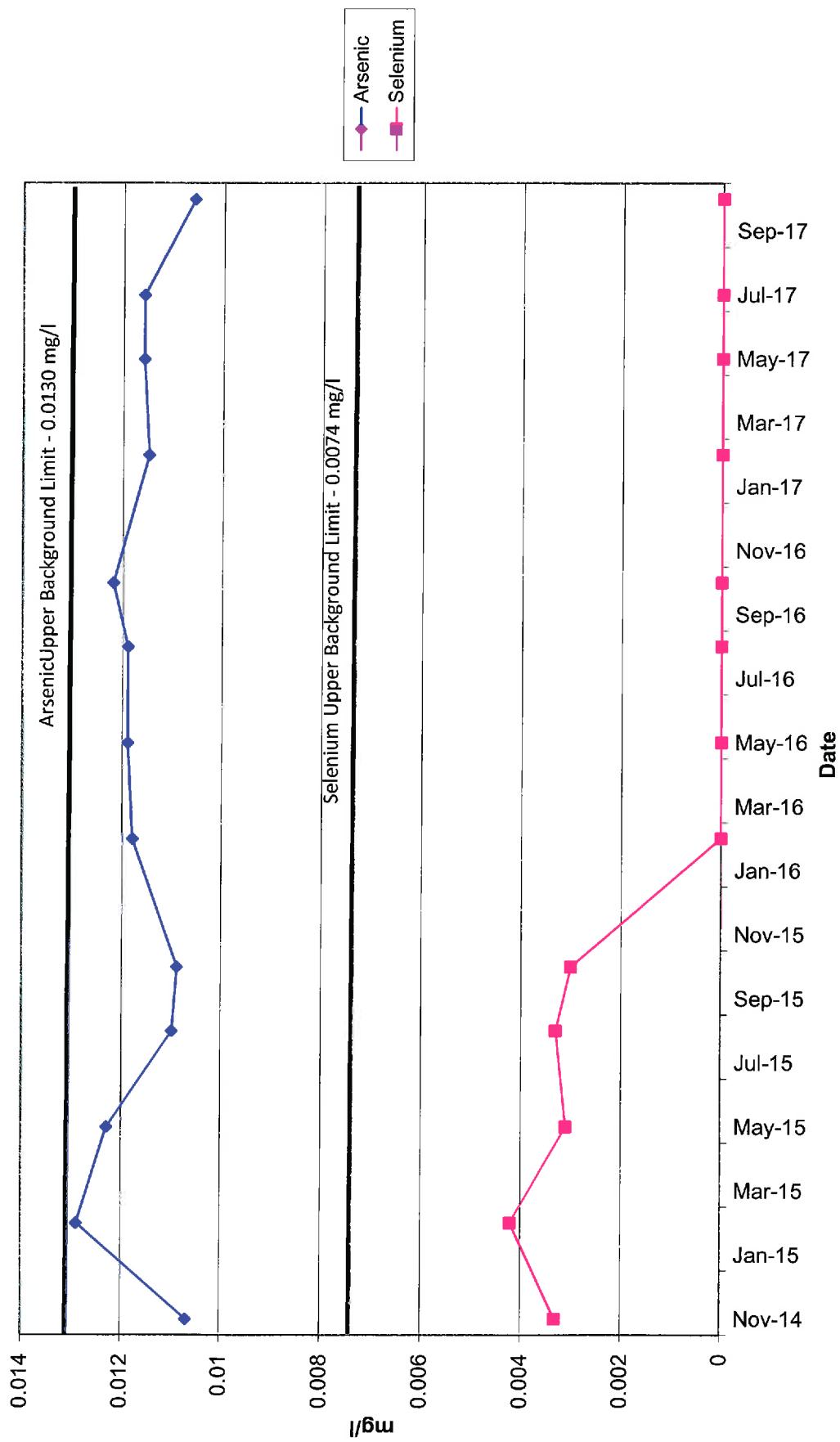
Landfill Monitor Well MW1		all values mg/l unless otherwise noted																	
Date	pH	Conductivity	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Lithium	Molybdenum	Thallium	Ra 226	Ra 228	PCuL	Ra 228	
4-Nov-14	768	7.71	91.2 <0.003	-0.002	92.9 <0.008	-0.002	92.9 <0.008	-0.002	92.9 <0.008	-0.002	<0.01	0.00331 <0.005	201 <1.0	1.21	1.07	<0.001	0.633		
11-Feb-15	753	7.75	1.040	-0.003	0.0123	-0.002	0.0123	-0.002	0.0123	-0.002	-0.003	0.00042 <0.005	219 <1.0	0.344	123	1.07	0.633		
19-May-15	751	7.75	1.070	-0.003	0.0123	-0.002	0.0123	-0.002	0.0123	-0.002	-0.003	0.00042 <0.005	209 <1.0	0.35	116	1.07	0.601		
25-Aug-15	8.06	7.72	0.0111	0.0398	-0.002	-0.002	0.0111	0.0398	-0.002	-0.002	-0.003	0.0033 <0.005	210 <1.0	0.0953	116	0.848	0.848		
22-Oct-15	753	7.75	1.060	-0.003	0.0123	-0.002	0.0123	-0.002	0.0123	-0.002	-0.003	0.0003 <0.005	182 <1.0	0.35	100	0.591	0.814 <0.008		
19-Feb-16	724	7.75	1.080	-0.003	0.0123	-0.002	0.0123	-0.002	0.0123	-0.002	-0.003	0.0003 <0.005	210 <1.0	1	0.344	120	0.687		
4-Mar-16	746	7.85	1.130	-0.003	0.0119	-0.002	0.0119	-0.002	0.0119	-0.002	-0.003	0.0003 <0.005	219 <1.0	0.324	121	0.685	0.765 <0.008		
24-Apr-16	750	7.97	1.140	-0.003	0.0119	-0.002	0.0119	-0.002	0.0119	-0.002	-0.003	0.0003 <0.005	225 <1.0	0.324	113	0.688	0.765 <0.008		
25-Oct-16	754	7.81	1.180	-0.003	0.0122	-0.002	0.0122	-0.002	0.0122	-0.002	-0.003	0.0003 <0.005	219 <1.0	0.351	114	0.687	0.692 <0.008		
26-Feb-17	800	7.83	1.280	-0.003	0.0115	-0.002	0.0115	-0.002	0.0115	-0.002	-0.003	0.0003 <0.005	251 <1.0	1.35	0.371	124	0.687		
3-May-17	810	7.78	1.240	-0.003	0.0116	-0.002	0.0116	-0.002	0.0116	-0.002	-0.003	0.0003 <0.005	251 <1.0	0.686	123	0.654	0.646 <0.008		
15-Jul-17	801	7.85	1.280	-0.003	0.0116	-0.002	0.0116	-0.002	0.0116	-0.002	-0.003	0.0003 <0.005	248 <1.0	0.357	131	0.687	0.928 <0.008		
24-Oct-17	833	7.8	1.270	-0.003	0.0106	-0.002	0.0106	-0.002	0.0106	-0.002	-0.003	0.0003 <0.005	238 <1.0	0.355	125	0.686	0.581 <0.008		

Monitor Well 1 - TDS and Conductivity

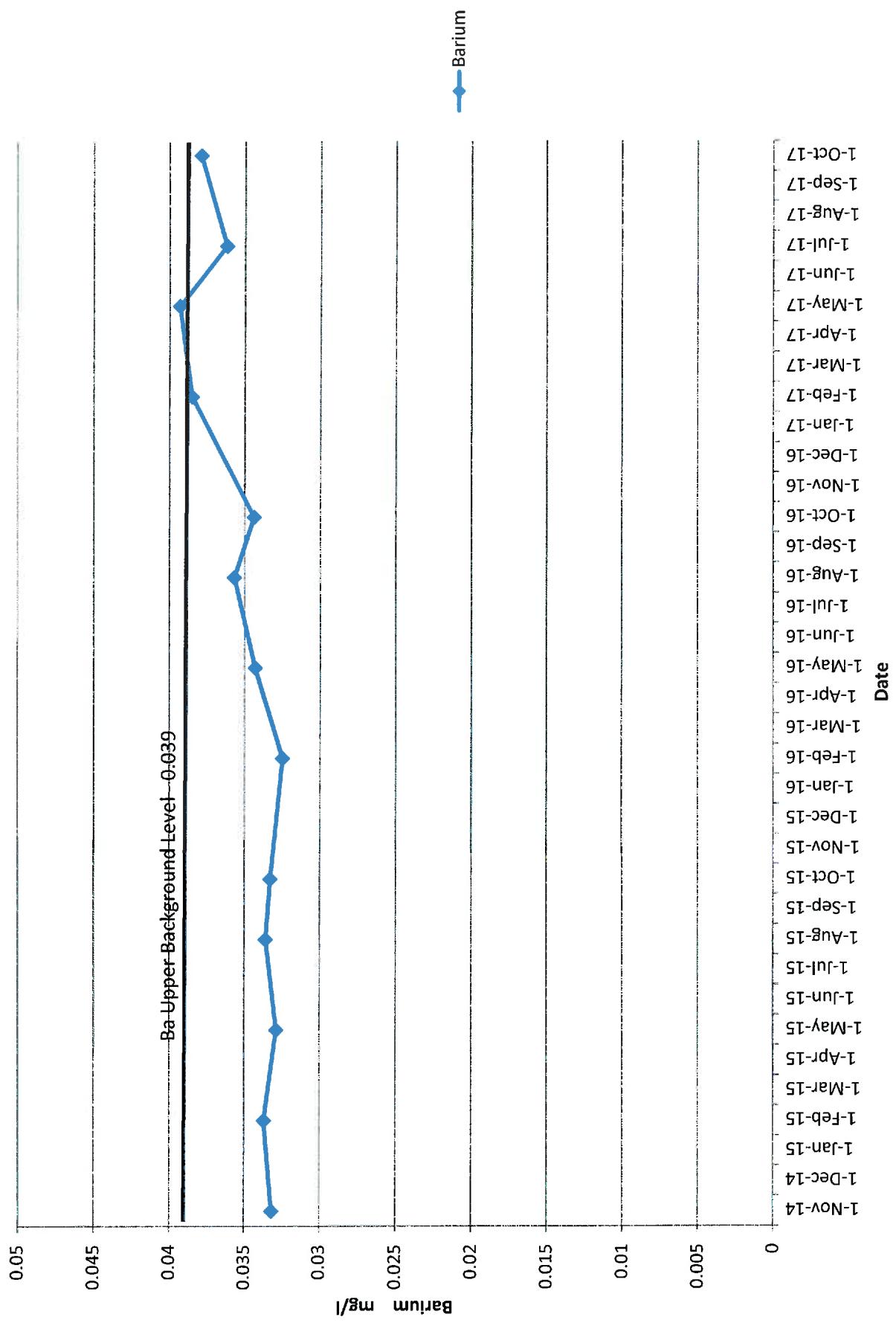




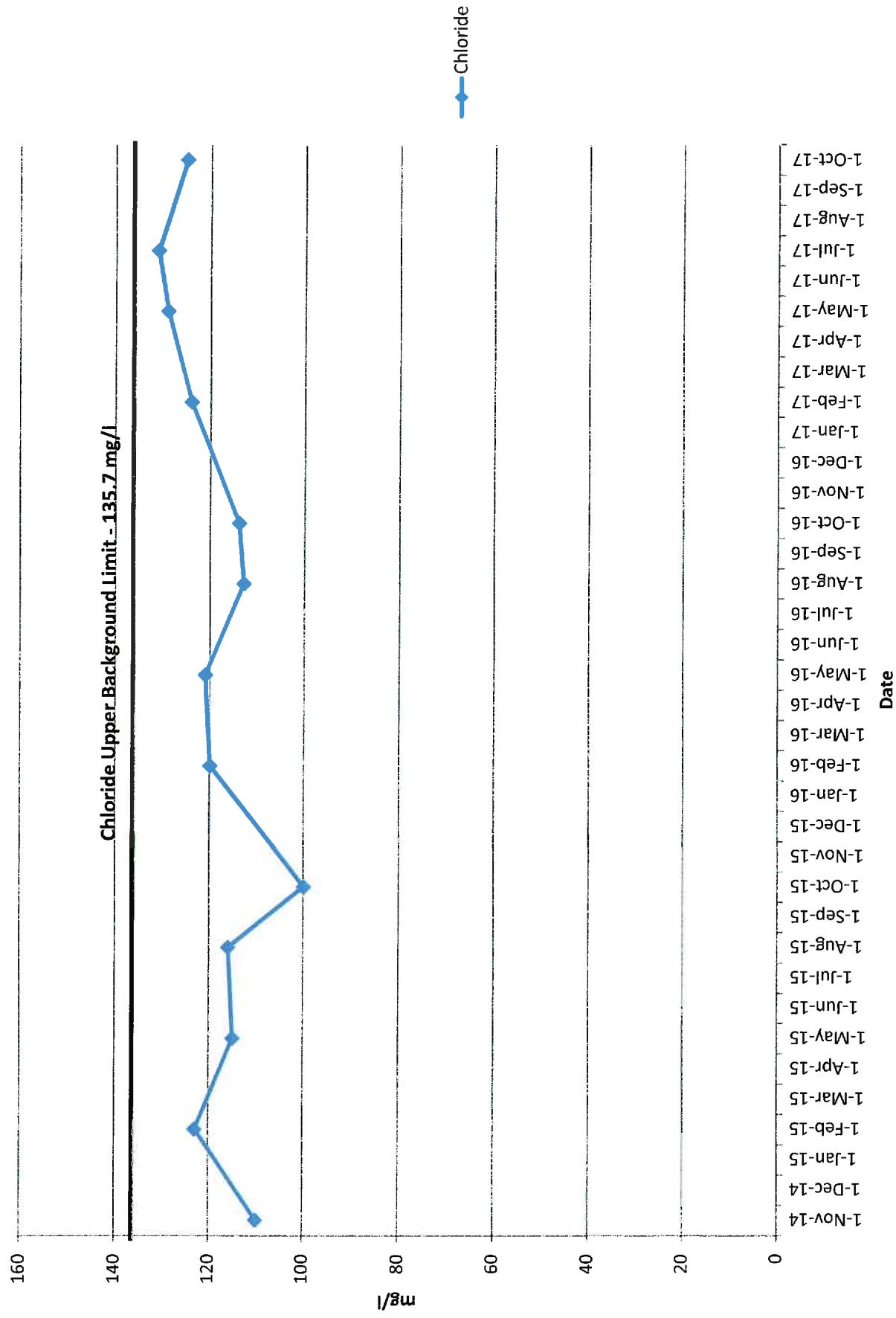
Landfill Monitor Well MW1 As and Se



MW1 - Barium

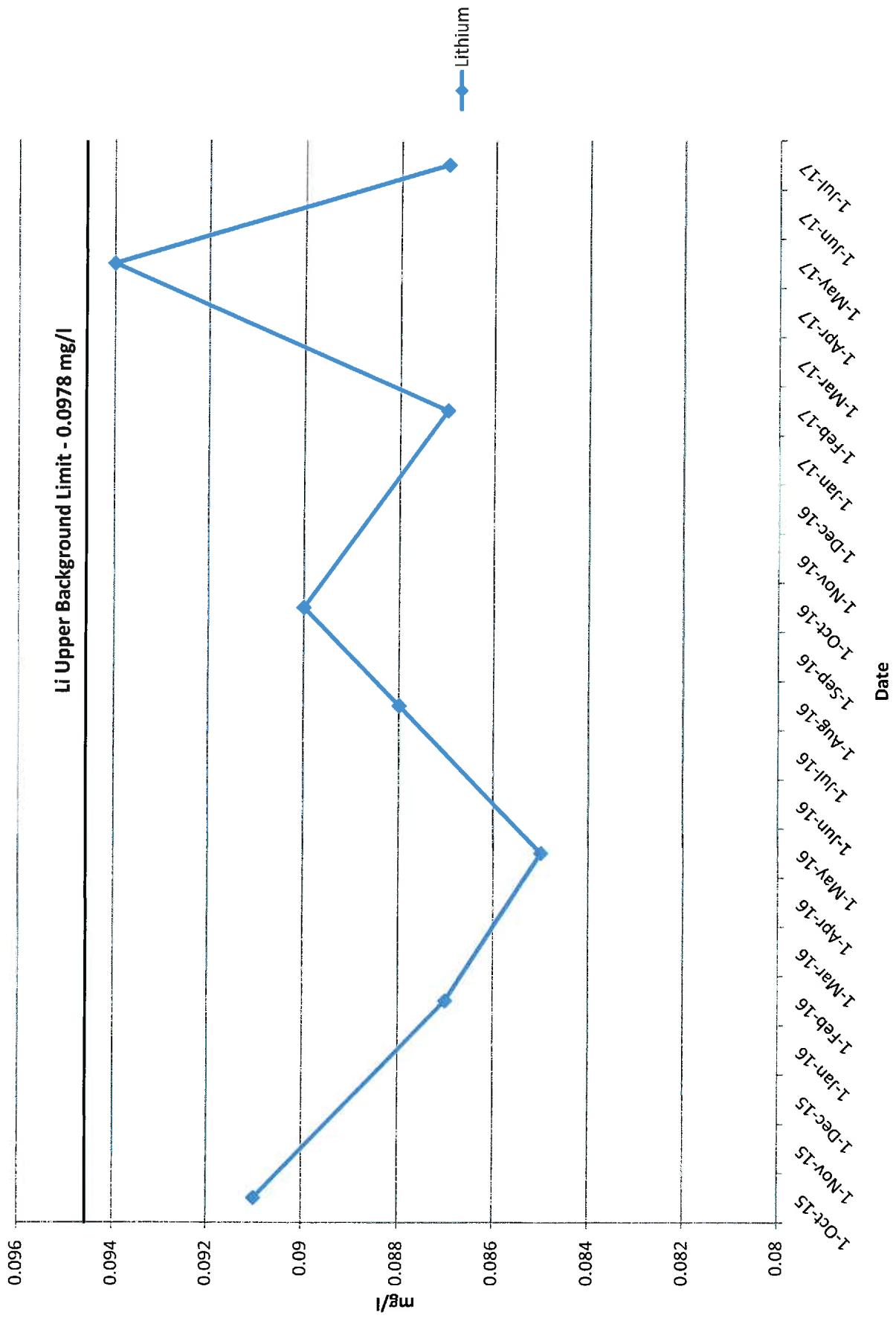


Monitor Well 1 - Chloride

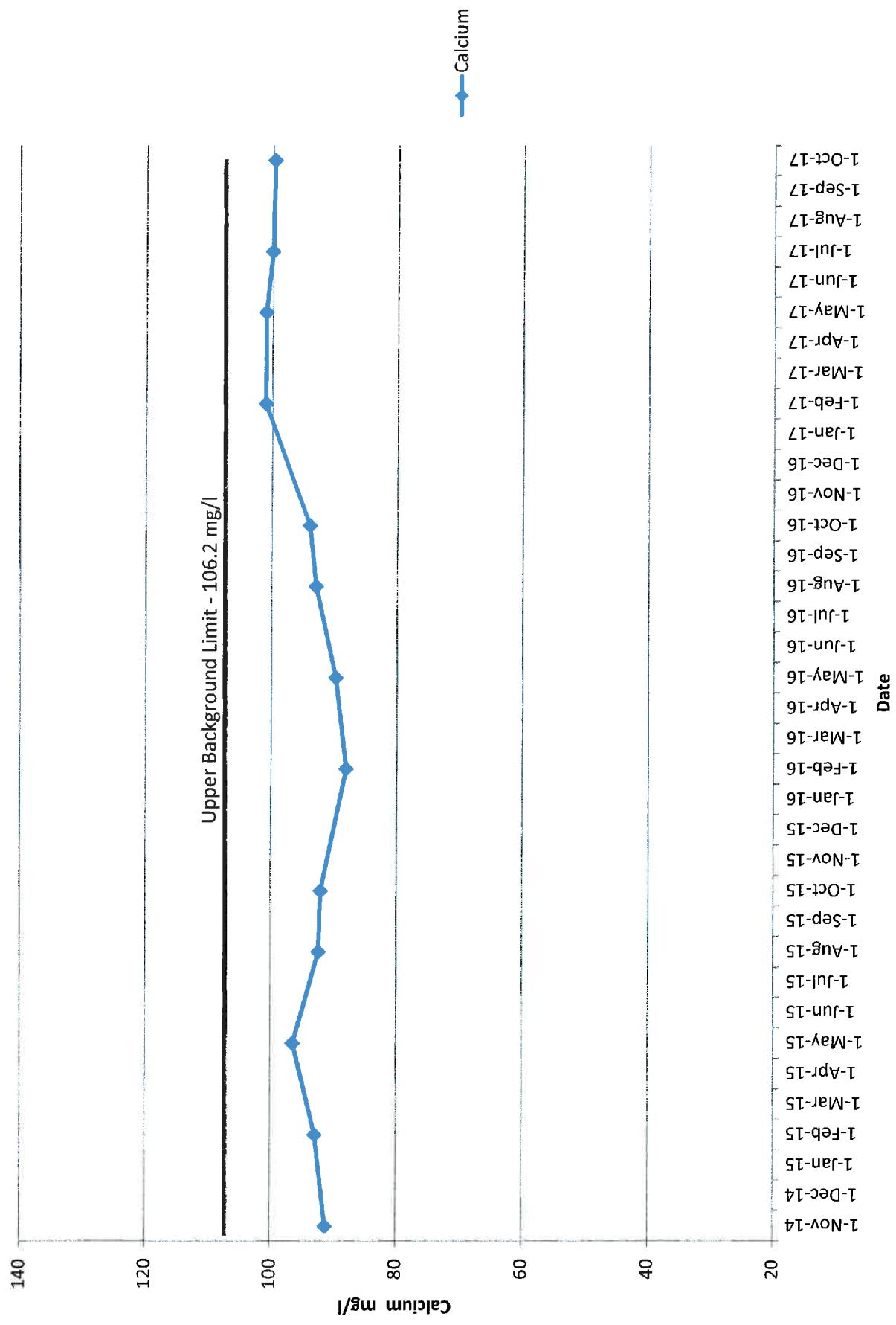


Monitor Well 1 - Lithium

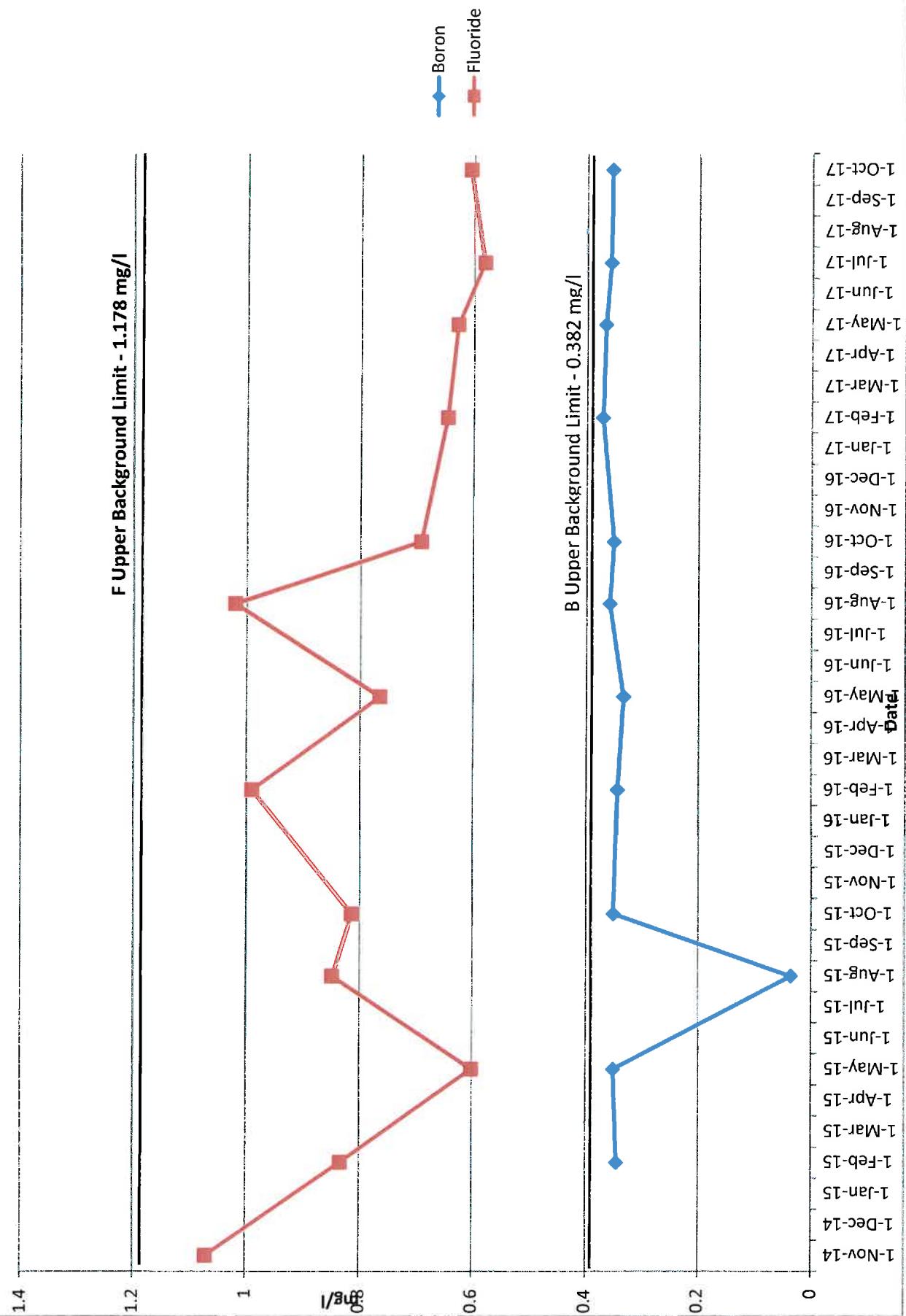
Li Upper Background Limit - 0.0978 mg/l



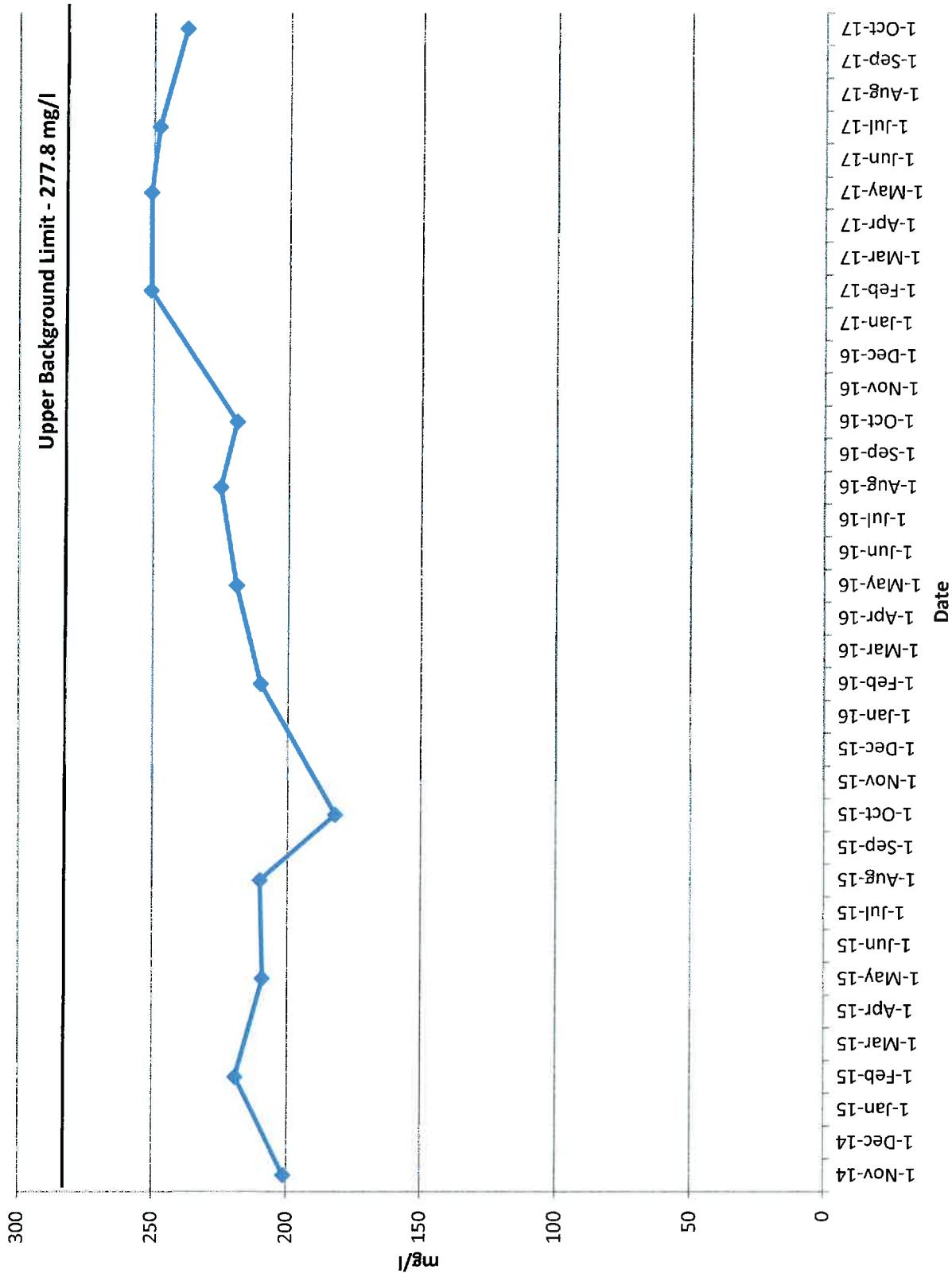
Monitor Well 1 - Calcium



Monitor Well 1 - Boron, Fluoride

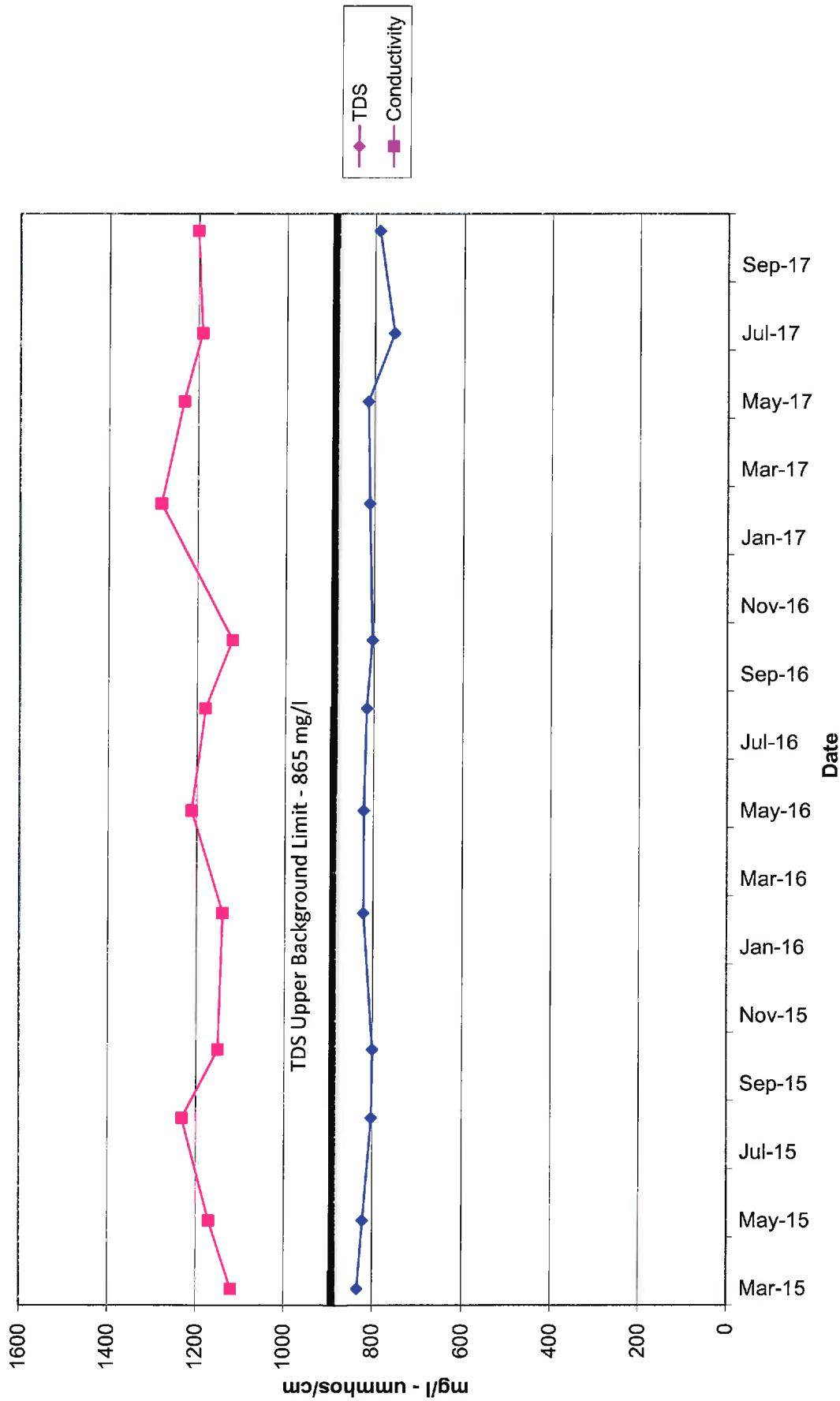


Monitor Well 1 - Sulfate

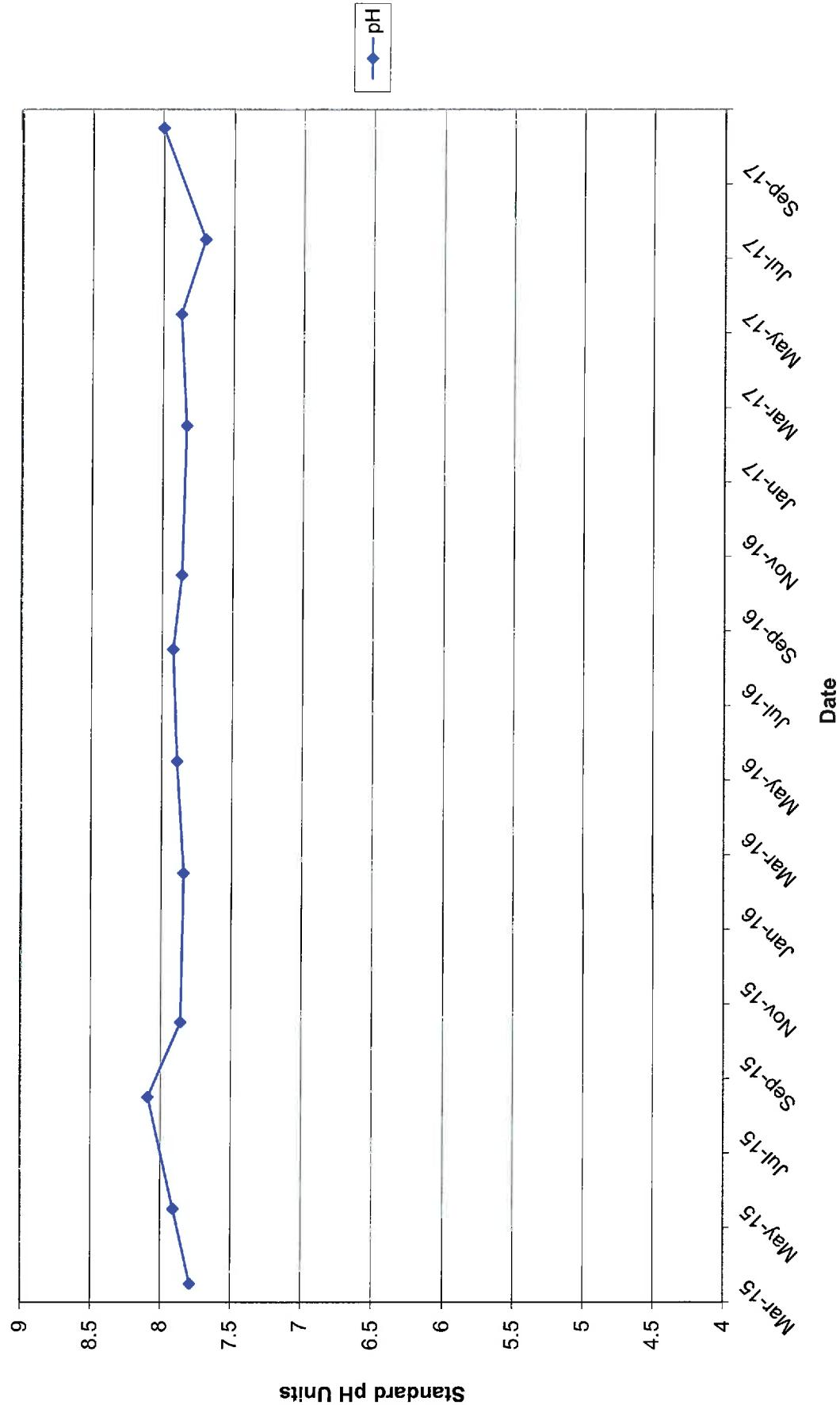


Landfill Monitor Well MW3 (all values ng/L unless otherwise noted)									
Date	TDS	pH	Conductivity	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium
20-Mar-15	533	7.73	1120	0.0119	0.0338	0.6348	<0.002	<0.002	105 <0.006
19-May-15	821	7.31	1200	0.0102	0.002	0.6124	<0.002	<0.002	107 <0.006
25-Aug-15	802	8.09	1200	0.0103	0.002	0.6348	<0.002	<0.002	107 <0.006
22-Oct-15	800	7.96	1150	<0.003	0.002	0.6067	0.002	0.002	106 <0.006
16-Feb-16	821	7.84	1140	<0.003	0.002	0.6351	<0.002	<0.002	105 <0.006
4-May-16	821	7.89	1210	<0.003	0.002	0.6343	<0.002	<0.002	105 <0.006
17-Aug-16	815	7.92	1190	<0.003	0.012	0.6363	<0.002	<0.002	101 <0.006
25-Oct-16	803	7.96	1120	<0.003	0.0124	0.6355	<0.002	<0.002	98.1 <0.006
28-Feb-17	810	7.83	1290	<0.003	0.0116	0.6359	<0.002	<0.002	101 <0.006
3-May-17	814	7.87	1230	<0.003	0.0116	0.6356	<0.002	<0.002	98.4 <0.006
13-Jun-17	757	7.7	1190	<0.003	0.0113	0.6338	<0.002	<0.002	99.7 <0.006
17-Oct-17	790	8	1200	0.0107	0.0107	0.6343	<0.002	<0.002	95.9 <0.006

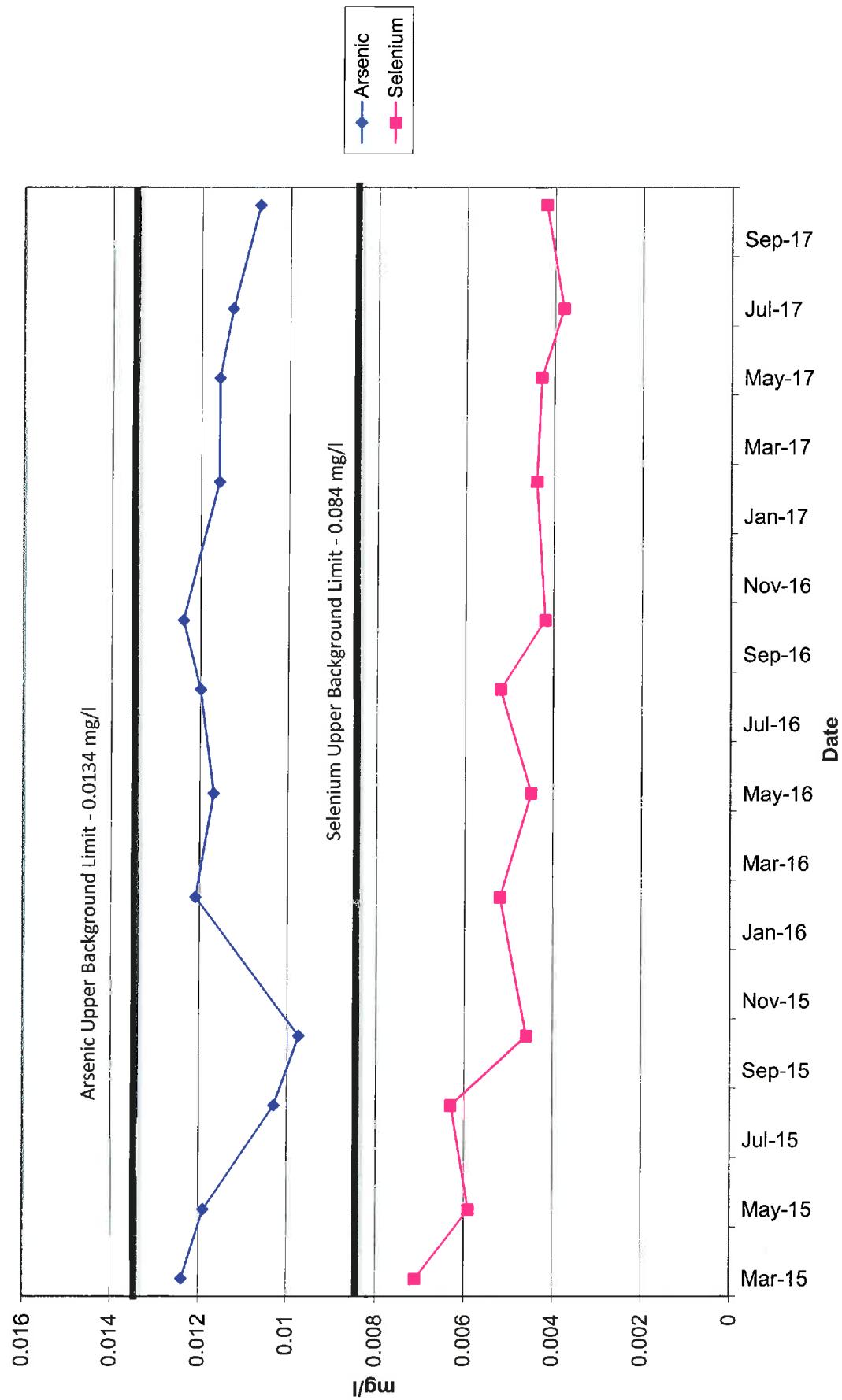
Landfill Monitor Well MW3 - TDS and Conductivity



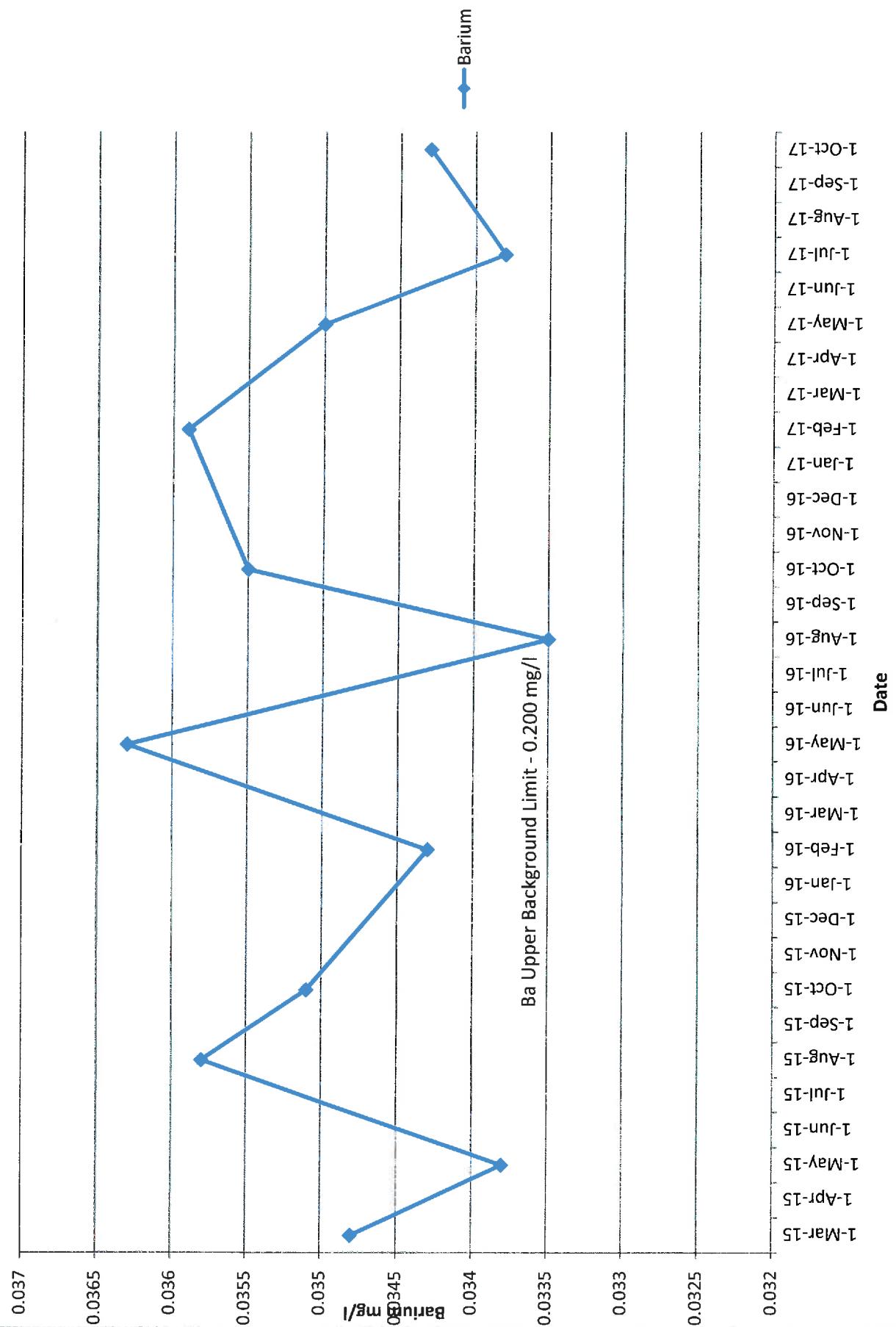
Monitor Well 3 - pH



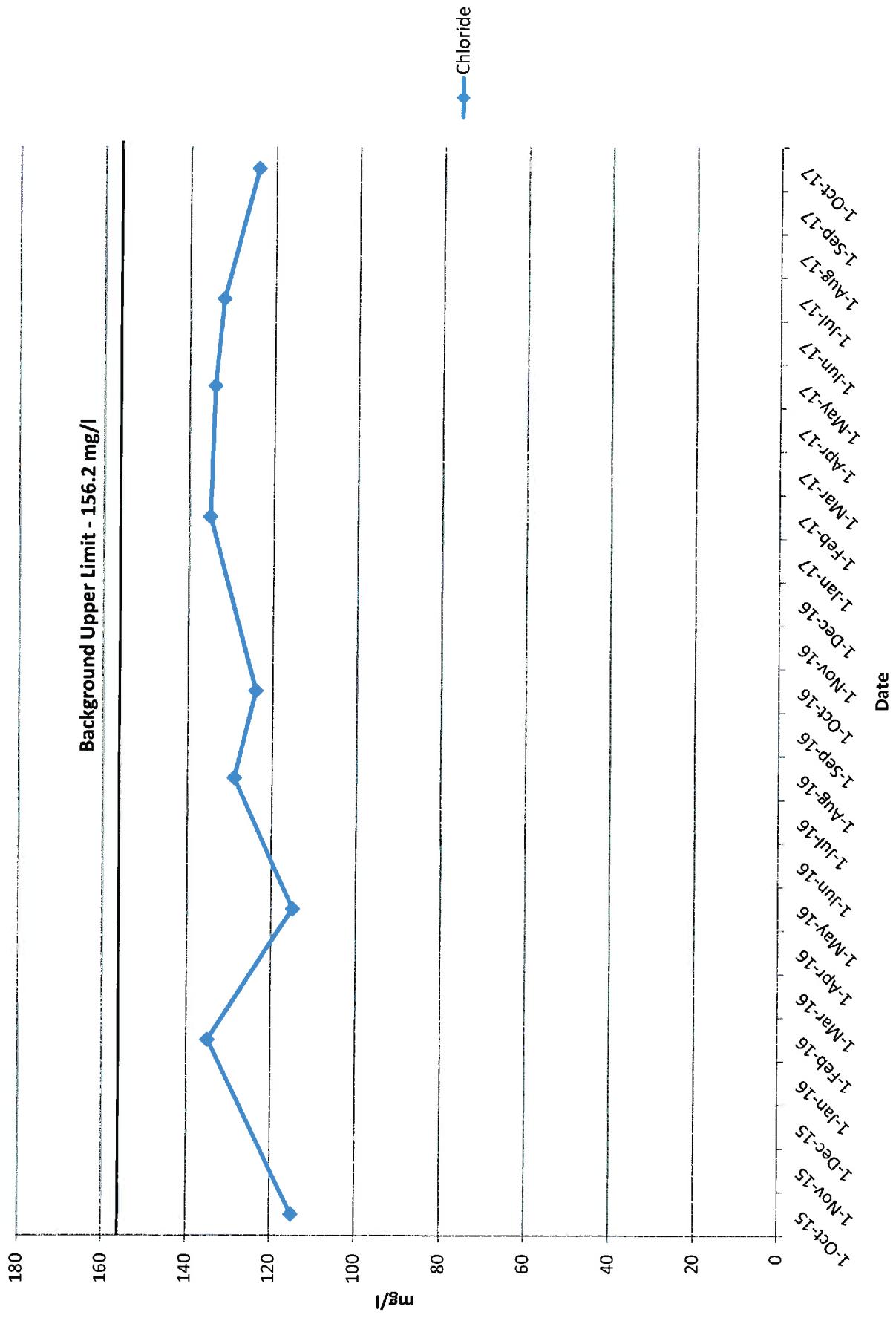
Landfill Monitor Well MW3 - As and Se Concentrations



Landfill Monitor Well MW3 - Barium

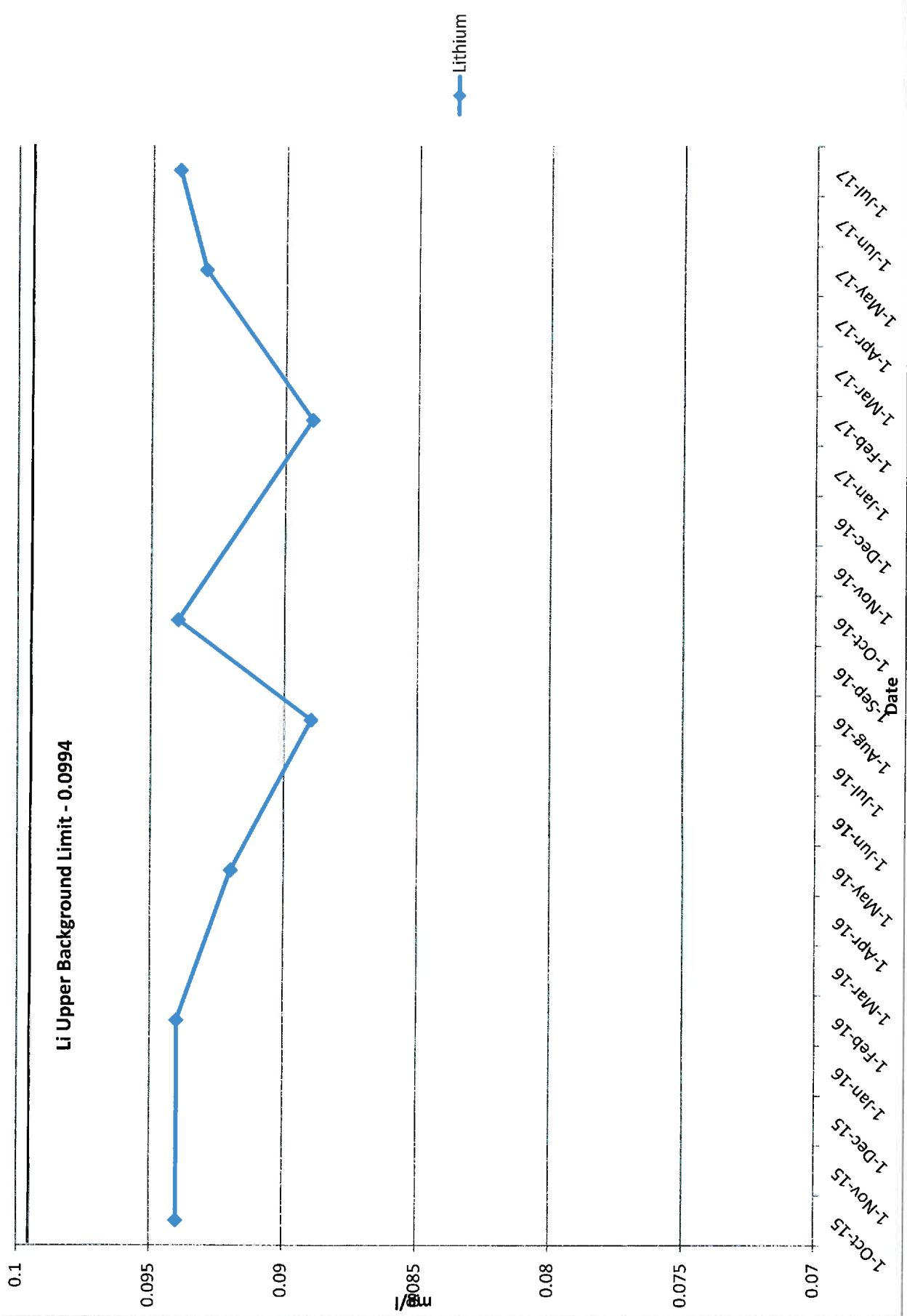


Monitor Well 3 - Chloride

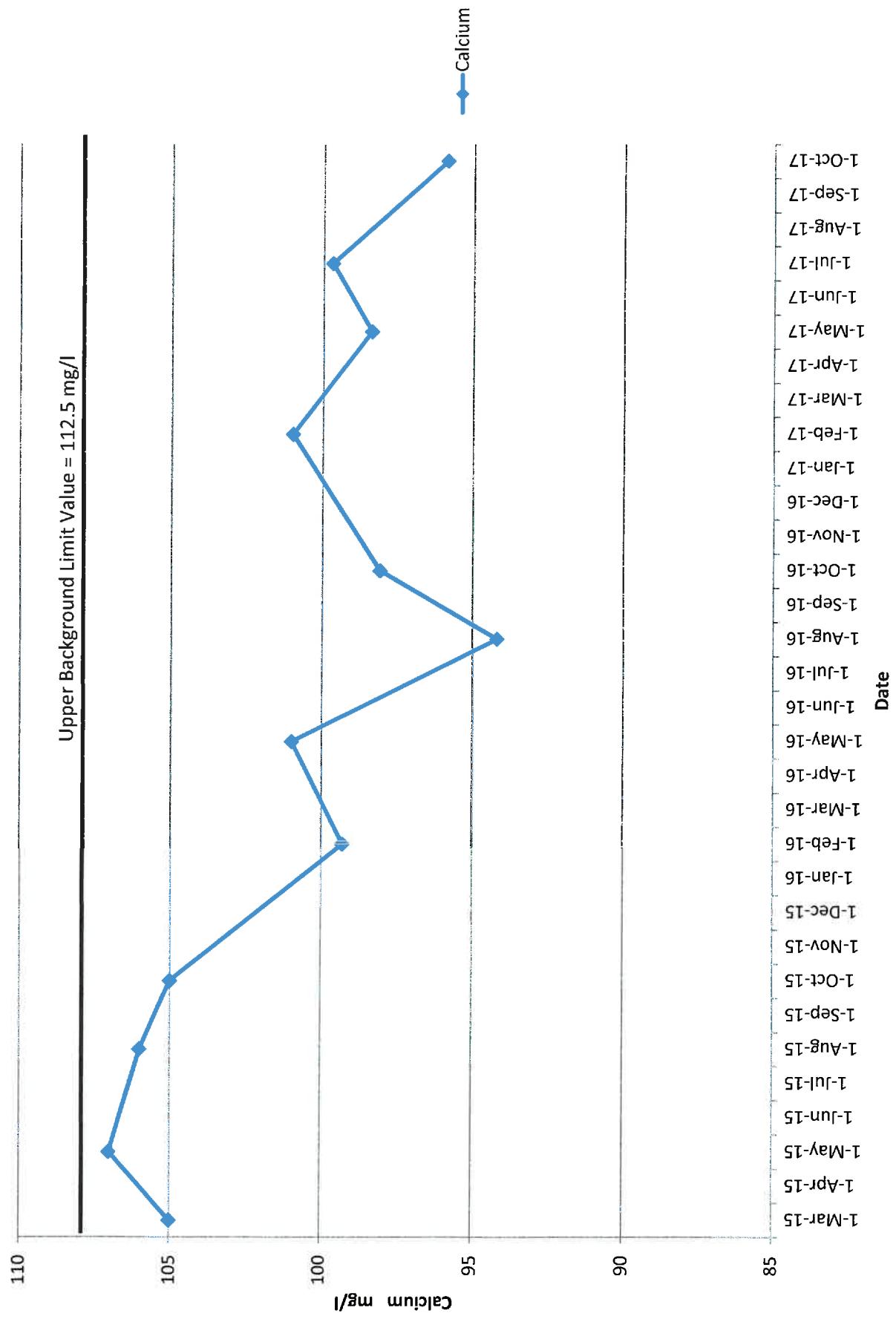


Monitor Well 3 - Lithium

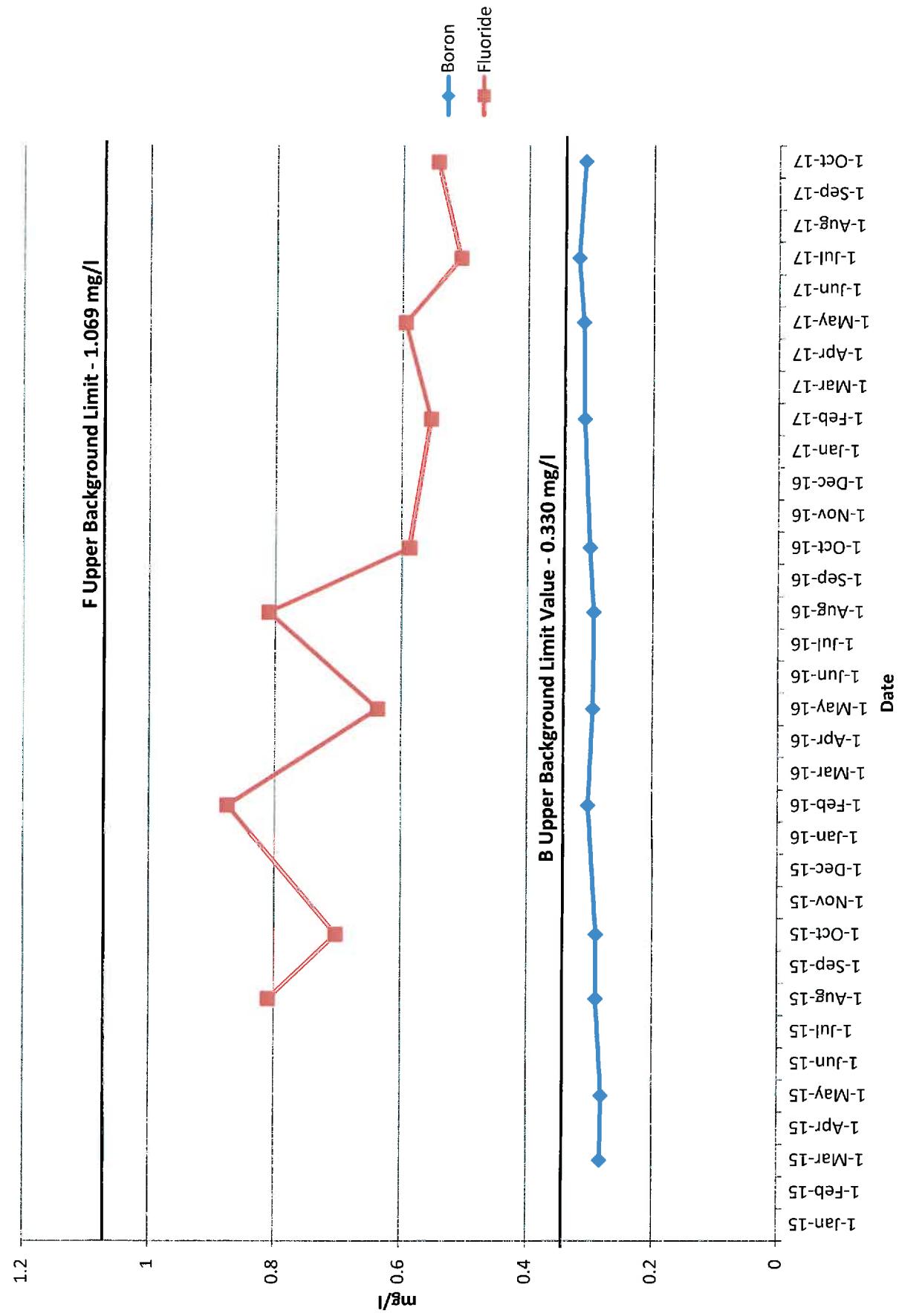
Li Upper Background Limit - 0.0994



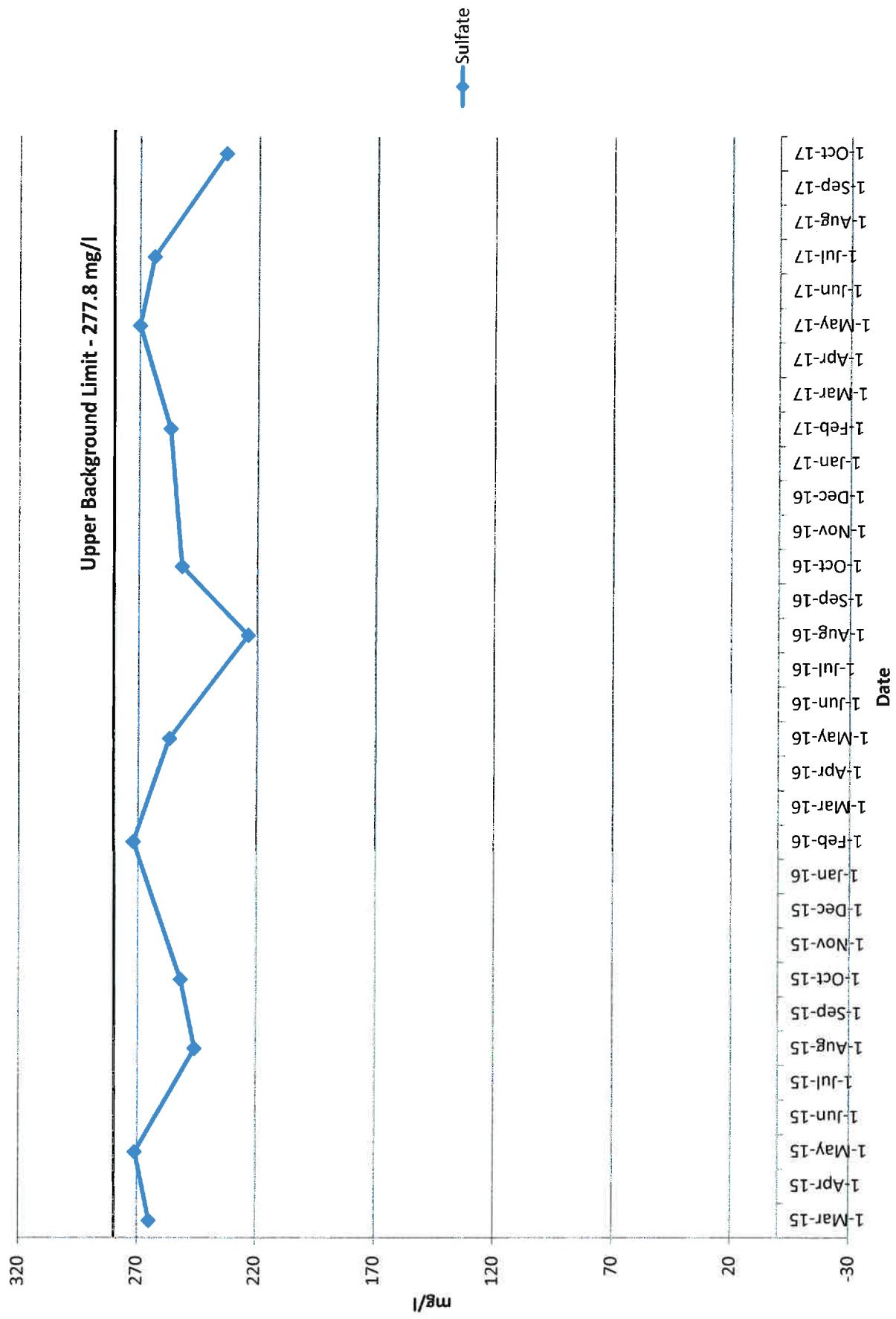
Monitor Well 3 - Calcium



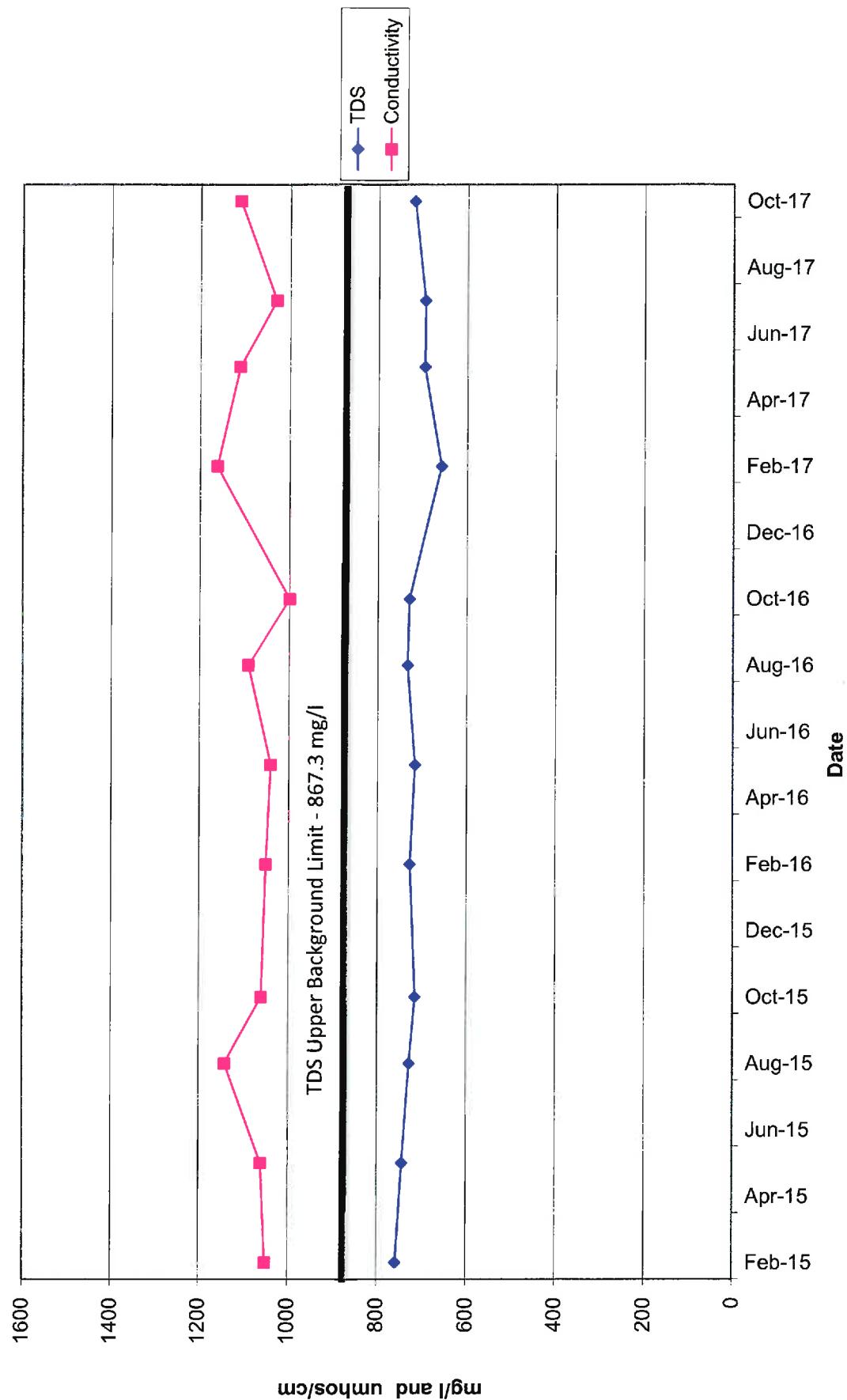
Monitor Well 3 - B, F

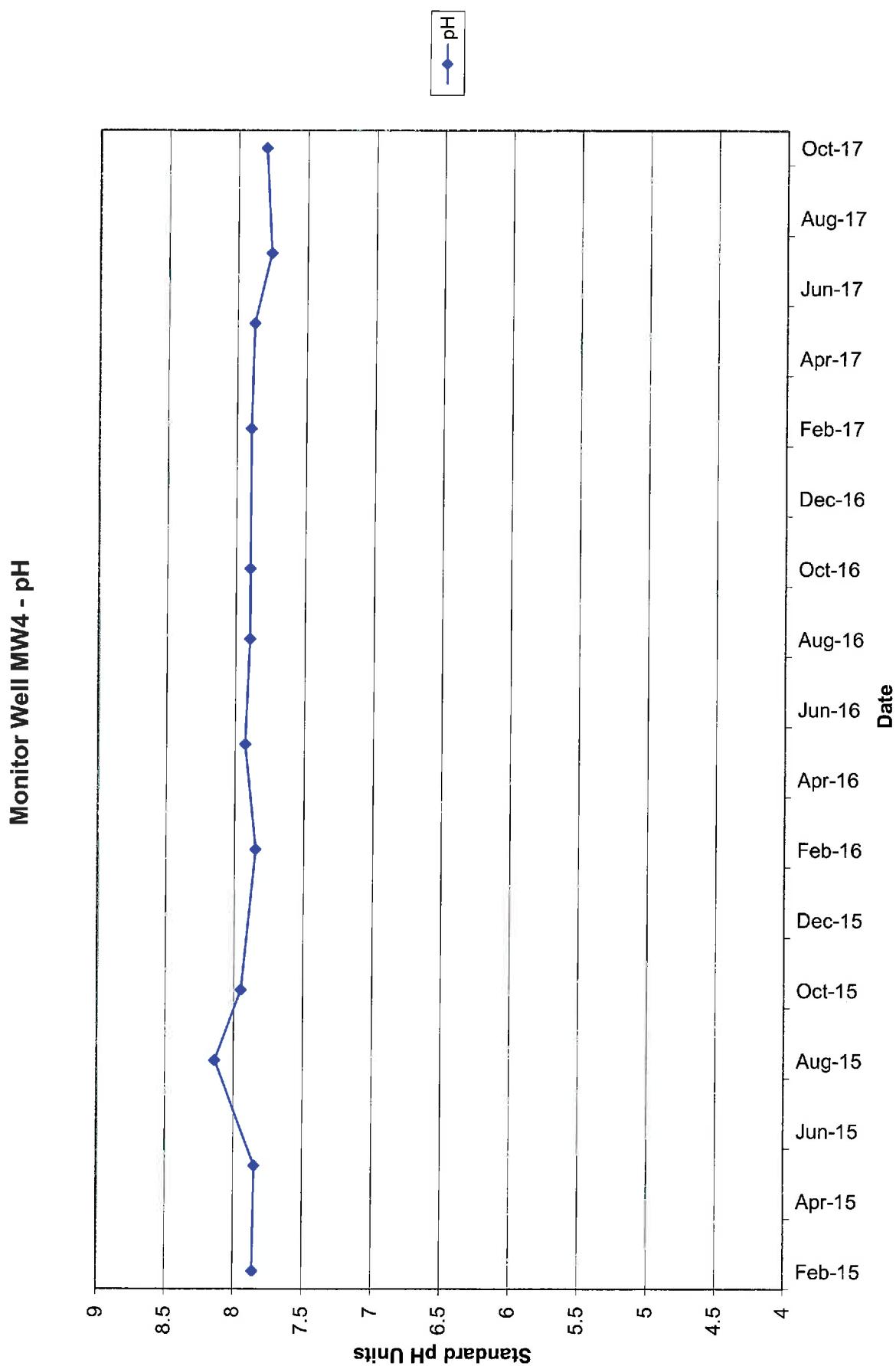


Monitor Well 3 - Sulfate

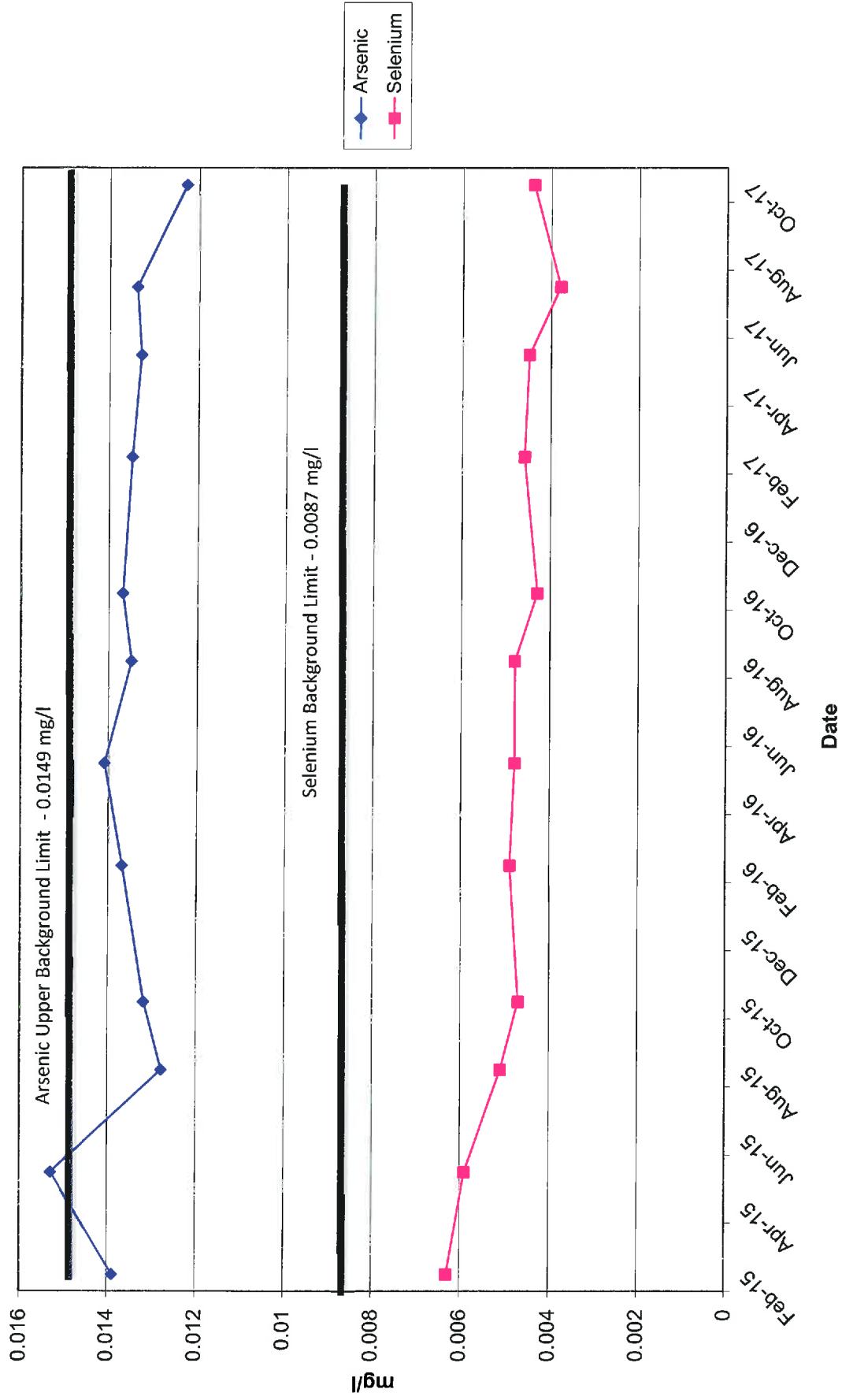


Monitor Well MW4 - TDS and Conductivity

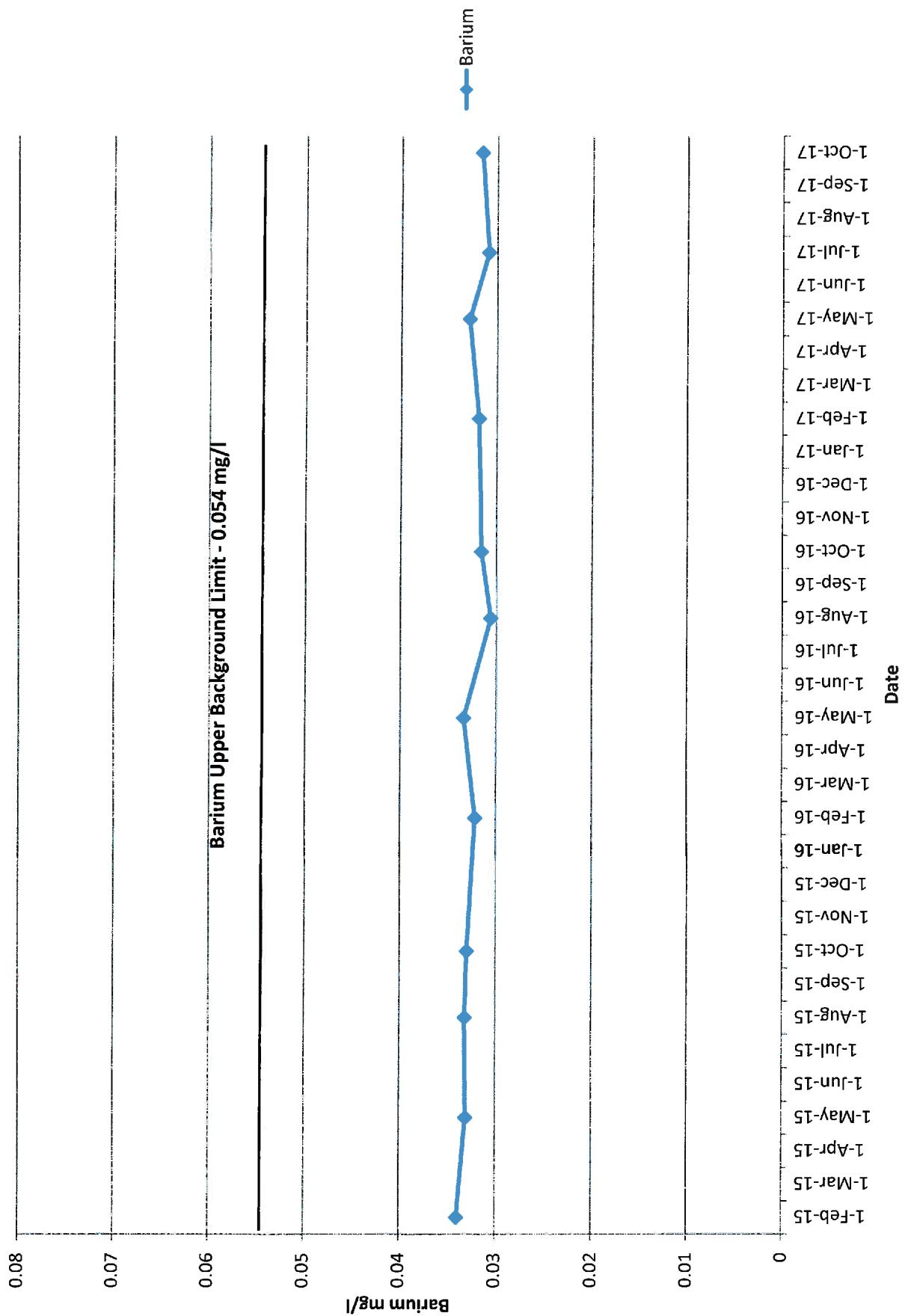




Landfill Monitor Well MW4 - As and Se

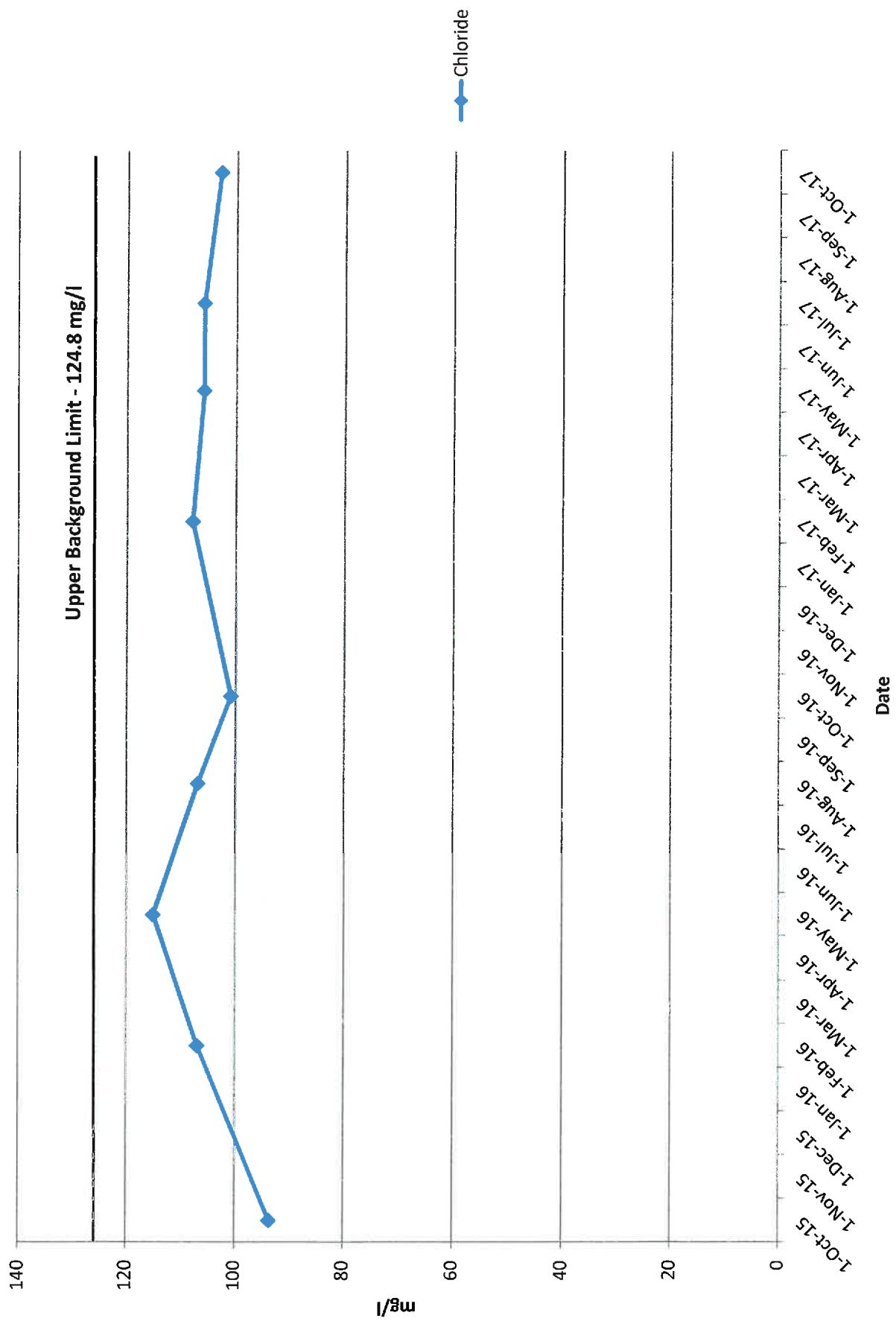


Landfill Monitor Well MW4 - Barium

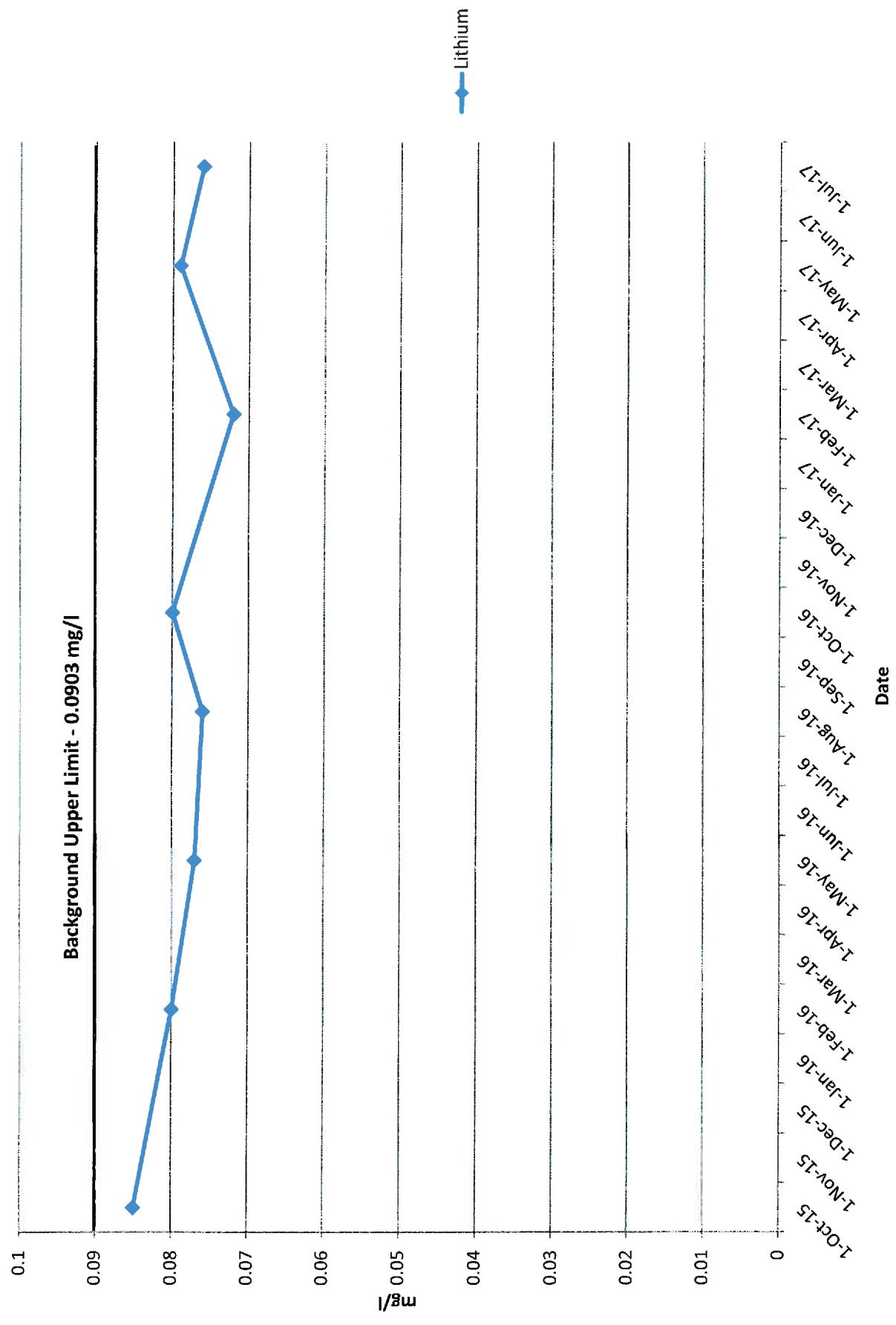


Monitor Well 4 Chloride

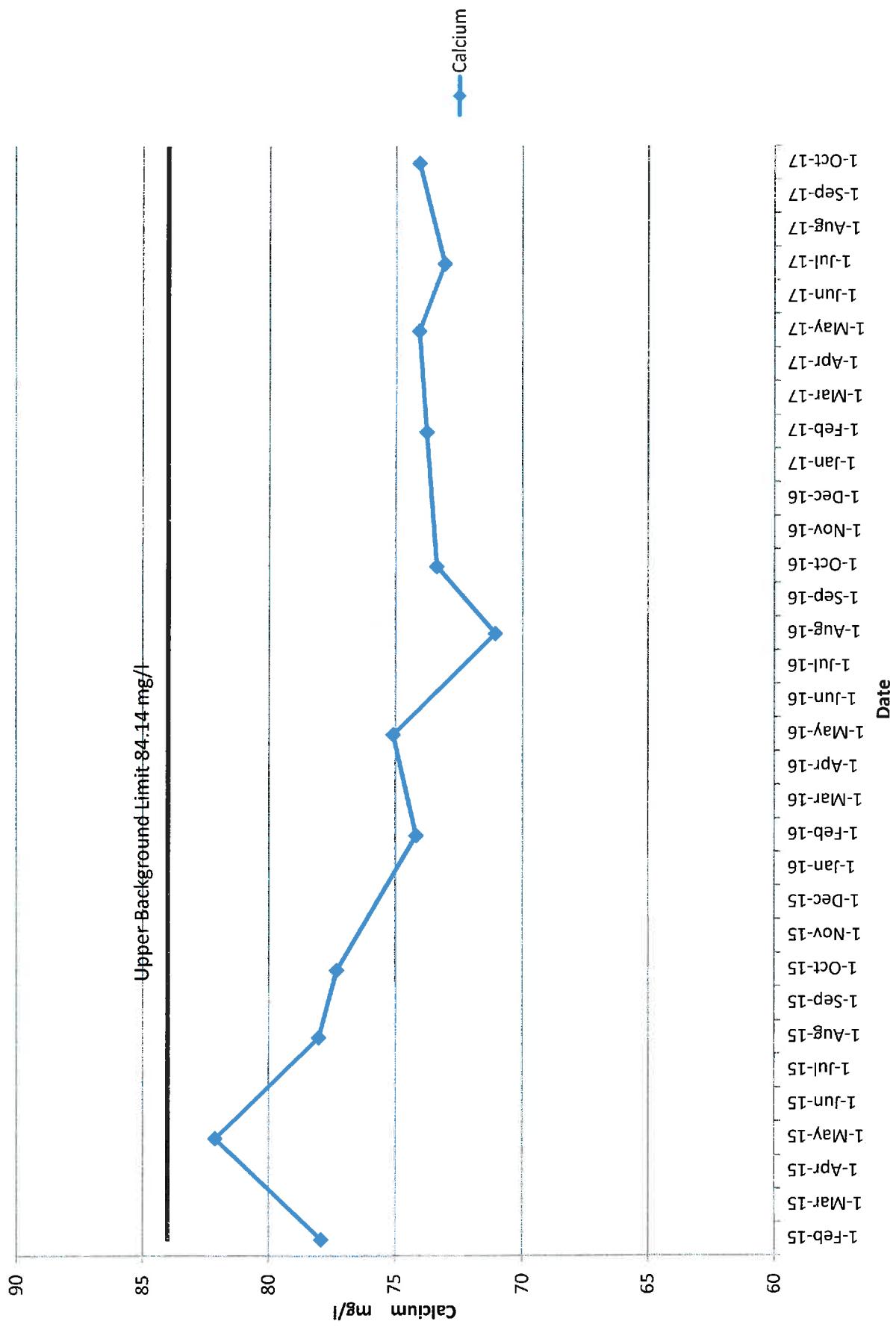
Upper Background Limit - 124.8 mg/l



Monitor Well 4 - Lithium



Monitor Well 4 - Calcium

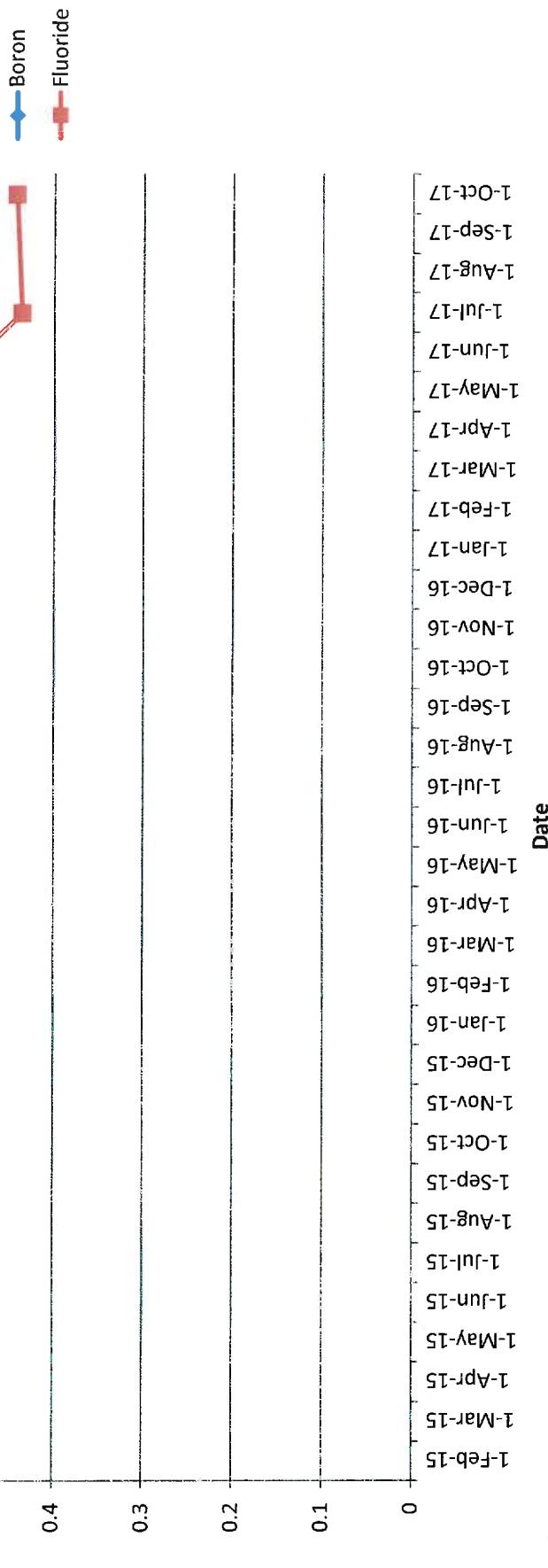


Monitor Well 4 - Boron, Fluoride

F Upper Background Limit - 0.890 mg/l

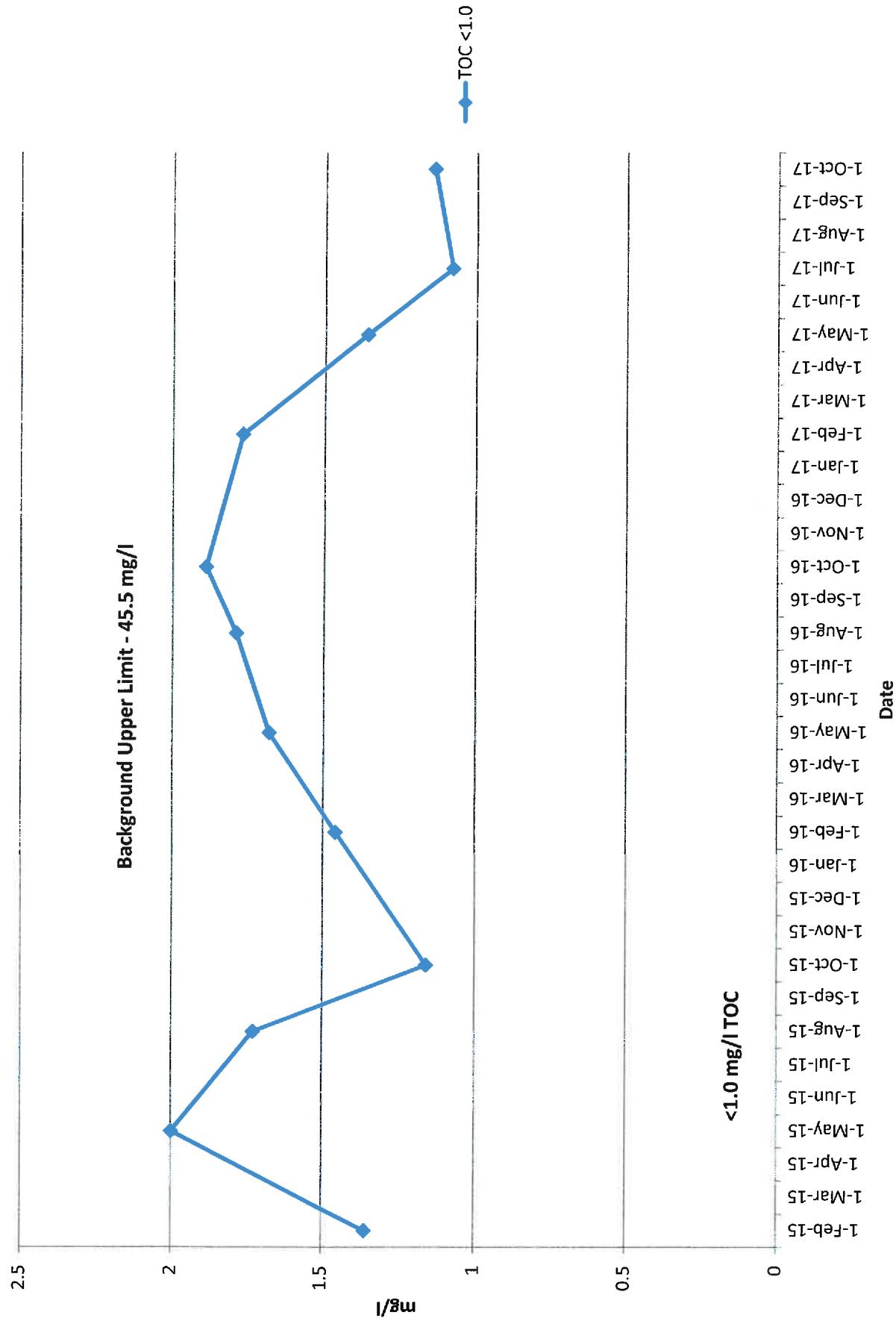
B Upper Background Limit - 0.623 mg/l

mg/l

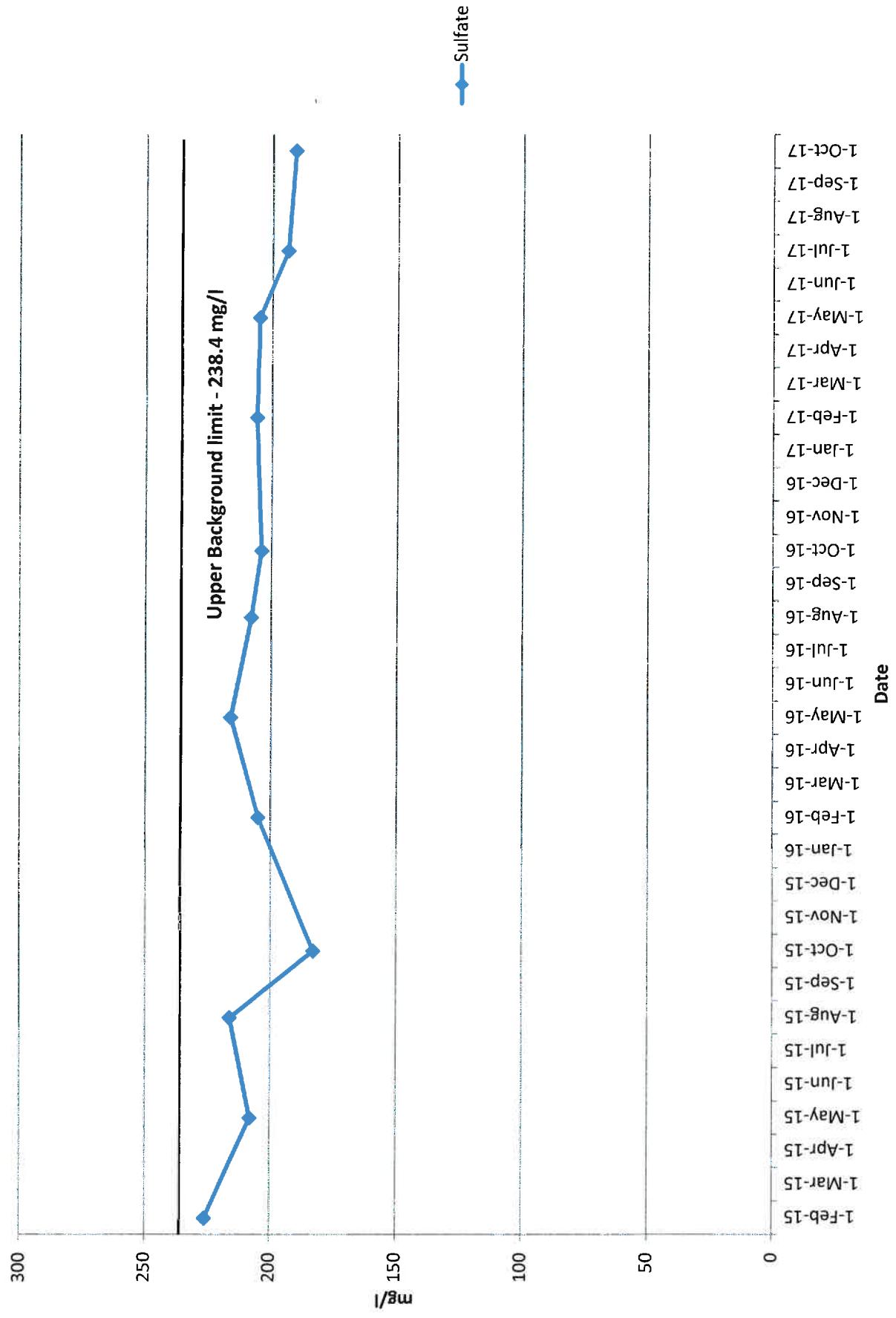


Monitor Well 4 - TOC

Background Upper Limit - 45.5 mg/l

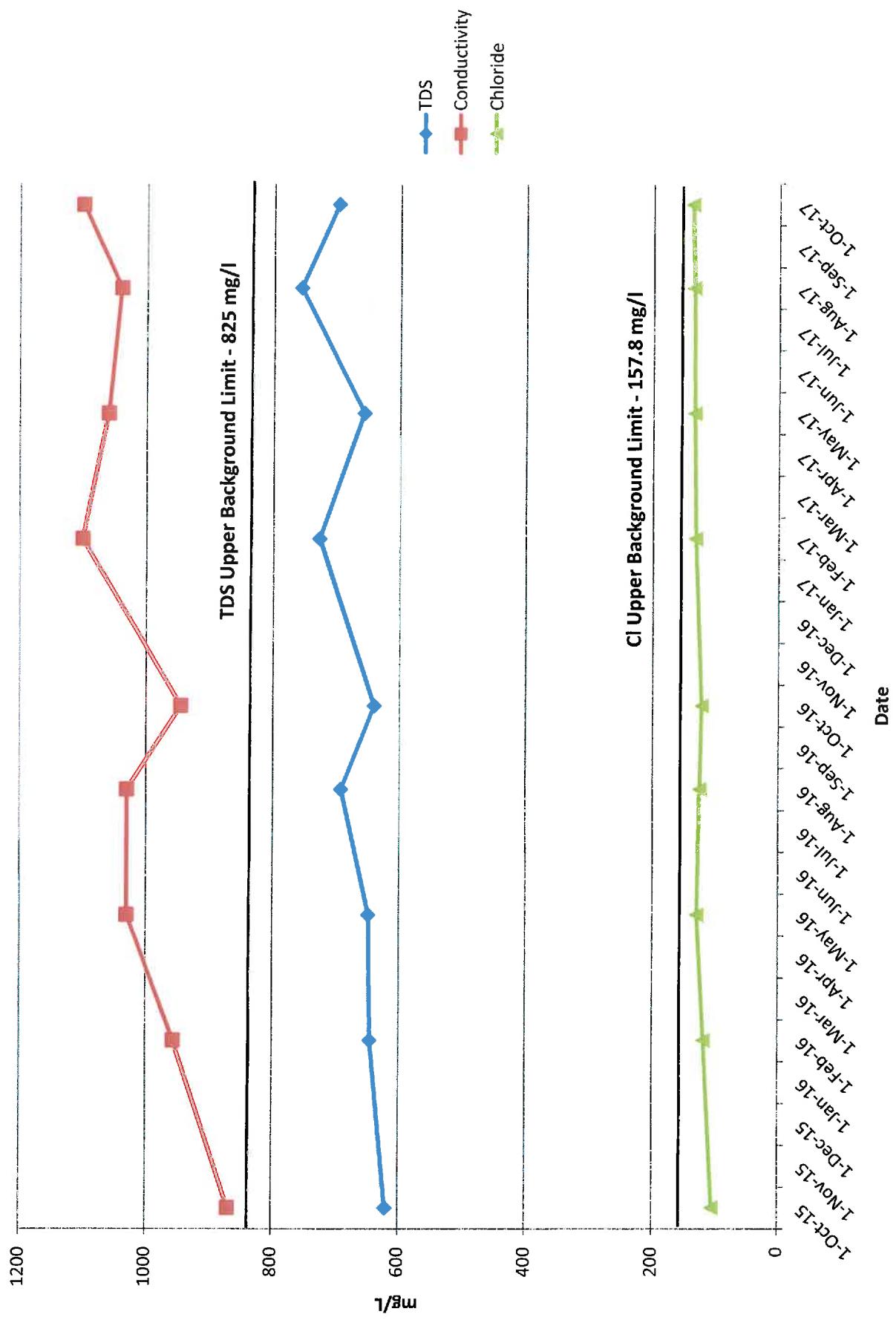


Monitor Well 4 - Sulfate

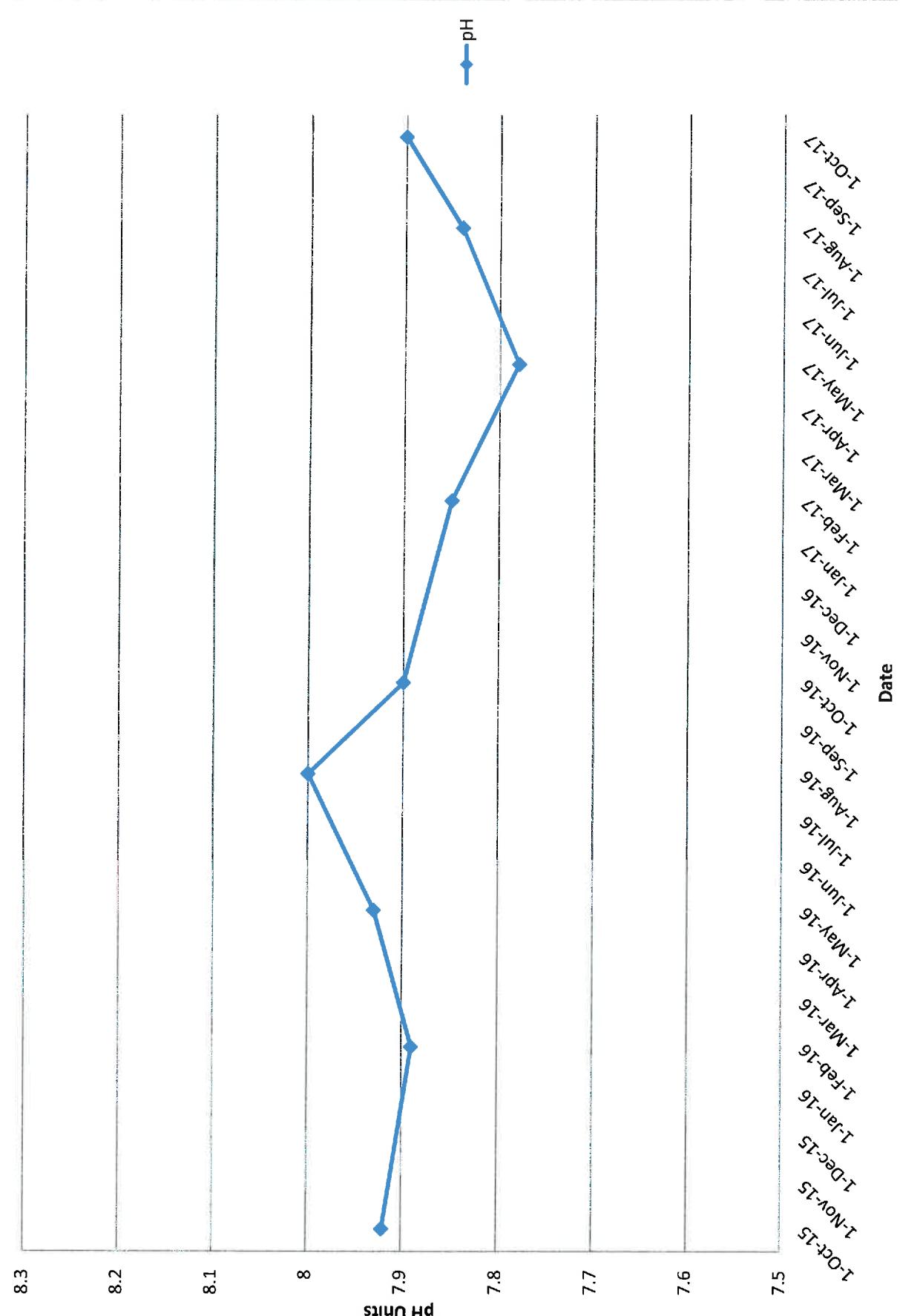


Lantaffi Monitor Well MW8		[all values mg/l, unless otherwise noted]																									
Date	Time	Conductivity	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Lead	Merkury	Nickel	Selenium	Siliver	Sulfate	TOC	Boron	Chloride	Lithium	Fluoride	Molybdenum	Thallium	Ra 226	PCuL	Ra 228	
22-Sept-15	1920	859 <0.003	0.0135	0.0145	0.068 ->0.002	0.0442 ->0.002	<0.002	63.4 <0.006	63.4 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<1.0	0.205	104	0.02	0.074 <0.008	<0.001	<0.14	-	1.7			
16-Feb-16	645	7.89	956 <0.003	0.0145	0.0442 ->0.002	0.0442 ->0.002	<0.002	66.4 <0.006	66.4 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	153	0.0065 <0.005	187	<1.0	0.083	0.966 <0.008	<0.001	<0.14	0.94		
4-May-16	646	7.93	1030 <0.003	0.0144	0.0458 ->0.002	0.0458 ->0.002	<0.002	68.1 <0.006	68.1 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	181	0.0083 <0.005	180	<1.0	0.083	0.743 <0.008	<0.001	0.33 <1.0	1.3		
17-Aug-16	692	8.6	1030 <0.003	0.0141	0.0421 ->0.002	0.0421 ->0.002	<0.002	69.6 <0.006	69.6 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	126	0.0062 <0.005	180	<1.0	0.084	0.906 <0.008	<0.001	0.21 <1.3	<0.5		
28-Oct-16	640	7.9	945 <0.003	0.0143	0.0445 ->0.002	0.0445 ->0.002	<0.002	69.4 <0.006	69.4 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	175	0.0053 <0.005	175	<1.0	0.087	0.736 <0.008	<0.001	<0.16	<0.4		
28-Feb-17	727	7.85	1100 <0.003	0.0134	0.0438 ->0.002	0.0438 ->0.002	<0.002	70.5 <0.006	70.5 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	183	0.0066 <0.005	183	<1.0	0.022	132	0.083	0.702 <0.008	<0.001	<0.14	<0.5
5-May-17	657	7.78	1050 <0.003	0.0143	0.0433 ->0.002	0.0433 ->0.002	<0.002	68.8 <0.006	68.8 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	187	0.0052 <0.005	187	<1.0	0.216	134	0.084	0.611 <0.008	<0.001	<0.14	<0.5
17-Aug-17	757	7.84	1040 <0.003	0.0143	0.0435 ->0.002	0.0435 ->0.002	<0.002	70.6 <0.006	70.6 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	185	0.0063 <0.005	185	<1.0	0.22	135	0.085	0.611 <0.008	<0.001	0.2 <0.3	<0.5
17-Oct-17	698	7.9	1100	0.0128	0.0348 ->0.002	0.0348 ->0.002	<0.002	74.1 <0.006	74.1 <0.006	<0.006	<0.002	<0.002	<0.002	<0.002	<0.002	<0.005	182	0.0063 <0.005	182	<1.0	0.214	136	0.085	0.658 <0.008	<0.001	0.2 <0.3	<0.5

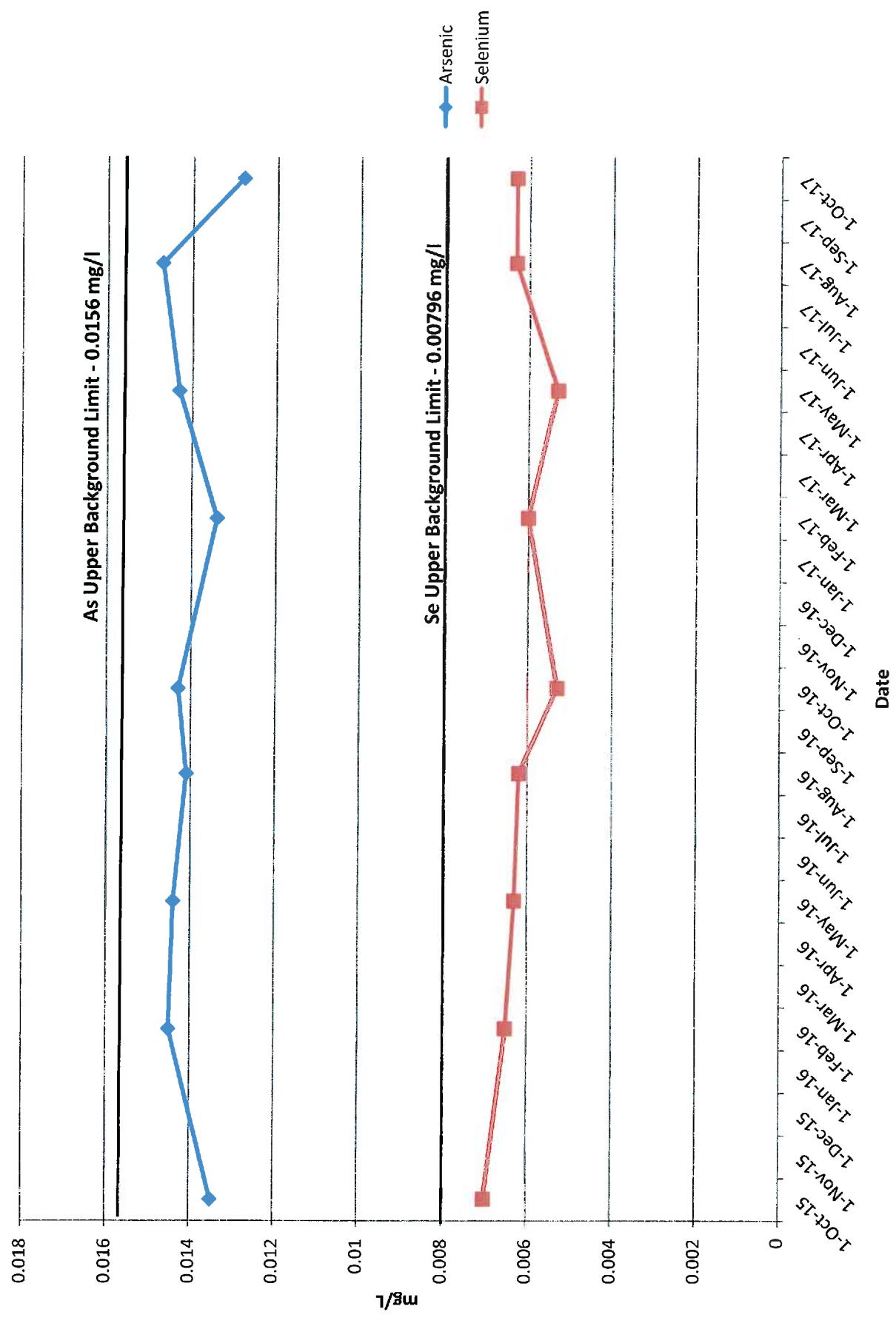
MW 8 - TDS, Conductivity, Chloride



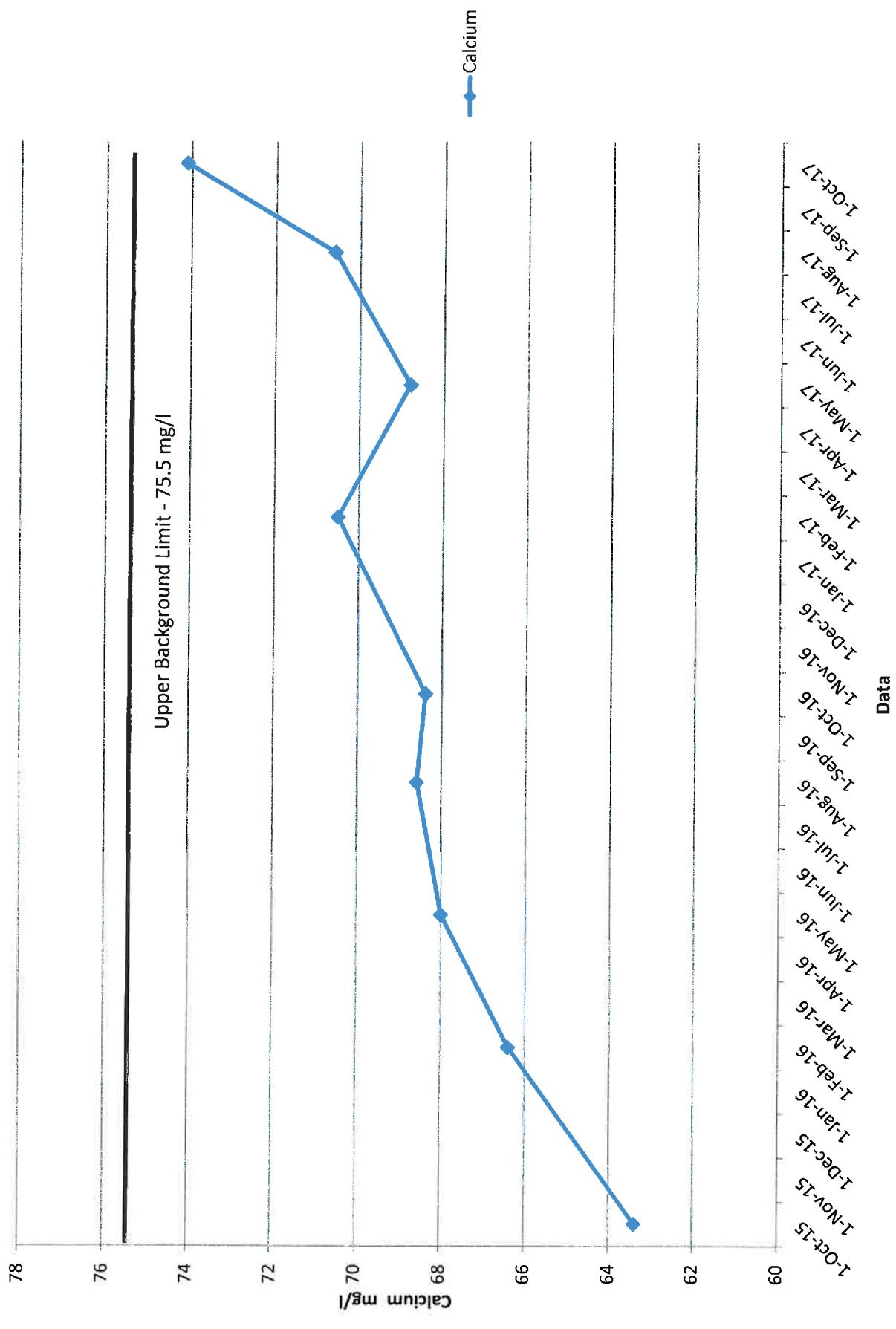
MW 8 - pH



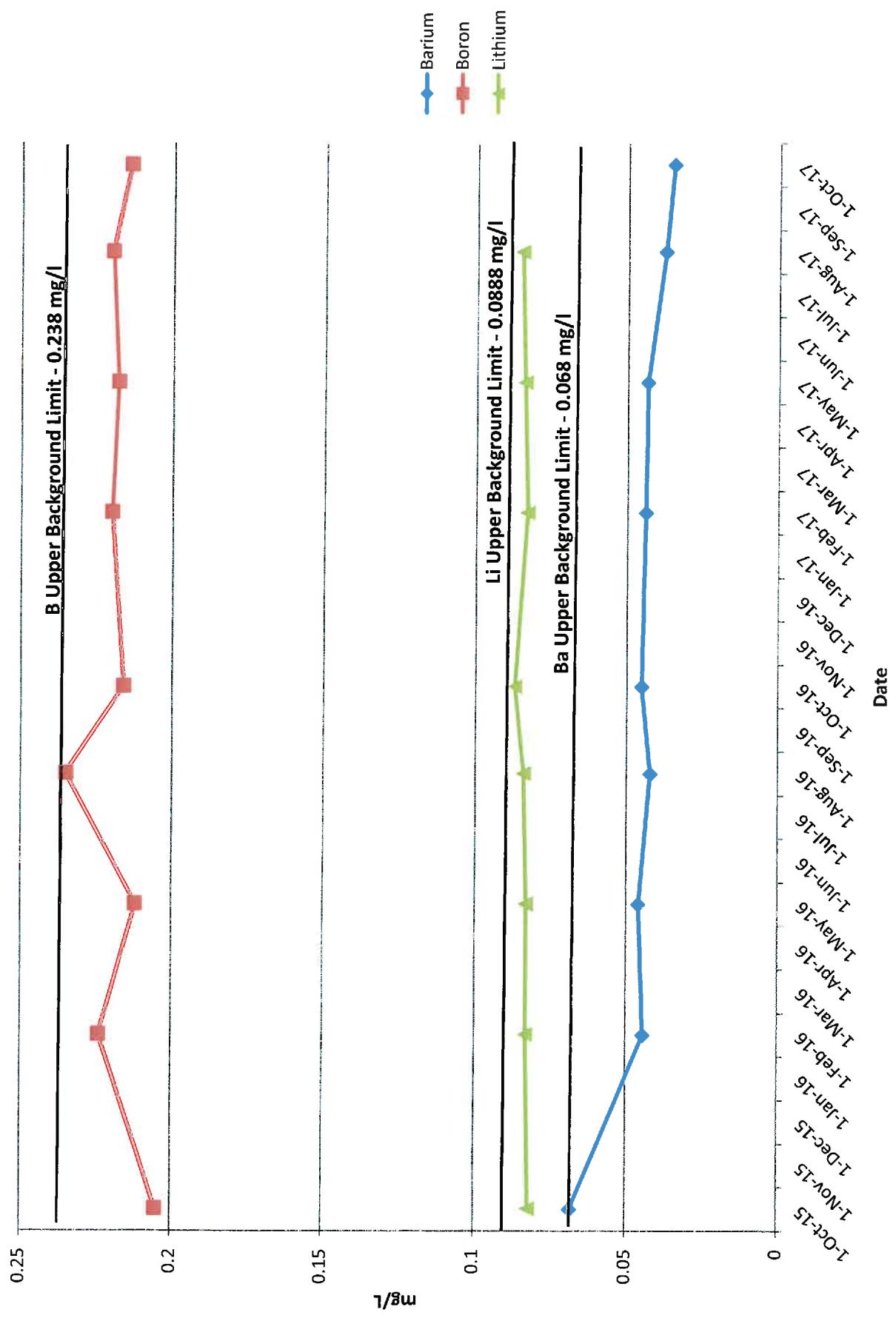
MW 8 - As and Selenium



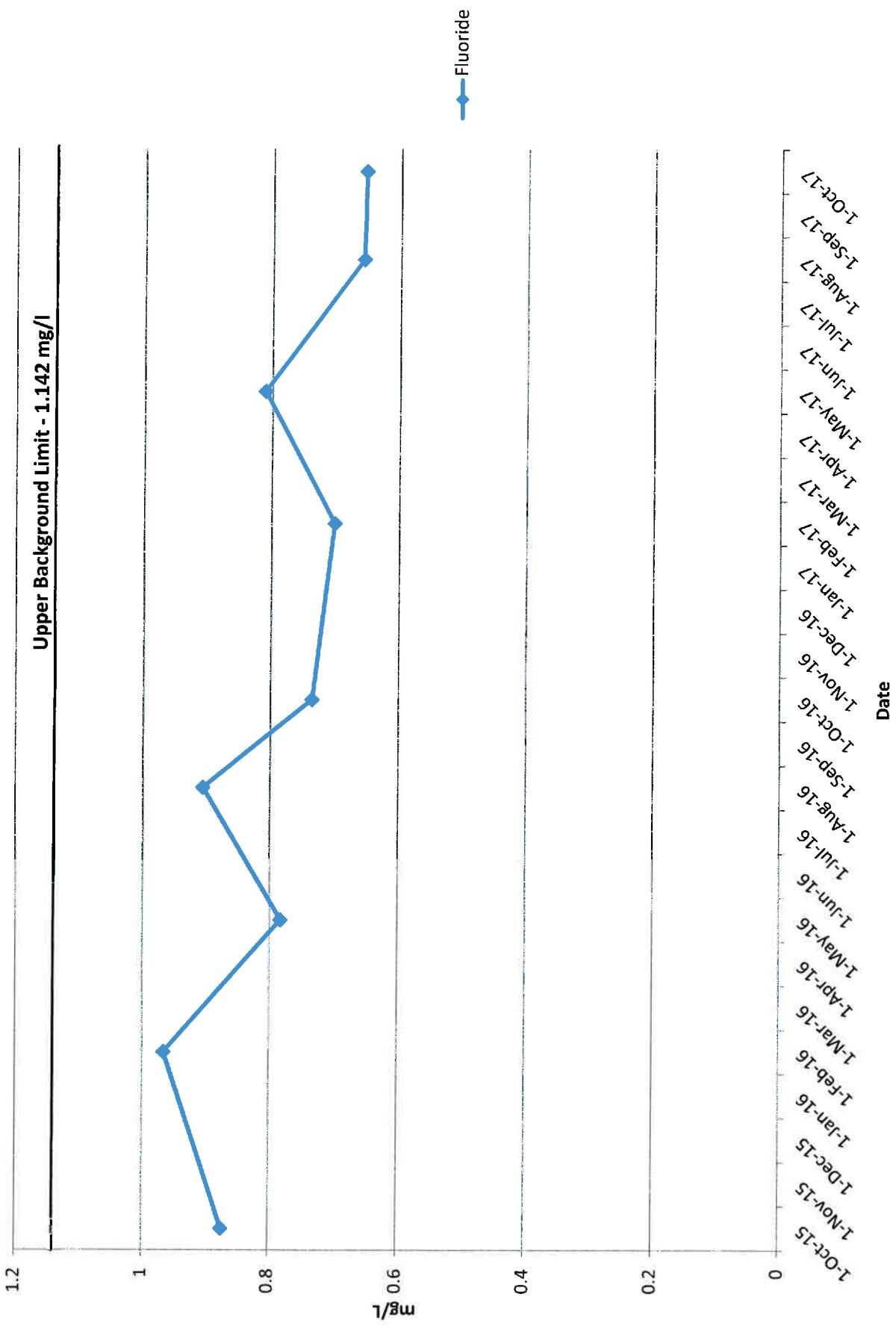
Monitor Well 8 - Calcium



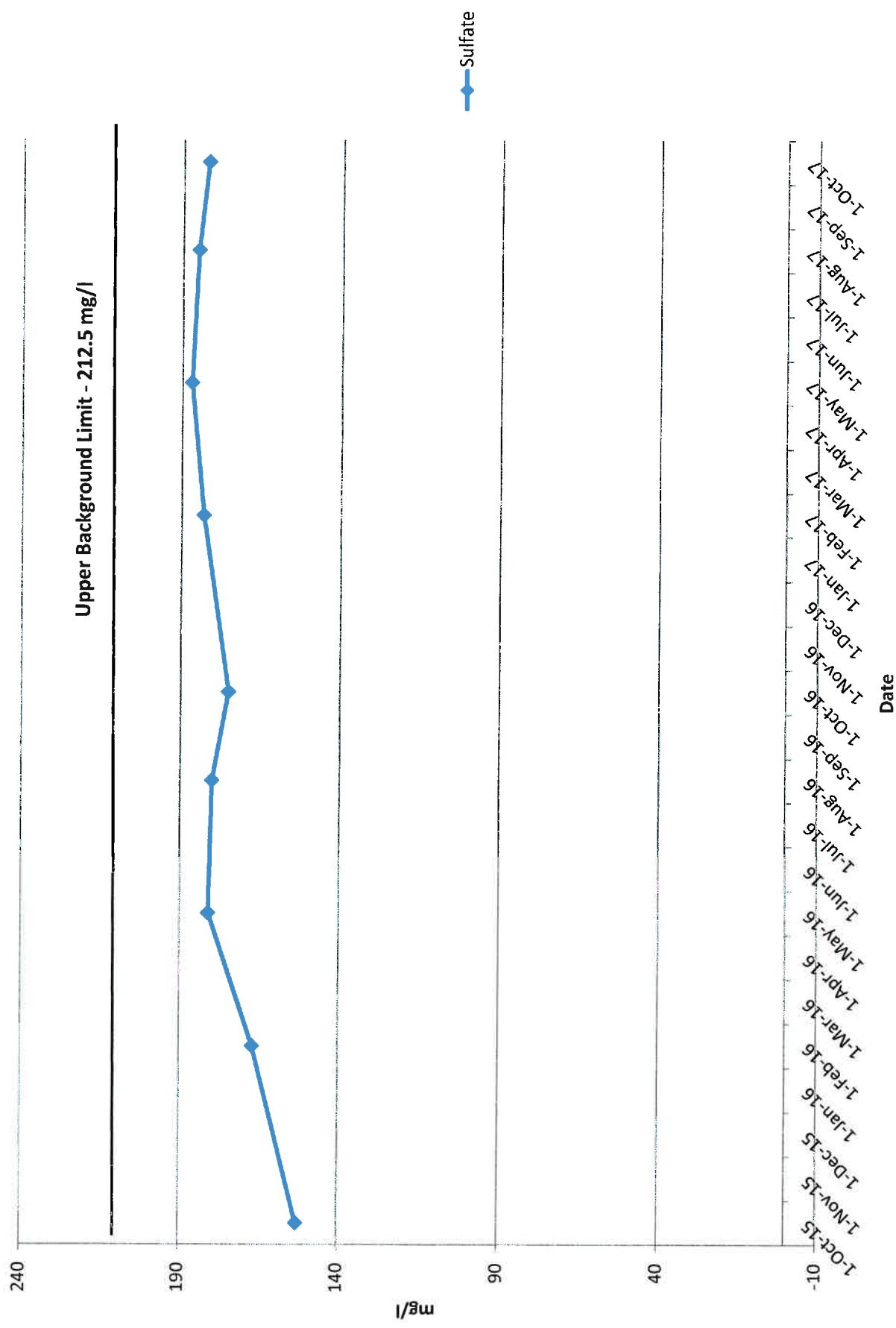
MW 8 - Ba, B, Li



MW 8 - Fluoride



Monitor Well 8 - Sulfate



Constituents Measured as Non Detects in Wells

Well ID	Antimony	Beryllium	Cadmium	Cobalt	Chromium	Molybdenum
TSMW-1	X	X	X	X	X	X
TSMW-3	X	X	X	X	X	X
TSMW-4	X	X	X	X	X	D
TSMW-8	X	X	X	X	D	X

Well ID	Lead	Mercury	Silver	Thallium
TSMW-1	X	X	X	X
TSMW-3	X	X	X	X
TSMW-4	X	X	X	X
TSMW-8	X	X	X	X

Notes:

X- Non Detect

D-Detected