

Annual Groundwater Monitoring Report

Southwestern Electric Power Company

J. Robert Welsh Power Plant

Landfill CCR Management Unit

1187 Country Road 4865

Titus County

Pittsburg, Texas

January 2020

Prepared by:

American Electric Power Service Corporation

1 Riverside Plaza

Columbus, Ohio 43215



An **AEP** Company

BOUNDLESS ENERGY™

Table of Contents

I. Overview 2

II. Groundwater Monitoring Well Locations and Identification Numbers 3

III. Monitoring Wells Installed or Decommissioned 5

IV. Groundwater Quality Data and Static Water Elevation Data, With Flow Rate and Direction and Discussion 5

V. Statistical Evaluations completed in 2019 5

VI. Alternate Source Demonstrations completed in 2019..... 6

VII. Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency..... 6

VIII. Other Information Required..... 6

IX. Description of Any Problems Encountered in 2019 and Actions Taken 6

X. A Projection of Key Activities for the Upcoming Year..... 6

Appendix I

Appendix II

Appendix III

Appendix IV

Appendix V

I. Overview

This *Annual Groundwater Monitoring Report* (Report) has been prepared to report the status of activities for the preceding year for an existing CCR unit at Southwestern Electric Power Company's, a wholly-owned subsidiary of American Electric Power Company (AEP), Welsh Power Plant. The USEPA's CCR rules require that the Annual Groundwater Monitoring Report be posted to the operating record for the preceding year no later than January 31, 2020.

In general, the following activities were completed:

- Groundwater samples were collected and analyzed for Appendix III and Appendix IV constituents, as specified in 40 CFR 257.95 *et seq.* and AEP's *Groundwater Sampling and Analysis Plan (2016)*;
- Semi-annual Groundwater data underwent various validation tests, including tests for completeness, valid values, transcription errors, and consistent units;
- No statistically significant levels (SSLs) were identified;
- Statistically significant increases (SSIs) remain without alternate source demonstrations, keeping the unit in assessment monitoring.
- Groundwater Monitoring Statistical Evaluation Reports to evaluate groundwater data were prepared in accordance with 40 CFR 257.93 and certified. The statistical process was guided by USEPA's *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* ("Unified Guidance", USEPA, 2009).
- This CCR Unit remained in assessment monitoring throughout 2019.

The major components of this annual report, to the extent applicable at this time, are presented in sections that follow:

- A map, aerial photograph or a drawing showing the CCR management unit(s), all groundwater monitoring wells and monitoring well identification numbers;
- Identification of any monitoring wells that were installed or decommissioned during the preceding year, along with a statement as to why that happened;
- All of the monitoring data collected, including the rate and direction of groundwater flow, plus a summary showing the number of samples collected per monitoring well, the dates the samples were collected and whether the sample was collected as part of detection monitoring or assessment monitoring programs is included in Appendix I;
- Statistical reports are located in Appendix II

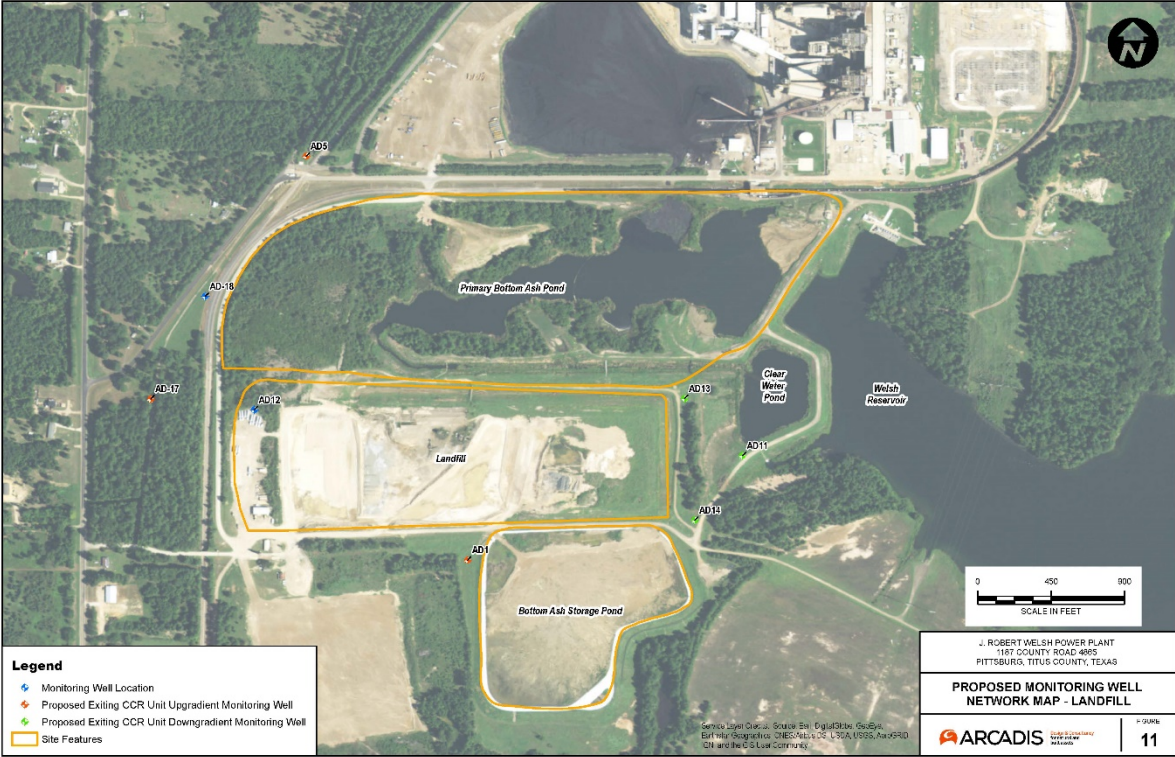
- A summary of any transition between monitoring programs or an alternate monitoring frequency, for example the date and circumstances for transitioning from detection monitoring to assessment monitoring, in addition to identifying the constituents detected at a statistically significant increase over background concentrations (Appendix IV).
- Other information required to be included in the annual report such as alternate source demonstration or assessment of corrective measures, if applicable.

In addition, this report summarizes key actions completed, and where applicable, describes any problems encountered and actions taken to resolve those problems. The report includes a projection of key activities for the upcoming year.

II. Groundwater Monitoring Well Locations and Identification Numbers

The figure that follows depicts the PE-certified groundwater monitoring network, the monitoring well locations and their corresponding identification numbers.

Landfill Monitoring Wells	
Up Gradient	Down Gradient
AD-1	AD-11
AD-5	AD-13
AD-17	AD-14



D:\arcadis\pub\230250\proj\1102\PROJ\Network_Proposed_Landfill.mxd (2017) (July 18, 17) - proposed_mnw_c.mxd

III. Monitoring Wells Installed or Decommissioned

During 2019, no monitoring wells were installed or decommissioned during this time period.

IV. Groundwater Quality Data and Static Water Elevation Data. With Flow Rate and Direction and Discussion

Appendix I contains tables showing the groundwater quality data obtained under 40 CFR 257.90 through 275.9. Static water elevation data from each monitoring event also are shown in Appendix I, along with the groundwater velocity, groundwater flow direction and potentiometric maps developed after each sampling event.

The sampling event conducted 5/30/19 satisfies the requirement of 257.95(b).

V. Statistical Evaluations completed in 2019

During the 2nd semi-annual 2018 event the following SSIs were determined:

- Boron concentrations exceeded the interwell UPL of 0.77 mg/L at AD-11 (1.84 mg/L), AD-13 (1.49 mg/L), and AD-14 (1.51 mg/L).
- Chloride concentrations exceeded the intrawell UPLs of 12.6 mg/L at AD-11 (15.0 mg/L) and 6.45 mg/L at AD-14 (12.00 mg/L).
- pH value was below the interwell LPL of 4.29 SU at AD-14 (4.27 SU).
- Sulfate concentration exceeded the intrawell UPL of 131 mg/L at AD-14 (204 mg/L).
- TDS concentration exceeded the intrawell UPL of 325 mg/L at AD-14 (384 mg/L).

SSLs were not determined for the landfill during 2nd semi-annual 2018 event.

During the 1st semi-annual 2019 event, the following SSIs were determined:

- Boron concentrations exceeded the interwell UPL of 0.775 mg/L at AD-11 (1.63 mg/L and 1.34 mg/L) and AD-14 (1.20 mg/L and 1.04 mg/L).

SSLs were not determined for the landfill during the 1st semi-annual 2019 event.

During the 2nd semi-annual 2019 event, the following SSIs were determined:

- Boron concentrations exceeded the interwell UPL of 0.700 mg/L at AD-11 (1.56 mg/L), AD-13 (0.780 mg/L), and AD-14 (1.25 mg/L).
- TDS concentration at AD-14 exceeded the intrawell UPL of 369 mg/L at AD-14 (440 mg/L).

SSLs were not determined for the landfill during the 2nd semi-annual 2019 event.

These SSIs cause the unit to remain in assessment monitoring.

The statistical reports completed in 2019 are found in Appendix II

VI. Alternate Source Demonstrations completed in 2019

No ASDs were conducted for the landfill's SSIs.

VII. Discussion About Transition Between Monitoring Requirements or Alternate Monitoring Frequency

This unit remains in assessment monitoring.

VIII. Other Information Required

As required by the CCR assessment monitoring rules in 40 CFR 257.95 (b) and (d 1), sampling all CCR wells for the required Appendix III and IV parameters was completed in 2019. Statistical comparison of Appendix III and IV parameters to the GWPSs was completed in 2019.

IX. Description of Any Problems Encountered in 2019 and Actions Taken

No significant problems were encountered.

X. A Projection of Key Activities for the Upcoming Year

Key activities for 2020 include:

- Assessment monitoring will continue;
- Evaluation of the assessment monitoring results from a statistical analysis viewpoint, looking for SSIs as well as SSLs above GWPS;
- Responding to any new data received in light of CCR rule requirements;
- Preparation of the next annual groundwater report.

APPENDIX I

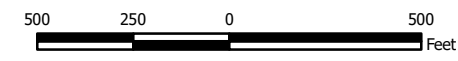
Tables follow, showing the groundwater monitoring data collected, the rate and direction of groundwater flow, and a summary showing the number of samples collected per monitoring well. The dates that the samples were collected also is shown.



- Legend**
- Groundwater Monitoring Well
 - Approximate Groundwater Flow Direction
 - Groundwater Elevation Contour
 - CCR Units

Notes

- Monitoring well coordinates and water level data (collected on February 20-21, 2019) provided by AEP.
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluations (Arcadis, 2016).
- Groundwater elevation units are feet above mean sea level.
- AD-16 was replaced with AD-16R on 4/12/2017.



**Groundwater Potentiometric Map
February 2019**

AEP Welsh Power Plant
Cason, Texas



Columbus, Ohio

2020/01/22

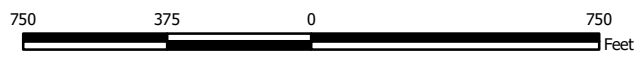
Figure
1



- Legend**
- Groundwater Monitoring Well
 - ➔ Approximate Groundwater Flow Direction
 - Groundwater Elevation Contour
 - ▭ CCR Units

Notes

- Monitoring well coordinates and water level data (collected on May 29-30, 2019) provided by AEP.
- AD-10, AD-6, AD-7, AD-2, and AD-12 were not gauged during this event
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluations (Arcadis, 2016).
- Groundwater elevation units are feet above mean sea level.
- AD-16 was replaced with AD-16R on 4/12/2017.



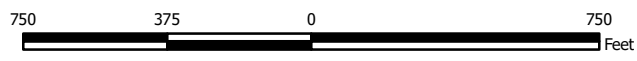
Groundwater Potentiometric Map May 2019		Figure 2
AEP Welsh Power Plant Cason, Texas		
Geosyntec consultants		
Columbus, Ohio	2019/12/12	



- Legend**
- ◆ Groundwater Monitoring Well
 - ➔ Approximate Groundwater Flow Direction
 - Groundwater Elevation Contour
 - - - Groundwater Elevation Contour (Inferred)
 - ▭ CCR Units

Notes

- Monitoring well coordinates and water level data (collected on July 23-24, 2019) provided by AEP.
- AD-12 and AD-6 were not gauged during this event.
- Site features based on information available in CCR Groundwater Monitoring Well Network Evaluations (Arcadis, 2016).
- Groundwater elevation units are feet above mean sea level.
- Inferred groundwater contours were ectrapolated from topographic and hydrographic information as well as previous monitoring events.



**Groundwater Potentiometric Map
July 2019**

AEP Welsh Power Plant
Cason, Texas

Geosyntec
consultants

Columbus, Ohio

2020/01/22

Figure
3

**Table 1: Residence Time Calculation Summary
Welsh Landfill**

CCR Management Unit	Monitoring Well	Well Diameter (inches)	2019-02		2019-05		2019-07	
			Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)	Groundwater Velocity (ft/year)	Groundwater Residence Time (days)
Landfill	AD-5 ^[1]	2.0	1.5	40.2	2.4	25.4	2.1	29.2
	AD-11 ^[2]	2.0	5.3	11.4	7.4	8.2	4.4	13.9
	AD-13 ^[2]	0.0	2.5	24.7	4.8	12.8	3.8	15.8
	AD-14 ^[2]	0.0	3.5	17.2	1.9	32.2	1.9	32.9
	AD-1 ^[1]	2.0	2.7	22.4	5.3	11.5	4.1	14.9
	AD-17 ^[1]	2.0	8.9	6.9	4.7	13.0	3.5	17.5

Notes:

[1] - Upgradient Well

[2] - Downgradient Well

**Table 1 - Groundwater Data Summary: AD-1
Welsh - LF
Appendix III Constituents**

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/26/2016	Background	0.346	36.5	5	<0.083 U	5.9	252	42
7/29/2016	Background	0.35	39.6	4	<0.083 U	5.3	239	36
9/30/2016	Background	0.332	15	5	<0.083 U	5.4	173	35
10/21/2016	Background	0.398	19.1	4	<0.083 U	5.2	192	42
12/14/2016	Background	0.394	8.74	4	<0.083 U	5.2	200	40
1/20/2017	Background	0.656	129	4	<0.083 U	7.1	538	68
2/24/2017	Background	0.7	147	9	<0.083 U	6.9	612	68
6/8/2017	Background	0.449	15.1	4	<0.083 U	5.1	176	42
10/6/2017	Detection	0.453	14.3	4	<0.083 U	5.3	160	40
5/24/2018	Assessment	0.345	10.2	4	<0.083 U	2.2	150	43
8/14/2018	Assessment	0.443	5.95	5	<0.083 U	5.2	160	44
2/20/2019	Assessment	0.504	142	2.82	0.24	7.3	522	49.2
5/30/2019	Assessment	0.689	138	1.59	0.29	6.7	588	43.3
7/24/2019	Assessment	0.644	62.7	2	0.106 J	6.0	180	58

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: AD-1

Welsh - LF

Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/26/2016	Background	<0.93 U	1.39361 J	191	0.271453 J	0.213294 J	0.240267 J	1.15339 J	1.184	<0.083 U	<0.68 U	0.01	0.033	0.53149 J	1.74922 J	0.959865 J
7/29/2016	Background	<0.93 U	<1.05 U	191	0.315631 J	0.0940357 J	<0.23 U	0.615933 J	0.9952	<0.083 U	<0.68 U	0.019	0.00793 J	<0.29 U	1.81763 J	<0.86 U
9/30/2016	Background	<0.93 U	2.96797 J	141	0.382874 J	<0.07 U	5	0.850408 J	1.38	<0.083 U	3.38434 J	0.014	0.01773 J	<0.29 U	1.02629 J	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	114	0.311247 J	<0.07 U	0.412131 J	0.649606 J	1.141	<0.083 U	<0.68 U	0.008	0.00534 J	1.39872 J	2.03168 J	1.25062 J
12/14/2016	Background	<0.93 U	<1.05 U	72	0.34133 J	<0.07 U	<0.23 U	0.424105 J	0.719	<0.083 U	<0.68 U	0.008	0.01521 J	<0.29 U	1.85825 J	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	410	0.0366913 J	<0.07 U	<0.23 U	0.480125 J	3.009	<0.083 U	<0.68 U	0.000275956 J	<0.005 U	<0.29 U	4.04737 J	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	488	<0.02 U	<0.07 U	<0.23 U	0.765099 J	4.309	<0.083 U	<0.68 U	0.001	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	1.14 J	93.46	0.37 J	<0.07 U	0.66 J	0.77 J	0.676	<0.083 U	<0.68 U	0.00902	0.007 J	<0.29 U	2.1 J	<0.86 U
5/24/2018	Assessment	3.17 J	<1.05 U	79.9	0.39 J	<0.07 U	<0.23 U	0.35 J	1.983	<0.083 U	<0.68 U	0.00814	0.006 J	<0.29 U	1.38 J	<0.86 U
8/14/2018	Assessment	0.03 J	0.21	63	0.482	0.02	--	--	1.102	<0.083 U	0.238	0.00708	0.013 J	0.210	1.7	0.03 J
2/20/2019	Assessment	0.16	0.46	457	0.09 J	0.01 J	0.306	0.399	3.159	0.24	0.124	0.00155	<0.005 U	1 J	0.7	<0.1 U
5/30/2019	Assessment	0.16	0.60	512	0.244	0.01 J	0.1 J	0.756	2.717	0.29	0.197	<0.009 U	<0.005 U	2.43	1.4	<0.1 U
7/24/2019	Assessment	0.08 J	0.39	245	0.54	0.02 J	0.1 J	0.789	1.819	0.106 J	0.1 J	0.00557	<0.005 U	2 J	3.4	<0.1 U

Notes:
 µg/L: micrograms per liter
 SU: standard unit
 <: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
 J: Estimated value. Parameter was detected at concentration below the reporting limit
 --: Not analyzed
 pCi/L: picocuries per liter

**Table 1 - Groundwater Data Summary: AD-5
Welsh - LF
Appendix III Constituents**

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	0.03	36.9	15	0.3469 J	6.4	337	123
7/29/2016	Background	0.04	44.7	16	<0.083 U	5.4	360	163
9/30/2016	Background	0.04	46.3	15	0.2436 J	5.3	416	190
10/21/2016	Background	0.05	50.7	14	<0.083 U	5.9	448	267
12/14/2016	Background	0.05	49.6	13	<0.083 U	6.2	484	233
1/20/2017	Background	0.04	49.8	14	<0.083 U	6.3	438	234
2/24/2017	Background	0.04	33	15	<0.083 U	5.5	286	127
6/8/2017	Background	0.05281	49.7	14	<0.083 U	6.0	300	82
10/6/2017	Detection	0.04322	33.1	16	<0.083 U	5.6	258	82
5/24/2018	Assessment	0.05007	28.1	22	<0.083 U	6.2	242	60
8/15/2018	Assessment	0.05	40.5	19	<0.083 U	6.2	428	240
2/21/2019	Assessment	0.033	33.9	24.7	0.21	5.4	220	46.5
5/30/2019	Assessment	0.03 J	30.0	22.3	0.29	6.3	238	51.3
7/24/2019	Assessment	0.04 J	41.1	18	0.112 J	6.3	354	90

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: AD-5

Welsh - LF

Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	<1.05 U	57	0.149801 J	0.0765156 J	0.555038 J	14	1.634	0.3469 J	<0.68 U	0.135	0.01135 J	<0.29 U	<0.99 U	<0.86 U
7/29/2016	Background	2.05116 J	2.90819 J	93	0.518653 J	0.502155 J	0.411466 J	15	4.75	<0.083 U	<0.68 U	0.191	0.01516 J	<0.29 U	1.08901 J	<0.86 U
9/30/2016	Background	<0.93 U	4.7609 J	87	0.251584 J	<0.07 U	0.90676 J	14	3.33	0.2436 J	<0.68 U	0.186	<0.005 U	<0.29 U	<0.99 U	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	70	0.08781 J	0.107488 J	0.248085 J	9	2.319	<0.083 U	<0.68 U	0.225	<0.005 U	1.36984 J	<0.99 U	<0.86 U
12/14/2016	Background	<0.93 U	1.15381 J	53	0.164529 J	0.203546 J	0.747921 J	13	2.182	<0.083 U	<0.68 U	0.199	0.00802 J	<0.29 U	<0.99 U	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	47	0.0574718 J	0.180502 J	<0.23 U	12	1.023	<0.083 U	<0.68 U	0.239	<0.005 U	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	42	0.0306858 J	<0.07 U	<0.23 U	13	1.788	<0.083 U	<0.68 U	0.166	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	3.85 J	87.7	0.08 J	0.39 J	0.28 J	11.93	2.32	<0.083 U	<0.68 U	0.124	<0.005 U	<0.29 U	<0.99 U	<0.86 U
5/24/2018	Assessment	<0.93 U	<1.05 U	71.16	<0.02 U	0.23 J	0.8 J	14.24	1.946	<0.083 U	<0.68 U	0.121	<0.005 U	<0.29 U	<0.99 U	<0.86 U
8/15/2018	Assessment	0.01 J	1.69	63.7	0.055	0.008 J	0.072	11.4	0.316	<0.083 U	0.079	0.147	<0.005 U	0.13	0.08 J	<0.01 U
2/21/2019	Assessment	0.02 J	1.59	69.4	0.08 J	<0.01 U	0.432	8.58	1.267	0.21	0.147	0.0807	<0.005 U	<0.4 U	0.1 J	<0.1 U
5/30/2019	Assessment	<0.02 U	3.05	60.5	0.08 J	<0.01 U	0.06 J	11.8	1.431	0.29	0.05 J	0.104	0.006 J	<0.4 U	0.05 J	<0.1 U
7/24/2019	Assessment	<0.02 U	2.48	77.4	0.05 J	<0.01 U	0.05 J	8.38	2.533	0.112 J	<0.05 U	0.108	<0.005 U	<0.4 U	0.06 J	<0.1 U

Notes:

µg/L: micrograms per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

- -: Not analyzed

pCi/L: picocuries per liter

**Table 1 - Groundwater Data Summary: AD-11
Welsh - LF
Appendix III Constituents**

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	2.47	8.47	9	2	5.2	388	518
7/29/2016	Background	2.83	8.88	10	2	3.8	1000	596
9/30/2016	Background	3.4	10.7	12	2	4.1	1065	683
10/21/2016	Background	3.77	8.78	11	3	3.7	1024	706
12/14/2016	Background	3.36	8.98	10	2	3.8	1044	548
1/20/2017	Background	2.81	10.3	11	2	4.4	1048	760
2/24/2017	Background	2.88	9.31	10	2	4.3	876	558
6/8/2017	Background	2.79	9.93	10	1.366	3.9	960	556
10/6/2017	Detection	2.58	6.99	10	<0.083 U	4.4	752	527
1/18/2018	Detection	1.9	--	--	--	4.5	564	377
5/23/2018	Assessment	--	--	--	<0.083 U	4.1	--	--
8/15/2018	Assessment	--	--	--	<0.083 U	4.7	--	--
9/17/2018	Assessment	1.84	6.61	15	--	--	720	410
2/5/2019	Assessment	1.47	4.56	9.47	0.47	4.3	--	225
2/21/2019	Assessment	1.63	19.1	9.23	0.41	4.9	542	306
4/30/2019	Assessment	1.34	7.53	--	--	5.3	--	--
5/29/2019	Assessment	1.40	5.78	6.96	0.47	4.2	680	367
7/23/2019	Assessment	1.56	7.19	6	0.338 J	4.5	700	342

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: AD-11

Welsh - LF

Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	<1.05 U	14	4	0.325877 J	3	26	1.773	2	<0.68 U	0.032	0.02258 J	<0.29 U	1.54658 J	<0.86 U
7/29/2016	Background	<0.93 U	<1.05 U	12	4	0.453906 J	0.581828 J	26	2.23	2	<0.68 U	0.047	0.00624 J	<0.29 U	1.63477 J	1.31673 J
9/30/2016	Background	<0.93 U	1.77308 J	52	5	0.579196 J	7	30	3.92	2	4.25302 J	0.047	0.01924 J	<0.29 U	2.09096 J	1.07034 J
10/21/2016	Background	<0.93 U	<1.05 U	20	5	0.515668 J	2	27	2.56	3	<0.68 U	0.047	0.0156 J	1.51918 J	<0.99 U	<0.86 U
12/14/2016	Background	<0.93 U	<1.05 U	13	4	0.366319 J	0.365212 J	25	1.569	2	<0.68 U	0.041	0.01212 J	<0.29 U	1.57203 J	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	13	4	0.394925 J	0.749253 J	25	1.082	2	<0.68 U	0.046	<0.005 U	<0.29 U	<0.99 U	1.23139 J
2/24/2017	Background	<0.93 U	<1.05 U	19	4	0.430668 J	2	24	1.45	2	1.18289 J	0.035	0.01613 J	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	1.23 J	10.12	2.79	0.41 J	0.32 J	22.16	1.902	1.366	<0.68 U	0.03654	<0.005 U	<0.29 U	<0.99 U	<0.86 U
5/23/2018	Assessment	<0.93 U	2.6 J	16.27	0.89 J	0.18 J	0.8 J	8.63	1.912	<0.083 U	<0.68 U	0.01875	0.007 J	<0.29 U	1.34 J	46
8/15/2018	Assessment	0.02 J	1.05	11.9	1.18	0.37	0.257	15.3	2.568	<0.083 U	1.42	0.0175	<0.005 U	0.05 J	2.4	0.2
2/21/2019	Assessment	0.03 J	0.51	40.3	0.824	0.19	0.259	8.58	1.506	0.41	0.523	0.0157	<0.005 U	<0.4 U	1.5	0.1 J
5/29/2019	Assessment	<0.02 U	0.78	19.1	1.05	0.20	0.369	9.82	1.473	0.47	0.847	0.02 J	<0.005 U	<0.4 U	2.2	0.1 J
7/23/2019	Assessment	<0.02 U	0.59	16.4	0.987	0.24	0.413	10.5	2.246	0.338 J	0.976	0.0153	<0.005 U	<0.4 U	1.0	0.2 J

Notes:
 µg/L: micrograms per liter
 SU: standard unit
 <: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
 J: Estimated value. Parameter was detected at concentration below the reporting limit
 -: Not analyzed
 pCi/L: picocuries per liter

**Table 1 - Groundwater Data Summary: AD-13
Welsh - LF
Appendix III Constituents**

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	1.19	8.02	12	0.4948 J	6.1	900	177
7/29/2016	Background	1.23	3.7	15	0.7416 J	4.5	404	187
9/30/2016	Background	1.37	2.7	17	0.6464 J	4.6	431	207
10/21/2016	Background	1.67	3.66	19	1.1263	4.3	482	226
12/14/2016	Background	1.96	3.77	18	0.4149 J	4.8	596	287
1/20/2017	Background	0.402	33.5	7	<0.083 U	5.4	222	90
2/24/2017	Background	1.27	10.3	13	<0.083 U	5.1	392	183
6/8/2017	Background	1.68	3.03	15	0.6679 J	4.2	494	244
10/6/2017	Detection	2.23	5.11	13	<0.083 U	4.6	564	345
1/18/2018	Detection	2.13	--	--	--	4.7	588	383
5/23/2018	Assessment	--	--	--	0.6534 J	4.5	--	--
8/14/2018	Assessment	--	--	--	0.7442 J	4.8	--	--
9/17/2018	Assessment	1.49	10.1	18	--	--	620	316
2/5/2019	Assessment	0.656	5.85	5.43	0.39	4.5	--	130
2/20/2019	Assessment	0.484	17.7	3.95	0.28	4.9	234	96.3
4/30/2019	Assessment	0.483	--	--	--	4.9	--	--
5/30/2019	Assessment	0.477	9.88	3.60	0.53	5.2	196	94.0
7/23/2019	Assessment	0.78	6.16	5	0.169 J	4.8	334	146

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: AD-13

Welsh - LF

Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	<1.05 U	62	0.682114 J	<0.07 U	0.690428 J	4.11633 J	1.223	0.4948 J	<0.68 U	0.011	0.01797 J	<0.29 U	1.4772 J	<0.86 U
7/29/2016	Background	<0.93 U	<1.05 U	36	0.922975 J	0.0850015 J	<0.23 U	4.46011 J	1.601	0.7416 J	<0.68 U	0.026	0.00515 J	<0.29 U	2.00998 J	<0.86 U
9/30/2016	Background	<0.93 U	<1.05 U	40	0.827513 J	0.0965393 J	0.77177 J	4.59287 J	2.213	0.6464 J	<0.68 U	0.020	<0.005 U	<0.29 U	1.03137 J	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	30	0.934335 J	0.0913657 J	0.581648 J	4.91926 J	3.662	1.1263	<0.68 U	0.022	<0.005 U	0.870491 J	1.03637 J	0.97358 J
12/14/2016	Background	<0.93 U	3.69546 J	51	1	0.185393 J	7	7	2.27	0.4149 J	1.09698 J	0.025	0.01565 J	0.353324 J	1.64297 J	<0.86 U
1/20/2017	Background	<0.93 U	6.00	112	0.198035 J	<0.07 U	4	1.76949 J	2.228	<0.083 U	2.72659 J	0.004	0.00673 J	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	41	0.612394 J	<0.07 U	<0.23 U	4.55541 J	1.556	<0.083 U	<0.68 U	0.015	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	1.53 J	<1.05 U	17.12	0.89 J	0.14 J	<0.23 U	6.24	1.565	0.6679 J	<0.68 U	0.02082	<0.005 U	<0.29 U	1.03 J	<0.86 U
5/23/2018	Assessment	<0.93 U	<1.05 U	26.53	0.87 J	<0.07 U	0.73 J	9.37	2.16	0.6534 J	<0.68 U	0.0291	0.008 J	<0.29 U	<0.99 U	<0.86 U
8/14/2018	Assessment	0.03 J	1.37	16.9	0.971	0.31	0.503	13.1	4.037	0.7442 J	1	0.0321	<0.005 U	0.06 J	1.7	0.277
2/20/2019	Assessment	0.02 J	0.380	55.2	0.302	0.05	0.2 J	2.35	2.534	0.28	0.05 J	0.0094	<0.005 U	<0.4 U	0.4	<0.1 U
5/30/2019	Assessment	0.03 J	0.320	60.9	0.385	0.07	0.310	3.15	3.15	0.53	0.05 J	0.009 J	<0.005 U	<0.4 U	0.4	<0.1 U
7/23/2019	Assessment	0.02 J	0.370	23.6	0.443	0.09	0.283	3.82	1.748	0.169 J	0.204	0.0175	<0.005 U	<0.4 U	0.3	0.1 J

Notes:
 µg/L: micrograms per liter
 SU: standard unit
 <: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
 J: Estimated value. Parameter was detected at concentration below the reporting limit
 -: Not analyzed
 pCi/L: picocuries per liter

**Table 1 - Groundwater Data Summary: AD-14
Welsh - LF
Appendix III Constituents**

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/31/2016	Background	1.28	2.88	4	<0.083 U	4.8	285	115
7/29/2016	Background	1.14	2.51	5	<0.083 U	4.2	267	111
9/30/2016	Background	1.14	1.19	5	<0.083 U	4.2	252	111
10/21/2016	Background	1.25	2.48	4	<0.083 U	3.9	276	118
12/14/2016	Background	1.25	2.41	5	<0.083 U	4.1	296	101
1/20/2017	Background	0.915	10.3	4	<0.083 U	6.1	254	92
2/24/2017	Background	1.06	9.48	4	<0.083 U	5.4	212	90
6/8/2017	Background	1.26	7.69	6	<0.083 U	4.8	256	108
10/6/2017	Detection	1.63	3.55	10	<0.083 U	4.6	288	143
1/18/2018	Detection	1.57	--	6.43	--	5.7	--	--
5/23/2018	Assessment	--	--	--	<0.083 U	4.2	--	--
8/14/2018	Assessment	--	--	--	<0.083 U	4.3	--	--
9/17/2018	Assessment	1.51	4.51	12	--	--	384	204
2/5/2019	Assessment	1.1	4.13	3.13	0.15	4.3	--	99.9
2/20/2019	Assessment	1.2	10.3	2.2	0.14	4.3	236	90.4
4/30/2019	Assessment	1.04	--	--	--	4.4	--	--
5/29/2019	Assessment	1.21	9.80	3.65	0.19	4.5	274	122
7/23/2019	Assessment	1.25	9.93	8	0.162 J	5.5	440	171

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: AD-14

Welsh - LF

Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/31/2016	Background	<0.93 U	1.89384 J	31	0.65845 J	0.99504 J	0.536293 J	10	0.871	<0.083 U	<0.68 U	0.012	0.03	<0.29 U	2.91711 J	<0.86 U
7/29/2016	Background	<0.93 U	<1.05 U	84	0.653837 J	0.976466 J	1	9	1.487	<0.083 U	<0.68 U	0.024	0.02159 J	<0.29 U	1.93417 J	<0.86 U
9/30/2016	Background	<0.93 U	1.45308 J	30	0.473938 J	0.975306 J	0.775009 J	9	4.817	<0.083 U	<0.68 U	0.015	0.02217 J	<0.29 U	2.73939 J	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	39	0.543258 J	1	0.640984 J	9	1.972	<0.083 U	<0.68 U	0.014	0.02024 J	0.49697 J	2.46916 J	<0.86 U
12/14/2016	Background	<0.93 U	<1.05 U	47	0.536415 J	1	1	9	1.271	<0.083 U	<0.68 U	0.013	0.037	<0.29 U	3.32013 J	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	38	0.215525 J	0.226476 J	0.700394 J	2.91252 J	1.825	<0.083 U	<0.68 U	0.013	0.01863 J	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	42	0.286071 J	0.187588 J	<0.23 U	3.50056 J	0.512	<0.083 U	<0.68 U	0.012	0.01443 J	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	<1.05 U	44.83	0.38 J	0.67 J	1.27	6.78	1.138	<0.083 U	<0.68 U	0.0127	0.021 J	<0.29 U	2.61 J	<0.86 U
5/23/2018	Assessment	<0.93 U	<1.05 U	28.17	0.78 J	1.61	<0.23 U	14.34	1.601	<0.083 U	<0.68 U	0.0152	0.145	<0.29 U	3.62 J	<0.86 U
8/14/2018	Assessment	0.01 J	0.39	24	0.854	1.99	0.276	17.6	1.502	<0.083 U	0.174	0.011	0.181	0.03 J	3.7	0.242
2/20/2019	Assessment	0.03 J	0.34	41.2	0.387	0.35	0.247	4.37	1.172	0.14	0.09 J	0.0114	<0.005 U	<0.4 U	0.8	<0.1 U
5/29/2019	Assessment	0.03 J	0.4	44.8	0.556	0.81	0.2 J	7.82	1.946	0.19	0.137	0.02 J	0.181	<0.4 U	2	<0.1 U
7/23/2019	Assessment	<0.02 U	0.43	36.2	0.934	2.49	0.286	18.5	2.731	0.162 J	0.2	0.0155	0.123	<0.4 U	2.7	0.2 J

Notes:
 µg/L: micrograms per liter
 SU: standard unit
 <: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
 J: Estimated value. Parameter was detected at concentration below the reporting limit
 -: Not analyzed
 pCi/L: picocuries per liter

**Table 1 - Groundwater Data Summary: AD-17
Welsh - LF
Appendix III Constituents**

Collection Date	Monitoring Program	Boron	Calcium	Chloride	Fluoride	pH	Total Dissolved Solids	Sulfate
		mg/L	mg/L	mg/L	mg/L	SU	mg/L	mg/L
5/26/2016	Background	0.121	200	43	0.4023 J	7.2	1810	1166
7/29/2016	Background	0.119	195	32	0.4135 J	5.7	1576	1005
9/30/2016	Background	0.111	191	36	0.3055 J	6.2	1663	1055
10/21/2016	Background	0.124	194	32	0.583 J	6.1	1612	1163
12/14/2016	Background	0.135	196	31	0.5399 J	6.0	1560	1096
1/20/2017	Background	0.101	196	33	<0.083 U	5.9	1686	1445
2/24/2017	Background	0.135	189	30	<0.083 U	5.7	1628	1055
6/8/2017	Background	0.121	188	30	<0.083 U	5.8	1578	1105
10/6/2017	Detection	0.183	183	31	<0.083 U	5.9	1548	1090
5/24/2018	Assessment	0.239	193	39	<0.083 U	6.3	1836	1067
8/15/2018	Assessment	0.118	187	40	<0.083 U	5.6	1748	1168
2/21/2019	Assessment	0.151	207	43.2	0.18	6.9	1722	1060
5/30/2019	Assessment	0.158	202	41.7	<0.04 U	6.1	1546	1120
7/24/2019	Assessment	0.113	216	37	0.085 J	6.0	1864	1127

Notes:

mg/L: milligrams per liter

SU: standard unit

<: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.

J: Estimated value. Parameter was detected at concentration below the reporting limit

--: Not analyzed

Table 1 - Groundwater Data Summary: AD-17

Welsh - LF

Appendix IV Constituents

Collection Date	Monitoring Program	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Combined Radium	Fluoride	Lead	Lithium	Mercury	Molybdenum	Selenium	Thallium
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	pCi/L	mg/L	µg/L	mg/L	µg/L	µg/L	µg/L
5/26/2016	Background	<0.93 U	1.37501 J	21	0.173275 J	2	1	63	1.525	0.4023 J	<0.68 U	0.37	0.032	<0.29 U	<0.99 U	<0.86 U
7/29/2016	Background	1.13716 J	<1.05 U	20	0.307264 J	4	1	68	2.78	0.4135 J	<0.68 U	0.374	0.02133 J	1.04115 J	4.56733 J	<0.86 U
9/30/2016	Background	<0.93 U	<1.05 U	31	0.175474 J	0.848199 J	3	58	2.358	0.3055 J	<0.68 U	0.354	<0.005 U	<0.29 U	<0.99 U	<0.86 U
10/21/2016	Background	<0.93 U	<1.05 U	34	0.200656 J	2	4	65	2.224	0.583 J	<0.68 U	0.394	<0.005 U	0.322249 J	3.34422 J	<0.86 U
12/14/2016	Background	<0.93 U	<1.05 U	17	0.0498325 J	3	0.816224 J	68	2.384	0.5399 J	<0.68 U	0.323	0.01485 J	<0.29 U	<0.99 U	<0.86 U
1/20/2017	Background	<0.93 U	<1.05 U	14	0.0319852 J	3	68	68	2.436	<0.083 U	<0.68 U	0.341	<0.005 U	<0.29 U	<0.99 U	<0.86 U
2/24/2017	Background	<0.93 U	<1.05 U	20	0.0665729 J	2	1	73	2.288	<0.083 U	<0.68 U	0.331	<0.005 U	<0.29 U	<0.99 U	<0.86 U
6/8/2017	Background	<0.93 U	<1.05 U	10.3	<0.02 U	6.06	<0.23 U	74.8	1.598	<0.083 U	<0.68 U	0.329	0.013 J	<0.29 U	<0.99 U	<0.86 U
5/24/2018	Assessment	<0.93 U	<1.05 U	9.65	<0.02 U	6.46	<0.23 U	71.73	1.939	<0.083 U	<0.68 U	0.308	<0.005 U	<0.29 U	<0.99 U	<0.86 U
8/15/2018	Assessment	0.02 J	1.83	12.8	0.069	0.25	0.604	43.5	2.35	<0.083 U	1.1	0.243	0.011 J	0.35	0.3	0.074
2/21/2019	Assessment	0.08 J	2.51	120	0.240	0.27	3.34	64.5	2.657	0.18	2.49	0.268	0.007 J	0.7 J	0.8	<0.1 U
5/30/2019	Assessment	<0.02 U	0.410	19.6	0.02 J	0.03 J	0.246	51.1	2.508	<0.04 U	0.03 J	0.341	<0.005 U	<0.4 U	0.06 J	<0.1 U
7/24/2019	Assessment	<0.02 U	1.07	14.3	0.13	0.03 J	0.228	57.7	3.45	0.085 J	0.263	0.283	<0.005 U	<0.4 U	0.1 J	<0.1 U

Notes:
 µg/L: micrograms per liter
 SU: standard unit
 <: Non-detect value. Parameters which were not detected are shown as less than the method detection limit (MDL) followed by a 'U' flag.
 J: Estimated value. Parameter was detected at concentration below the reporting limit
 - -: Not analyzed
 pCi/L: picocuries per liter

APPENDIX II

Where applicable, show in this appendix the results from statistical analyses, and a description of the statistical analysis method chosen. These statistical analyses are to be conducted separately for each constituent in each monitoring well.

STATISTICAL ANALYSIS SUMMARY LANDFILL

**J. Robert Welsh Plant
Pittsburg, Texas**

Submitted to



1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec 
consultants

engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, Ohio 43221

January 8, 2019

CHA8473

TABLE OF CONTENTS

SECTION 1 Executive Summary	1
SECTION 2 Landfill Evaluation	2-1
2.1 Data Validation & QA/QC	2-1
2.2 Statistical Analysis.....	2-1
2.2.1 Establishment of GWPSs.....	2-2
2.2.2 Evaluation of Potential Appendix IV SSLs	2-2
2.2.3 Evaluation of Potential Appendix III SSIs	2-2
2.3 Conclusions.....	2-3
SECTION 3 References.....	3-1

LIST OF TABLES

Table 1	Groundwater Data Summary
Table 2	Groundwater Protection Standards
Table 3	Appendix III Data Summary

LIST OF ATTACHMENTS

Attachment A	Certification by Qualified Professional Engineer
Attachment B	Statistical Analysis Output

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LF	Landfill
LFB	Laboratory Fortified Blanks
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Level
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Landfill (LF), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, total dissolved solids (TDS), and sulfate at the LF. An alternate source was not identified at the time, so three assessment monitoring events were conducted at the LF in 2018, in accordance with 40 CFR 257.95.

Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. No SSLs were identified, but Appendix III concentrations for boron, chloride, TDS, and sulfate remained above background. Thus, the unit will remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

LANDFILL EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, samples were collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(b) and 257.95(d)(1). Samples collected from background wells for the May and August 2018 sampling events were analyzed for both Appendix III and Appendix IV parameters, whereas samples collected from downgradient wells were analyzed for Appendix IV parameters only. Lead and molybdenum values for the August 2018 are not reported as they were not detected in any wells during the first event. Additional samples were collected from downgradient wells for Appendix III parameters in September 2018. A summary of data collected during assessment monitoring may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.5 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the LF were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained to meet the requirements of 40 CFR 257.95(b) and 257.95(d)(1) were screened for potential outliers. The reported chromium value of 0.068 milligrams per liter (mg/L) for the January 20, 2017 sampling event at background well AD-17 was removed as an outlier. The reported lithium value of 0.024 mg/L for the July 29, 2016 sampling event at compliance well AD-14 was also removed as an outlier.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with 40 CFR 257.95(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or regional screening level (RSL) for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for barium, beryllium, and combined radium. Non-parametric tolerance limits were calculated for arsenic, chromium, cobalt, lithium, mercury, molybdenum, and selenium due to apparent non-normal distributions; for antimony, fluoride, lead, and thallium due to a high non-detect frequency; and for cadmium due to both an apparent non-normal distribution and a high non-detect frequency. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

No SSLs were identified at the Welsh LF.

2.2.3 Evaluation of Potential Appendix III SSIs

The CCR rule allows CCR units to move from assessment monitoring to detection monitoring if all Appendix III and Appendix IV parameters were at or below background levels for two consecutive sampling events [40 CFR 257.95(e)]. Since no Appendix IV SSLs were identified, Appendix III results were analyzed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations.

Prediction limits were calculated for the Appendix III parameters to represent background values. As described in the January 2018 *Statistical Analysis Summary* report (Geosyntec, 2018), intrawell tests were used to evaluate potential SSIs for calcium, chloride, and pH, whereas interwell tests were used to evaluate potential SSIs for boron, fluoride, TDS, and sulfate.

Wells AD-1 and AD-17 were added to the monitoring well network following completion of the background statistics. Thus, the prediction limits were recalculated using both the background data from AD-1 and AD-17 and the data collected during the 2018 assessment monitoring events. Intrawell tests were selected for calcium, chloride, TDS, and sulfate, whereas interwell tests were selected for boron, fluoride and pH.

Data collected from each compliance well were compared to the prediction limits to evaluate SSIs. The results from this event and the prediction limits are summarized in Table 3. While the prediction limits were calculated assuming a 1-of-2 testing procedures, it was conservatively assumed that an SSI was identified if the initial sample exceeded either the lower prediction limit (LPL) or the upper prediction limit (UPL) based on results from previously unsuccessful alternative source demonstrations (ASDs). The following exceedances of the LPLs/UPLs were noted:

- Boron concentrations exceeded the interwell UPL of 0.77 mg/L at AD-11 (1.84 mg/L), AD-13 (1.49 mg/L), and AD-14 (1.51 mg/L).
- Chloride concentrations exceeded the intrawell UPLs of 12.6 mg/L at AD-11 (15.0 mg/L), and 6.45 mg/L at AD-14 (12.00 mg/L).
- The pH value was below the interwell LPL of 4.29 SU at AD-14 (4.27 SU).
- The sulfate concentration exceeded the intrawell UPL of 131 mg/L at AD-14 (204 mg/L).
- The TDS concentration exceeded the intrawell UPL of 325 mg/L at AD-14 (384 mg/L).

Based on these results, concentrations of Appendix III parameters exceeded background levels at compliance wells at the Welsh LF during assessment monitoring. As a result, the Welsh LF CCR unit will remain in assessment monitoring.

2.3 Conclusions

Three assessment monitoring events were conducted in 2018 in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the 2018 data. GWPSs were established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. No SSLs were identified.

The Appendix III results were evaluated to assess whether concentrations of Appendix III parameters exceeded background levels. The prediction limits were recalculated using data from additional background wells and the 2018 sampling events. Intrawell tests were used to evaluate for calcium, chloride, TDS, and sulfate exceedances, whereas interwell tests were used to evaluate for boron, fluoride and pH exceedances. Boron, chloride, pH, sulfate, and TDS results exceeded background levels.

Based on this evaluation, the Welsh LF CCR unit will remain in assessment monitoring.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – Welsh Plant. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Landfill, J. Robert Welsh Plant, Pittsburg, Texas. January 15, 2018.

TABLES

**Table 1 – Groundwater Data Summary
Welsh – Landfill**

Parameter	Unit	AD-1		AD-5		AD-11			AD-13			AD-14			AD-17	
		5/24/2018	8/14/2018	5/24/2018	8/15/2018	5/23/2018	8/15/2018	9/17/2018	5/23/2018	8/14/2018	9/17/2018	5/23/2018	8/14/2018	9/17/2018	5/24/2018	8/15/2018
Antimony	mg/L	0.00317 J	0.0000300 J	0.005 U	0.0000100 J	0.005 U	0.0000200 J	-	0.005 U	0.0000300 J	-	0.005 U	0.0000100 J	-	0.005 U	0.0000200 J
Arsenic	mg/L	0.005 U	0.000210	0.005 U	0.00169	0.00260 J	0.00105	-	0.005 U	0.00137	-	0.005 U	0.000390	-	0.005 U	0.00183
Barium	mg/L	0.0799	0.0630	0.0712	0.0637	0.0163	0.0119	-	0.0265	0.0169	-	0.0282	0.0240	-	0.00965	0.0128
Beryllium	mg/L	0.000390 J	0.000482	0.001 U	0.0000550	0.000890 J	0.00118	-	0.000870 J	0.000971	-	0.000780 J	0.000854	-	0.001 U	0.0000690
Boron	mg/L	0.345	0.443	0.0501	0.0500	-	-	1.84	-	-	1.49	-	-	1.51	0.239	0.118
Cadmium	mg/L	0.001 U	0.0000200	0.000230 J	0.00000800 J	0.000180 J	0.000370	-	0.001 U	0.000310	-	0.00161	0.00199	-	0.00646	0.000250
Calcium	mg/L	10.2	5.95	28.1	40.5	-	-	6.61	-	-	10.1	-	-	4.51	193	187
Chloride	mg/L	4.00	5.00	22.0	19.0	-	-	15.0	-	-	18.0	-	-	12.0	39.0	40.0
Chromium	mg/L	0.001 U	0.00016	0.000800 J	0.0000720	0.000800 J	0.000257	-	0.000730 J	0.000503	-	0.001 U	0.000276	-	0.001 U	0.000604
Cobalt	mg/L	0.000350 J	0.000797	0.0142	0.0114	0.00863	0.0153	-	0.00937	0.0131	-	0.0143	0.0176	-	0.0717	0.0435
Combined Radium	pCi/L	1.98	1.10	1.95	0.316	1.91	2.57	-	2.16	4.07*	-	1.60	1.50*	-	1.94	2.35
Fluoride	mg/L	1 U	1 U	1 U	1 U	1 U	1 U	-	0.653 J	0.7442 J	-	1 U	1 U	-	1 U	1 U
Lead	mg/L	0.005 U	NR	0.005 U	NR	0.005 U	0.00142	-	0.005 U	0.00100	-	0.005 U	0.000174	-	0.005 U	0.00110
Lithium	mg/L	0.00814	0.00708	0.121	0.147	0.0188	0.0175	-	0.0291	0.0321	-	0.0152	0.0110	-	0.308	0.243
Mercury	mg/L	0.00000600 J	0.0000130 J	0.000025 U	0.000025 U	0.00000700 J	0.000025 U	-	0.00000800 J	0.000025 U	-	0.000145	0.000181	-	0.000025 U	0.0000110 J
Molybdenum	mg/L	0.005 U	NR	0.005 U	NR	0.005 U	0.0000500 J	-	0.005 U	0.0000600 J	-	0.005 U	0.0000300 J	-	0.005 U	0.000350
Selenium	mg/L	0.00138 J	0.00170	0.005 U	0.0000800 J	0.00134 J	0.00240	-	0.005 U	0.00170	-	0.00362 J	0.00370	-	0.005 U	0.000300
Total Dissolved Solids	mg/L	150	160	242	428	-	-	720	-	-	620	-	-	384	1840	1750
Sulfate	mg/L	43.0	44.0	60.0	240	-	-	410	-	-	316	-	-	204	1070	1170
Thallium	mg/L	0.002 U	0.0000300 J	0.002 U	0.01 U	0.0460	0.000200	-	0.002 U	0.000277	-	0.002 U	0.000242	-	0.002 U	0.000074
pH	SU	2.19	5.18	6.22	6.23	4.05	4.73	-	4.52	4.82	-	4.17	4.27	-	6.28	5.60

Notes:

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit

J: Estimated value. Parameter was detected in concentrations below the reporting limit

-: Not sampled

NR: Values are not reported as this parameter was not detected during the May 2018 event at any wells

*Sample collected on 8/15/2018

The fluoride values collected in August 2018 were also used in Appendix III analyses.

**Table 2: Groundwater Protection Standards
Welsh Plant - Landfill**

Constituent Name	MCL	RSL	Background Limit
Antimony, Total (mg/L)	0.006		0.005
Arsenic, Total (mg/L)	0.01		0.005
Barium, Total (mg/L)	2		0.36
Beryllium, Total (mg/L)	0.004		0.00077
Cadmium, Total (mg/L)	0.005		0.0065
Chromium, Total (mg/L)	0.1		0.004
Cobalt, Total (mg/L)	n/a	0.006	0.075
Combined Radium, Total (pCi/L)	5		4.21
Fluoride, Total (mg/L)	4		1
Lead, Total (mg/L)	n/a	0.015	0.005
Lithium, Total (mg/L)	n/a	0.04	0.39
Mercury, Total (mg/L)	0.002		0.000033
Molybdenum, Total (mg/L)	n/a	0.1	0.005
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.002

Notes:

Grey cell indicates calculated UTL (Upper Tolerance Limit) is higher than MCL.

MCL = Maximum Contaminant Level

RSL = Regional Screening Level

Calculated UTL represents site-specific background values.

The higher of the calculated UTL or MCL/RSL is used as the GWPS.

**Table 3: Appendix III Data Evaluation
Welsh Plant - Landfill**

Parameter	Units	Description	AD-11	AD-13	AD-14
			9/17/2018	9/17/2018	9/17/2018
Boron	mg/L	Interwell Background Value (UPL)	0.77		
	mg/L	Assessment Monitoring Result	1.84	1.49	1.51
Calcium	mg/L	Intrawell Background Value (UPL)	11.4	38.5	13.9
	mg/L	Assessment Monitoring Result	6.61	10.1	4.51
Chloride	mg/L	Intrawell Background Value (UPL)	12.6	24.0	6.45
	mg/L	Assessment Monitoring Result	15	18	12
Fluoride	mg/L	Interwell Background Value (UPL)	1.0		
	mg/L	Assessment Monitoring Result	<0.083	0.744	<0.83
pH	SU	Interwell Background Value (UPL)	7.05		
	SU	Interwell Background Value (LPL)	4.29		
	SU	Assessment Monitoring Result	4.73	4.82	4.27
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1224	974	325
	mg/L	Assessment Monitoring Result	720	620	384
Sulfate	mg/L	Intrawell Background Value (UPL)	833	342	131
	mg/L	Assessment Monitoring Result	410	316	204

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

Bold values exceed the background value.

Background values are shaded gray.

Fluoride and pH analyzed on 8/14-8/15/2018

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

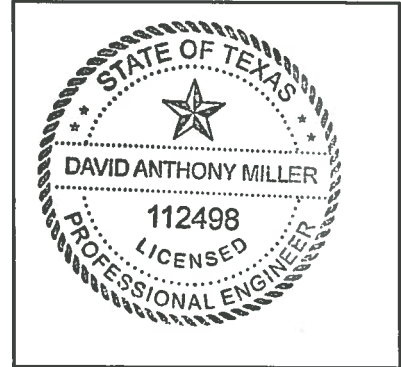
I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Welsh Landfill CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



112498

License Number

TEXAS

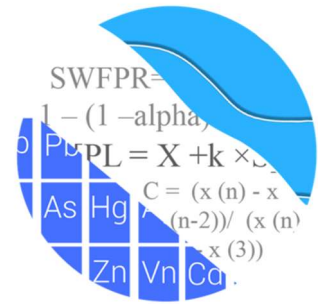
Licensing State

01.08.19

Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING



January 5, 2019

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

Re: Welsh Landfill
Assessment Monitoring Event 2018

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis of the September 2018 data for American Electric Power Inc.'s Welsh Landfill. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-1, AD-5, and AD-17; and
- **Downgradient wells:** AD-11, AD-13 and AD-14

Data were sent electronically to Groundwater Stats Consulting, and the statistical analysis was reviewed by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to Groundwater Stats Consulting.

The CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) - boron, calcium, chloride, fluoride, pH, sulfate, and TDS;

- **Appendix IV** (Assessment Monitoring) – antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium.

Time series and box plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figures A and B). Data were screened for trends and outliers during December 2017 and the results of those findings were submitted with that report. A summary of flagged values follows this report (Figure C). Values previously flagged as outliers may also be seen in a lighter font and disconnected symbol on the time series graphs. Since the original background screening, upgradient wells AD-1 and AD-17 were approved during 2018 for use as background wells at the Welsh Landfill. These data were previously evaluated during the November 2017 background screening as part of the Welsh PBAP monitoring well network, and no additional adjustments were required to the data sets. Data were, however, re-evaluated to determine the most appropriate statistical method, as described below, with the addition of the data from these upgradient wells.

Determination of Statistical Method

Appendix III – Determination of Spatial Variation

The Analysis of Variance (ANOVA) was used to statistically evaluate differences in average concentrations among upgradient wells, which assists in identifying the most appropriate statistical approach (Figure D). Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when average concentrations are similar across upgradient wells. Intrawell tests, which compare compliance data from a single well to screened historical data within the same well, are appropriate when upgradient wells exhibit spatial variation; when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; and when downgradient water quality is unimpacted compared to upgradient water quality for the same parameter.

The ANOVA identified variation for the following Appendix III parameters: boron, calcium, chloride, sulfate and TDS suggesting intrawell methods should be considered. No differences were noted for fluoride and pH; therefore, these parameters are eligible for interwell prediction limits. Boron, calcium, chloride, sulfate and TDS data were further evaluated as described below for the appropriateness of intrawell testing to accommodate the groundwater quality. A summary table of the ANOVA results is included with the reports.

Appendix III - Statistical Limits

Intrawell limits constructed from carefully screened background data from within each well serve to provide statistical limits that are conservative (i.e. lower) from a regulatory perspective, and will rapidly identify a change in more recent compliance data from within a given well. This statistical method removes the element of variation from across wells and eliminates the chance of mistaking natural spatial variation for a release from the facility. Prior to performing intrawell prediction limits, several steps are required to reasonably demonstrate downgradient water quality does not have existing impacts from the practices of the facility.

Exploratory data analysis was used as a general comparison of concentrations in downgradient wells for all Appendix III parameters recommended for intrawell analyses to concentrations reported in the upgradient well. Upper tolerance limits are used in conjunction with confidence intervals to determine whether the estimated averages in downgradient wells are higher than observed levels upgradient of the facility. The upper tolerance limits were constructed to represent the extreme upper range of possible background levels at the site.

In cases where downgradient average concentrations are higher than observed concentrations upgradient for a given constituent, an independent study and hydrogeological investigation would be required to identify local geochemical conditions and expected groundwater quality for the region to justify an intrawell approach. Such an assessment is beyond the scope of services provided by Groundwater Stats Consulting. When there is not an obvious explanation for observed concentration differences in downgradient wells relative to reported concentrations in the upgradient well, interwell prediction limits will initially be selected for the statistical method until further evidence shows that concentrations are due to natural variation rather than a result of the facility.

Parametric tolerance limits were constructed with a target of 99% confidence and 95% coverage using upgradient well data for each of the Appendix III parameters (Figure E). The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. As more data are collected, the background population is better represented and the confidence and coverage levels increase.

Confidence intervals were constructed on downgradient wells for each of the Appendix III parameters, using the tolerance limits discussed above, to determine intrawell eligibility (Figure F). When the entire confidence interval is above a background standard for a given parameter, interwell methods are initially recommended as the statistical method.

Therefore, only parameters with confidence intervals which did not exceed background standards are eligible for intrawell prediction limits.

Confidence intervals for the above parameters were found to be within their respective background limit for all parameters except boron. Therefore, intrawell methods are recommended for calcium, chloride, sulfate and TDS; and interwell methods are initially recommended for boron, fluoride and pH. As mentioned earlier, if a demonstration supports natural variation in groundwater, intrawell methods will be considered for all parameters.

All available data through June 2017 at each well were used to establish intrawell background limits for the parameters identified above based on a 1-of-2 resample plan that will be used for future comparisons (Figure G). Interwell prediction limits, combined with a 1-of-2 resample plan, were constructed from upgradient wells AD-1, AD-5 and AD-17 (Figure H). Downgradient measurements will be compared to these background limits during each subsequent semi-annual sampling event.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits will be necessary to accommodate these types of changes. In the interwell case, newer data will be included in background when a minimum of 2 new samples are available. In the intrawell case, data for all wells and constituents are re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater quality. In some cases, the earlier portion of data are deselected prior to construction of limits in order to provide sensitive limits that will rapidly detect changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

Evaluation of Appendix III Parameters

Interwell prediction limits combined with a 1-of-2 verification strategy were constructed for boron, fluoride, and pH. Intrawell limits combined with a 1-of-2 verification strategy were constructed for calcium, chloride, sulfate and TDS.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one additional sample to determine whether the initial exceedance is confirmed. When the resample confirms the initial exceedance, a statistically significant increase (SSI) is identified and further research would be required to identify the cause of the exceedance (i.e. impact from the site, natural variation, or an off-site source). If the

resample falls within the statistical limit, the initial exceedance is considered a false positive result and, therefore, no further action is necessary.

When upgradient wells exceed their background limits, it may be an indication that groundwater is changing naturally upgradient of the facility. Concentrations will continue to be monitored over the next sampling events. The results of those findings may be found in the Prediction Limit Summary tables following this letter.

When a statistically significant increase is identified, the data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing or stable (Figure I). Upgradient wells are included in the trend analyses to identify whether similar patterns exist upgradient of the site which is an indication of natural variability in groundwater unrelated to practices at the site.

No statistically significant increasing or decreasing trends were found for any of the well/parameter pairs. A Trend Test summary table follows this letter.

Evaluation of Appendix IV Parameters

Parametric tolerance limits were used to calculate background limits from pooled upgradient well data for Appendix IV parameters with a target of 95% confidence and 95% coverage to determine the Alternate Contaminant Level (ACL) (Figure J). The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and Regional Screening Levels (RSLs) in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure K).

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters using the highest limit of either the MCL, RSL, or ACL as discussed above (Figure L). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence intervals exceedances were found for any of the downgradient wells. A summary of the confidence interval results follows this letter.

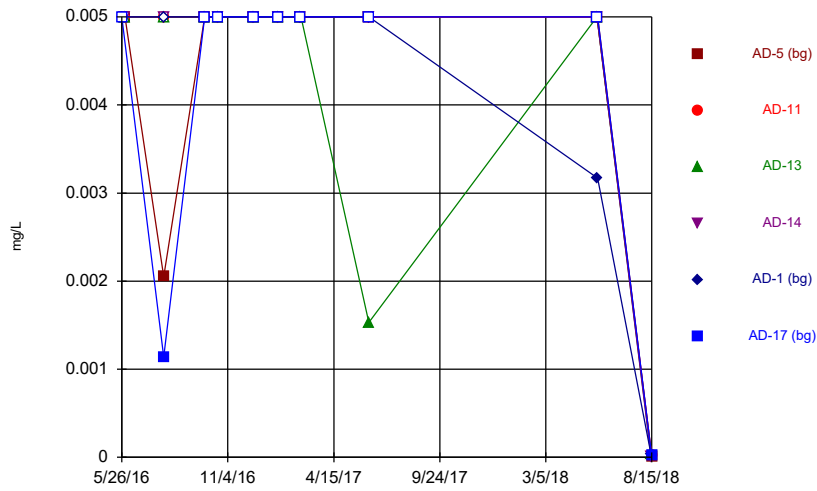
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Welsh Landfill. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

A handwritten signature in black ink that reads "Kristina Rayner". The signature is written in a cursive, flowing style.

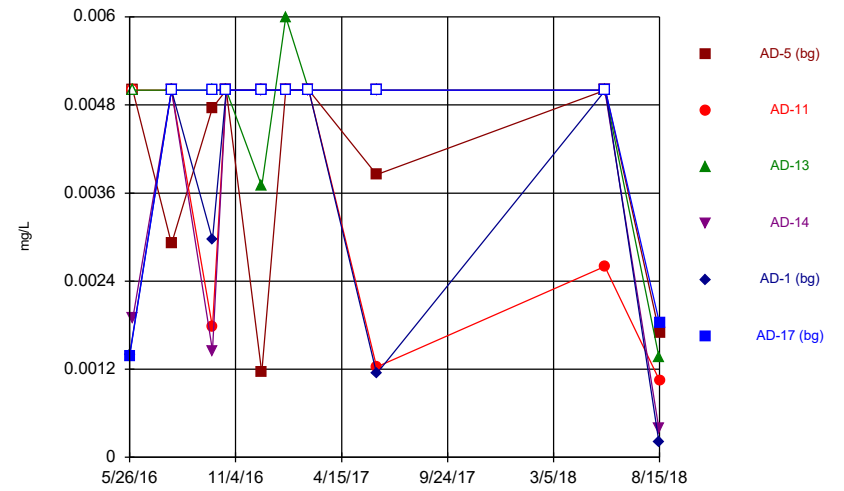
Kristina L. Rayner
Groundwater Statistician

Time Series



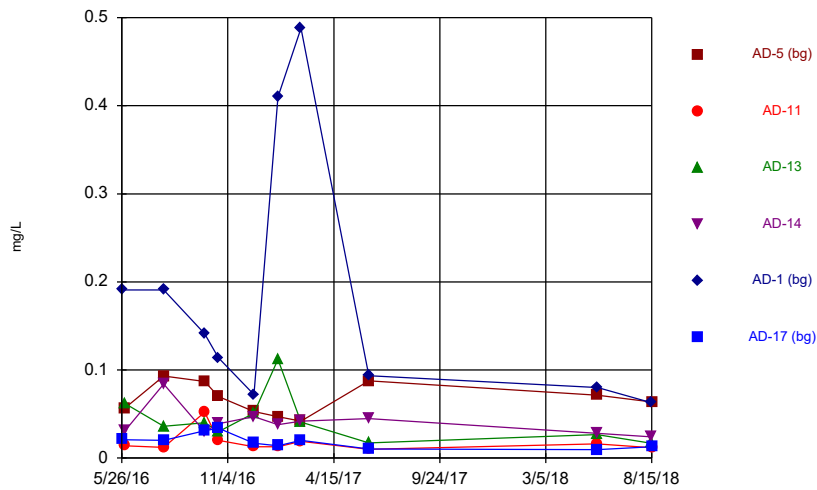
Constituent: Antimony, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



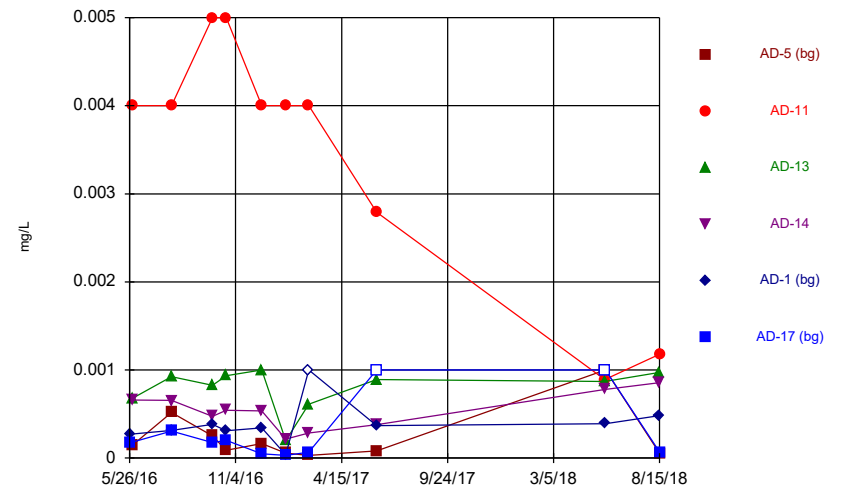
Constituent: Arsenic, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



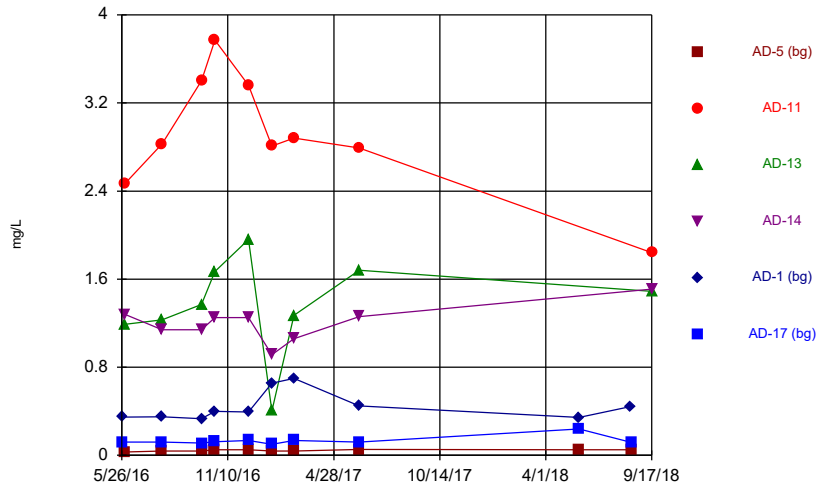
Constituent: Barium, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



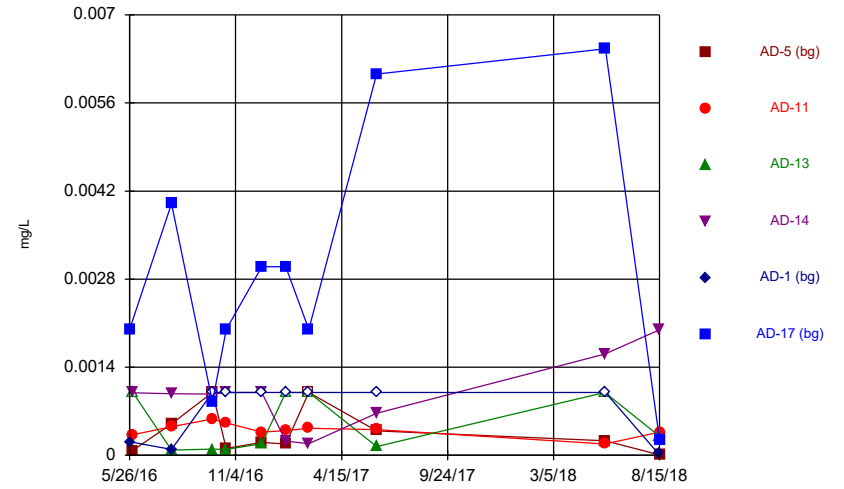
Constituent: Beryllium, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



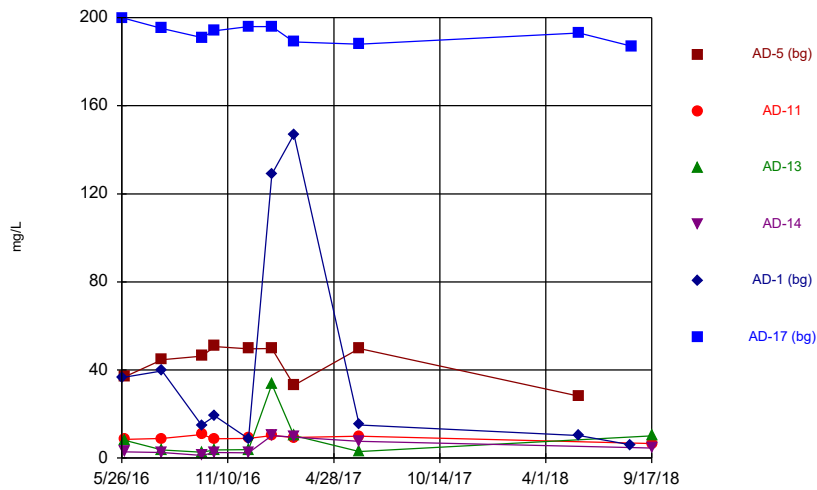
Constituent: Boron, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



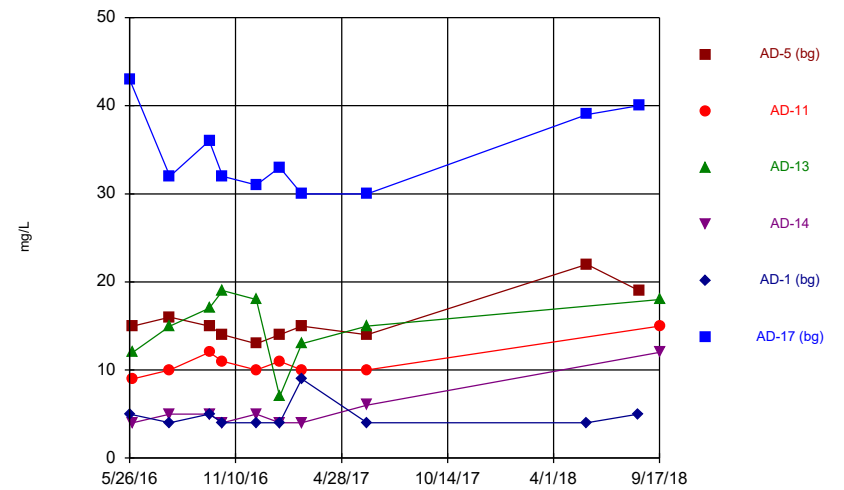
Constituent: Cadmium, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



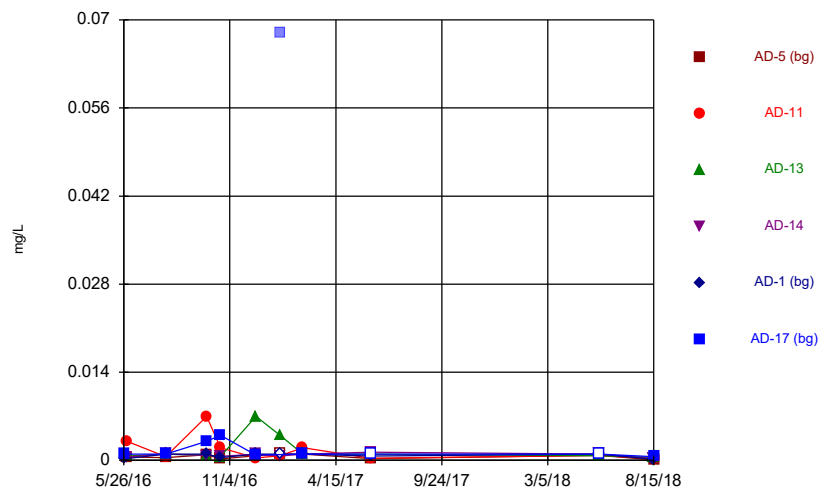
Constituent: Calcium, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



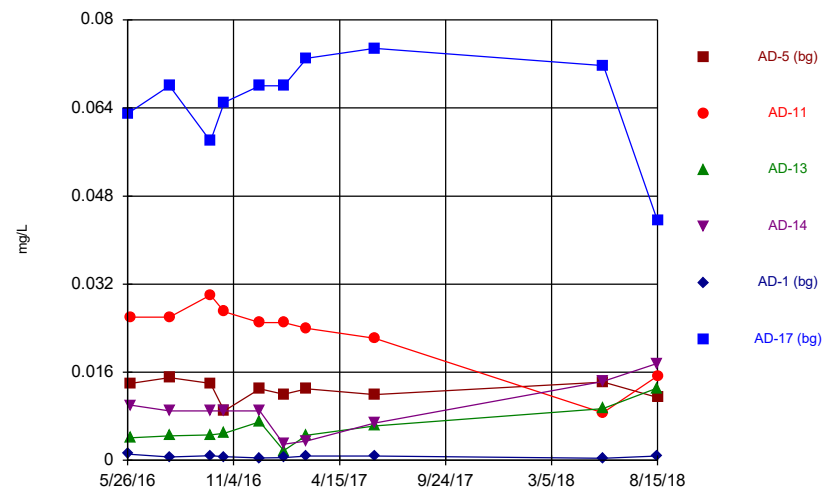
Constituent: Chloride, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



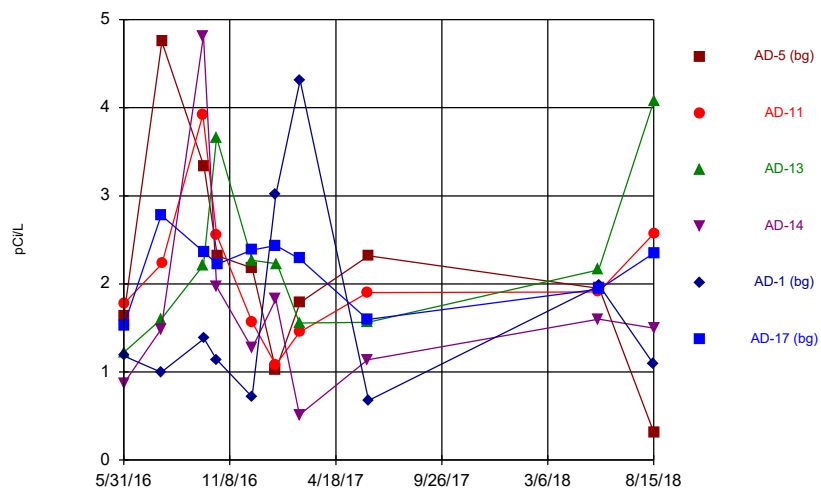
Constituent: Chromium, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



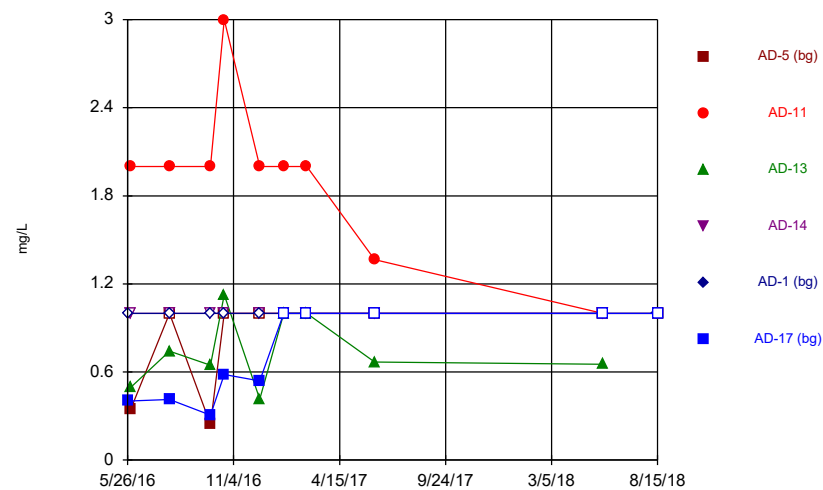
Constituent: Cobalt, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



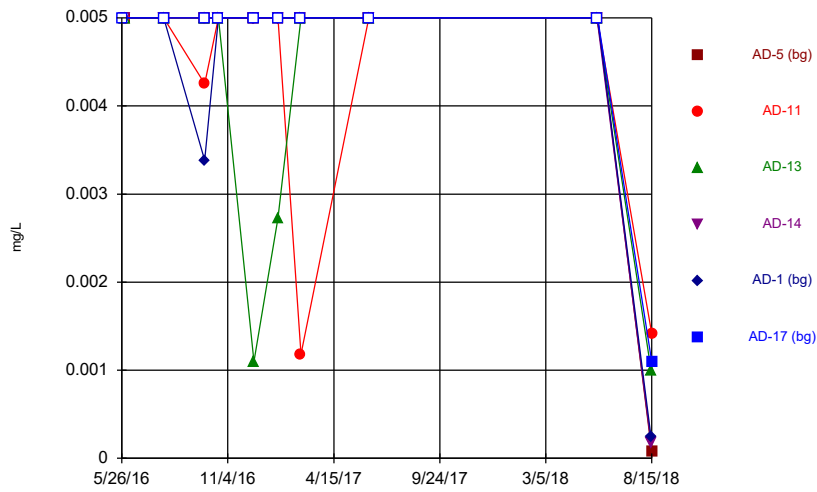
Constituent: Combined Radium 226 + 228 Analysis Run 12/24/2018 8:54 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



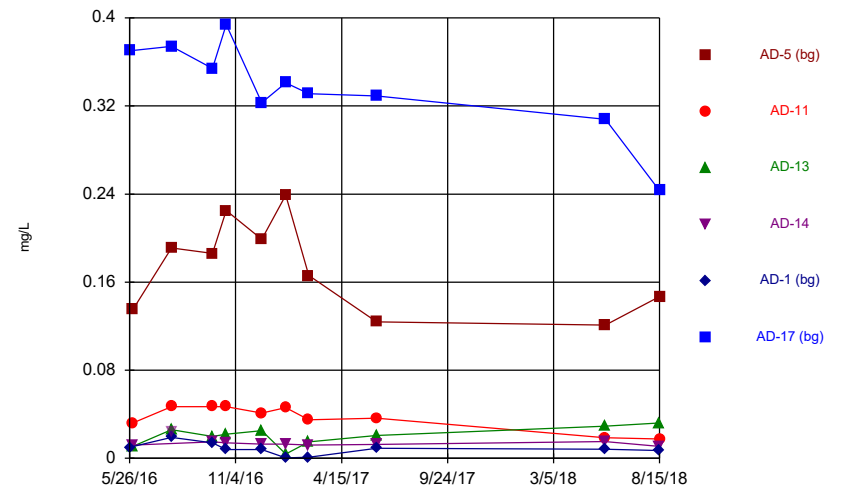
Constituent: Fluoride, total Analysis Run 12/24/2018 8:54 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



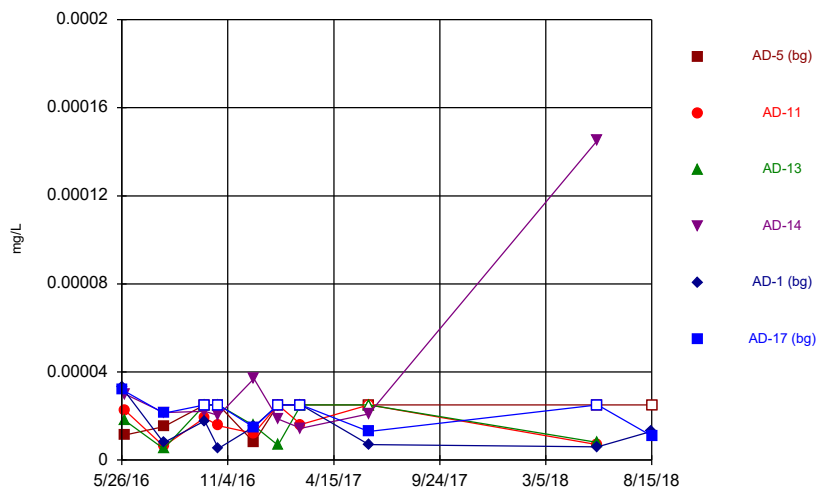
Constituent: Lead, total Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



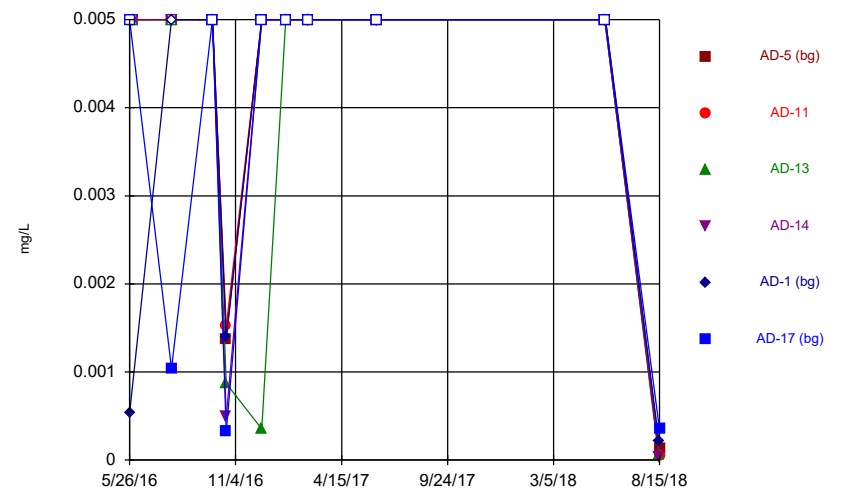
Constituent: Lithium, total Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



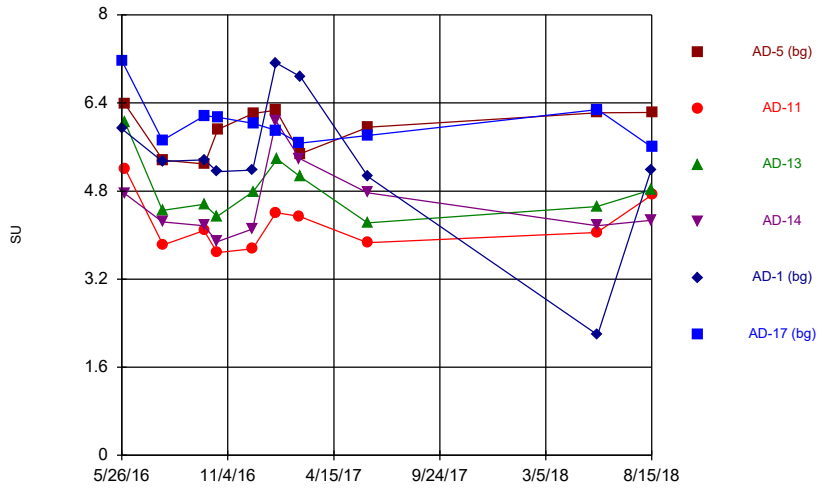
Constituent: Mercury, total Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



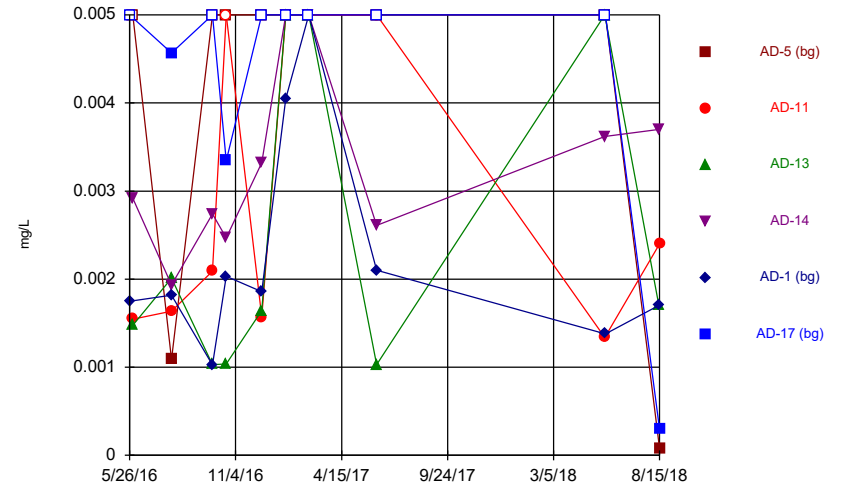
Constituent: Molybdenum, total Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



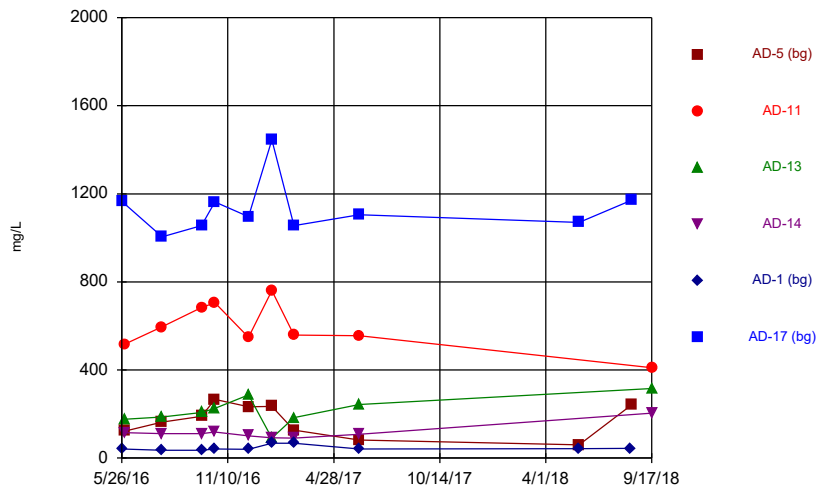
Constituent: pH, field Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



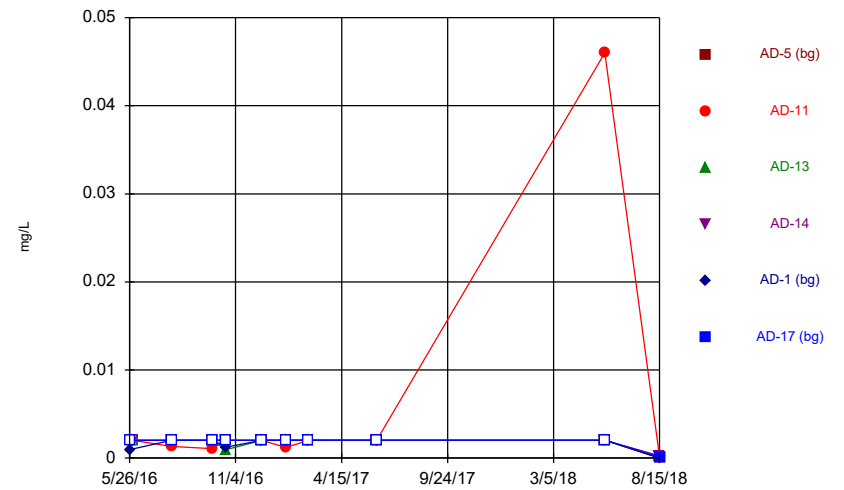
Constituent: Selenium, total Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



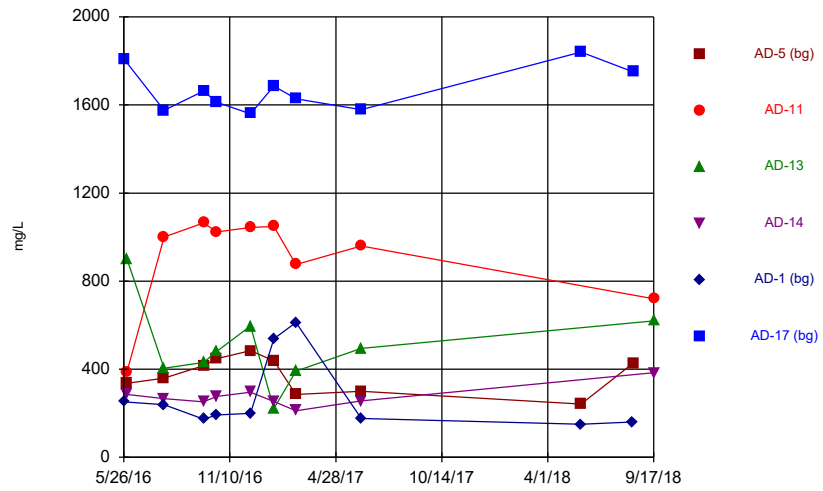
Constituent: Sulfate, total Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



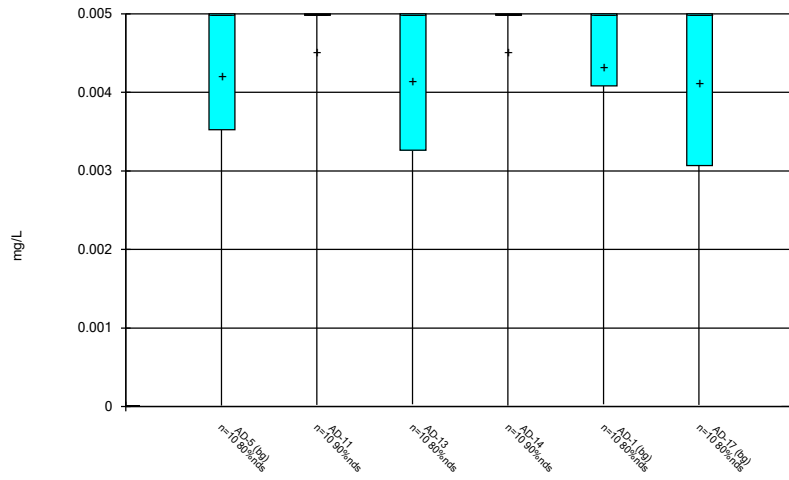
Constituent: Thallium, total Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



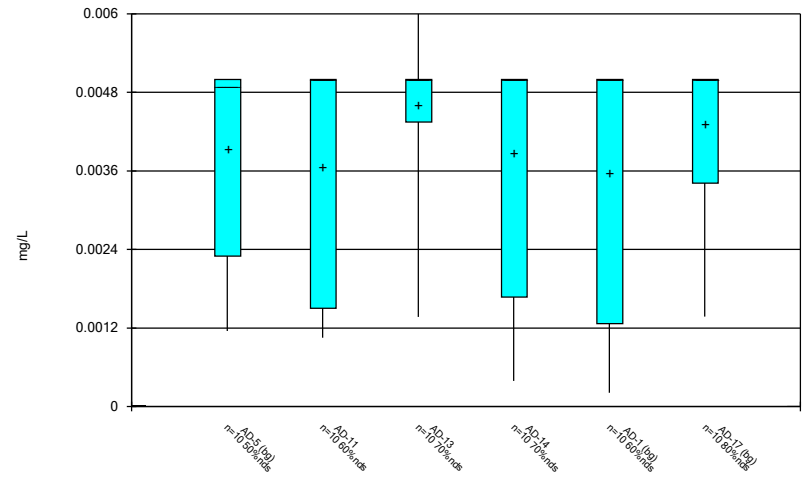
Constituent: Total Dissolved Solids Analysis Run 12/24/2018 8:55 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



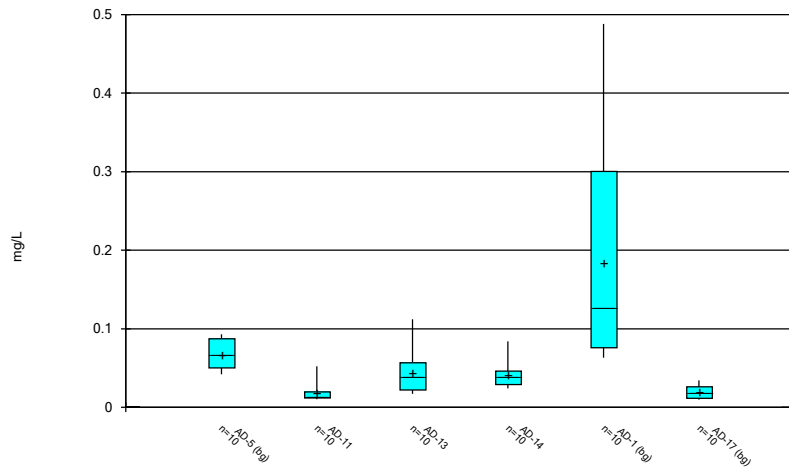
Constituent: Antimony, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



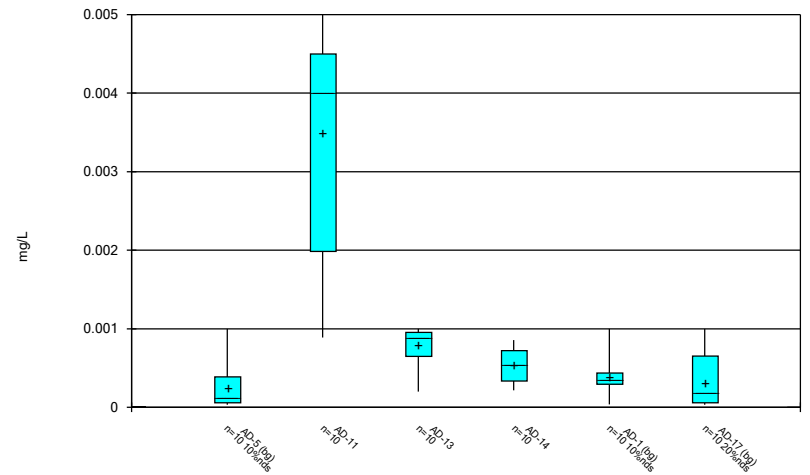
Constituent: Arsenic, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



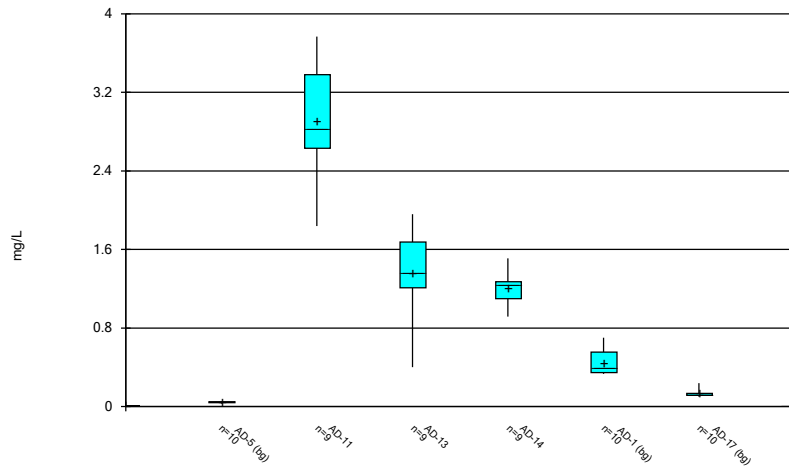
Constituent: Barium, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



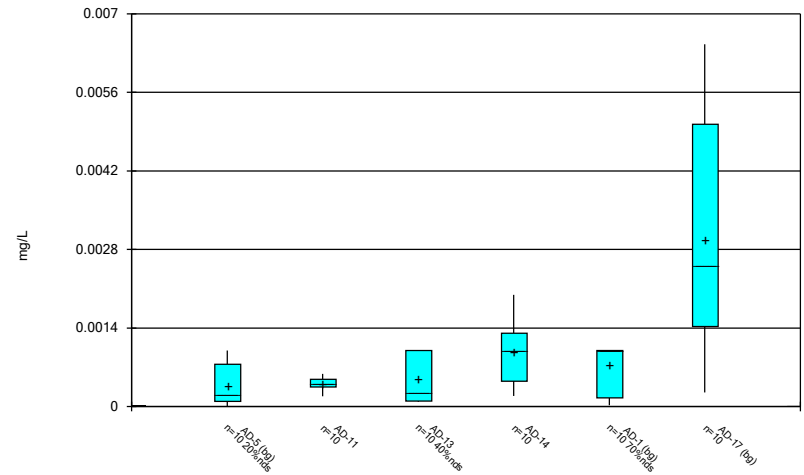
Constituent: Beryllium, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



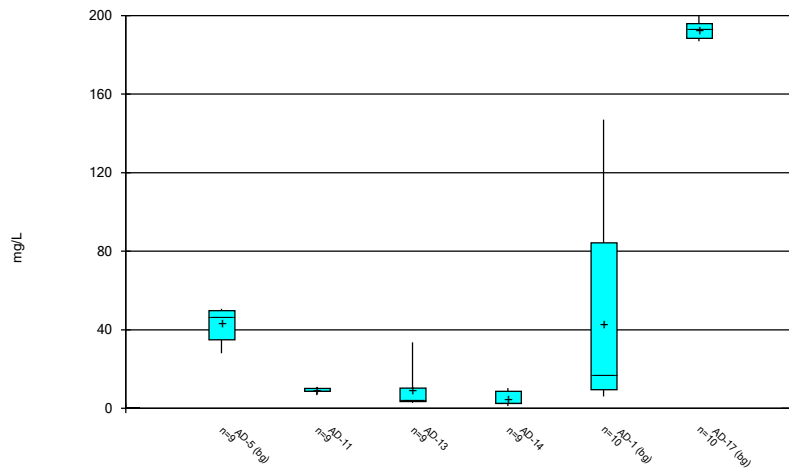
Constituent: Boron, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



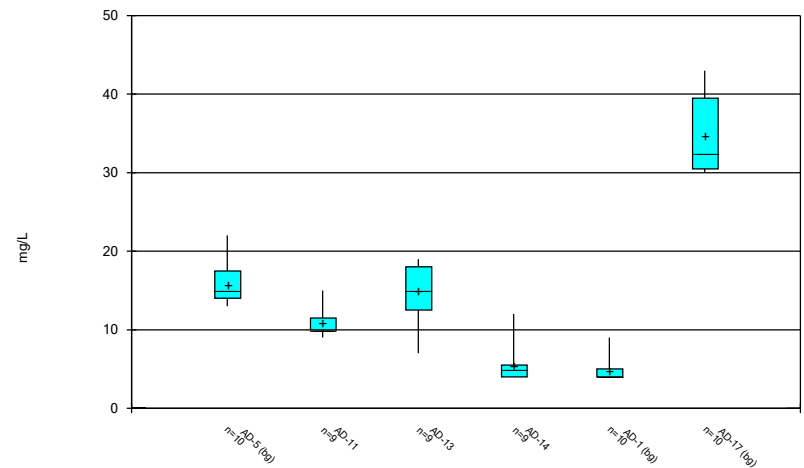
Constituent: Cadmium, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



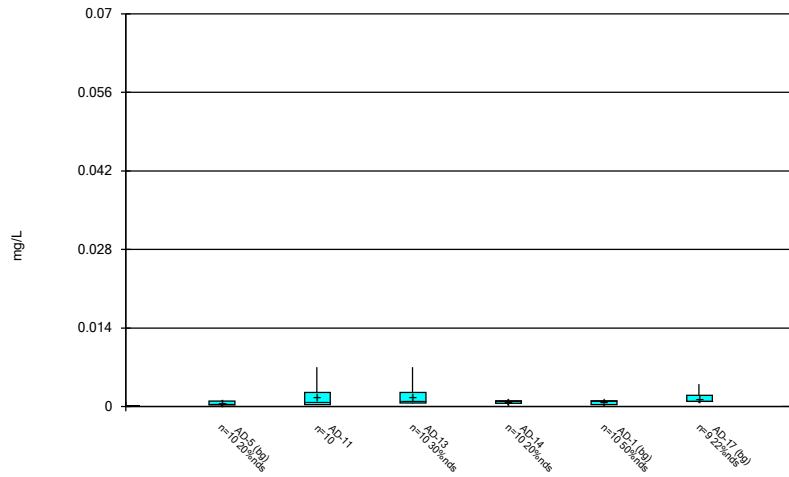
Constituent: Calcium, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



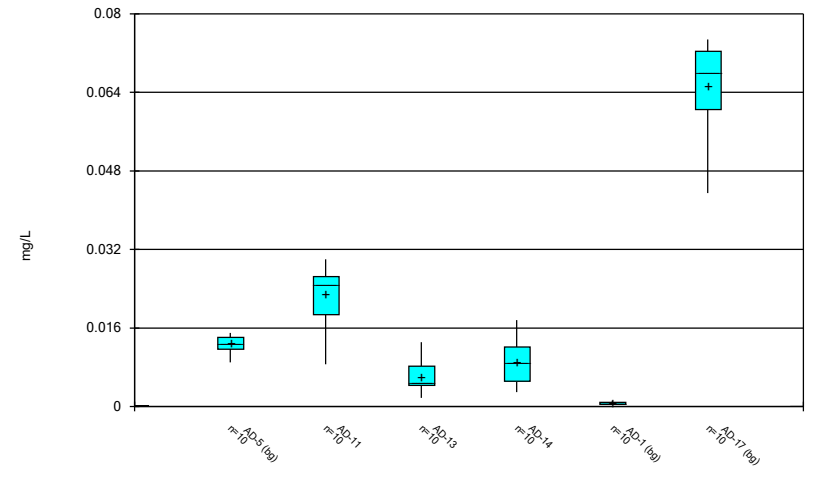
Constituent: Chloride, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



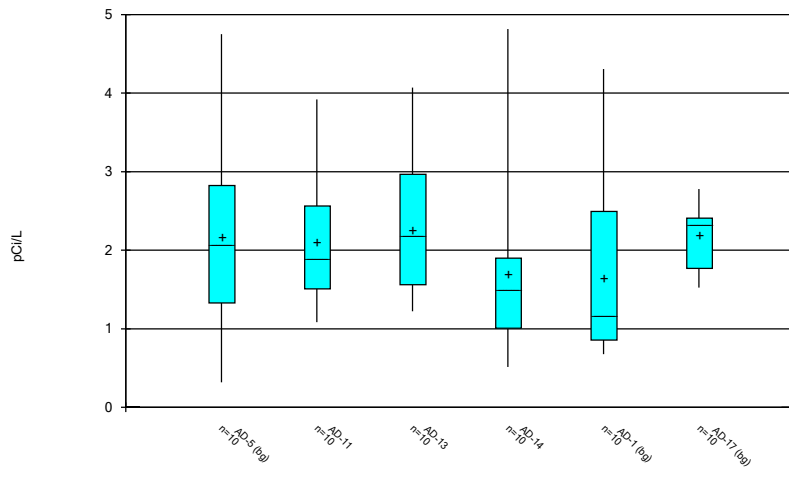
Constituent: Chromium, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



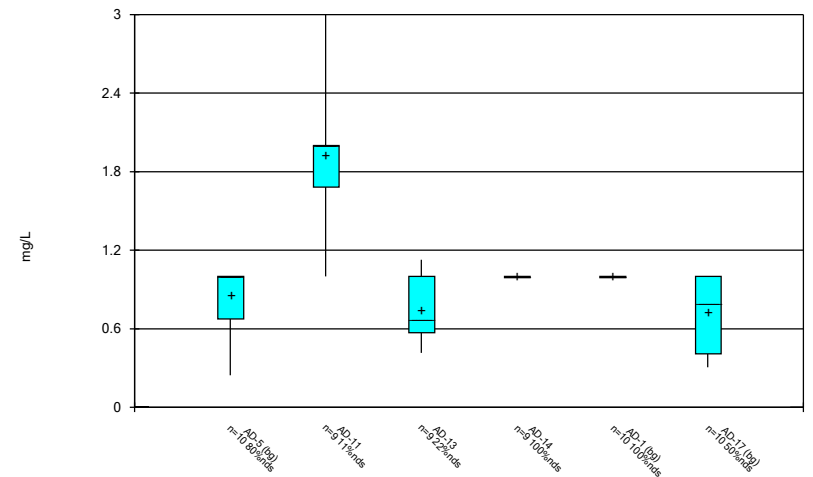
Constituent: Cobalt, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



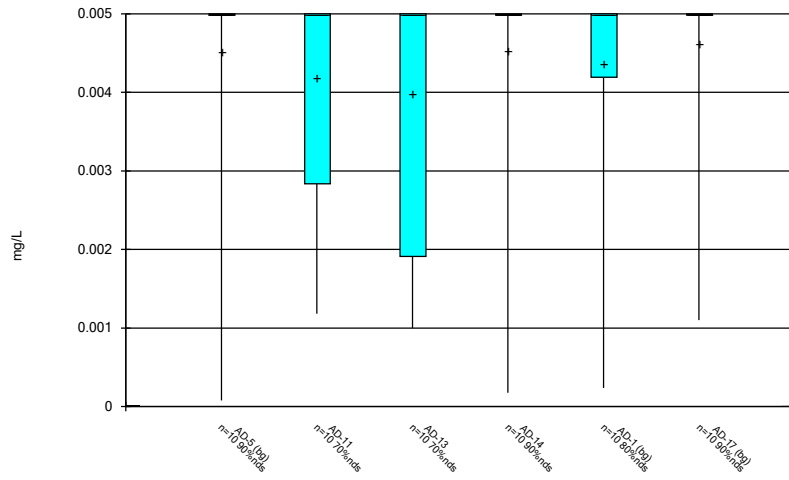
Constituent: Combined Radium 226 + 228 Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



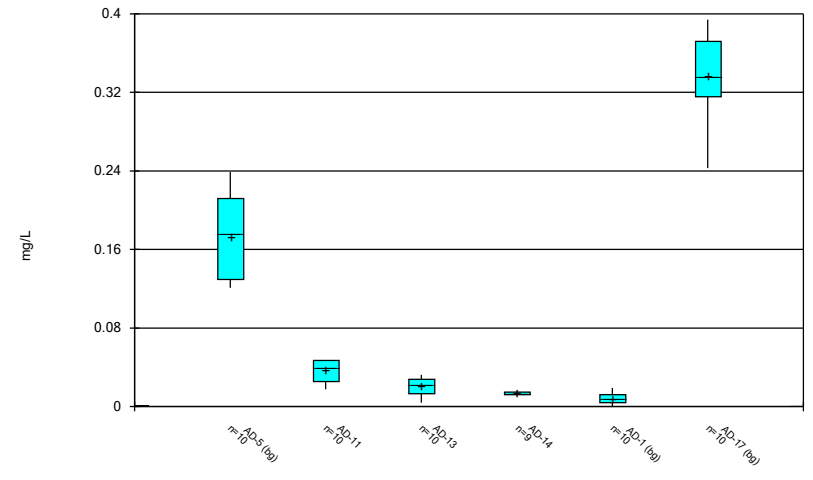
Constituent: Fluoride, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



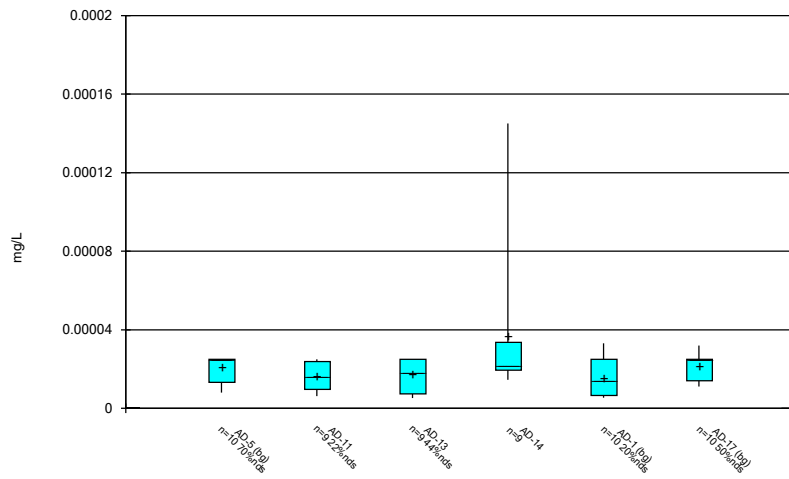
Constituent: Lead, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



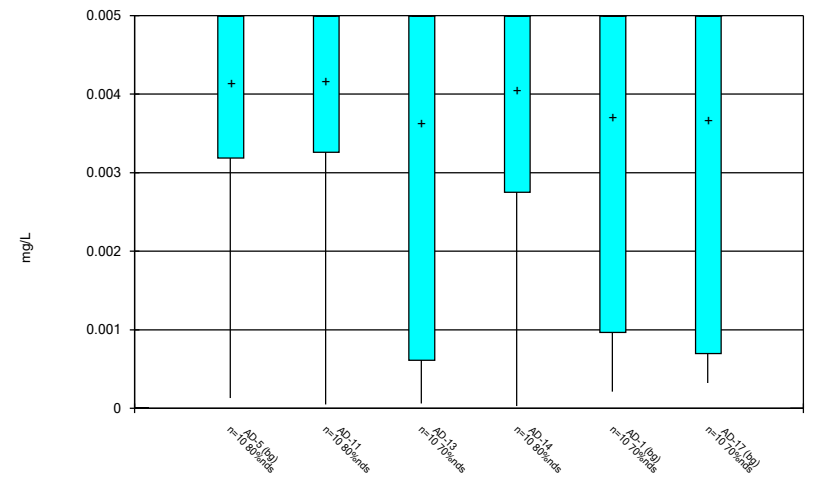
Constituent: Lithium, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



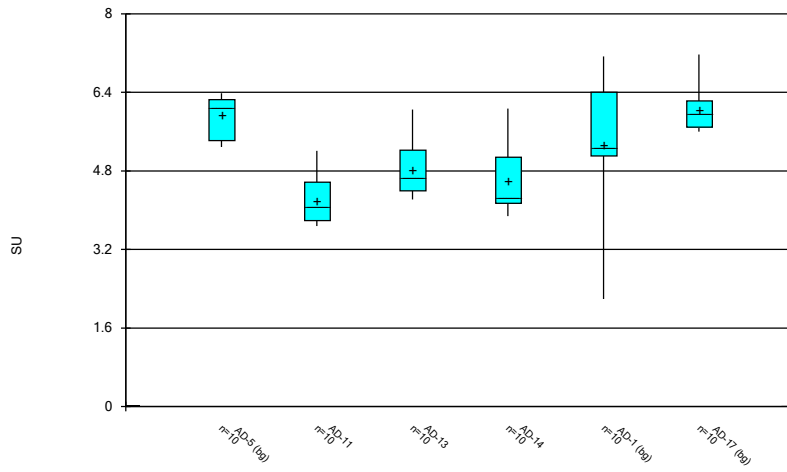
Constituent: Mercury, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



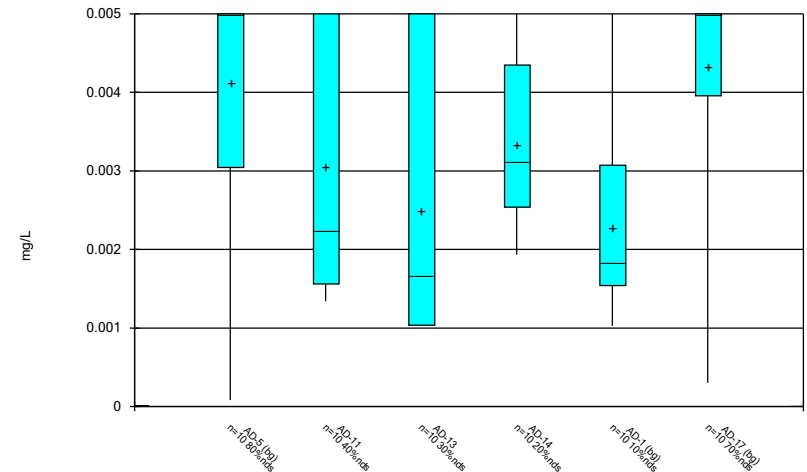
Constituent: Molybdenum, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



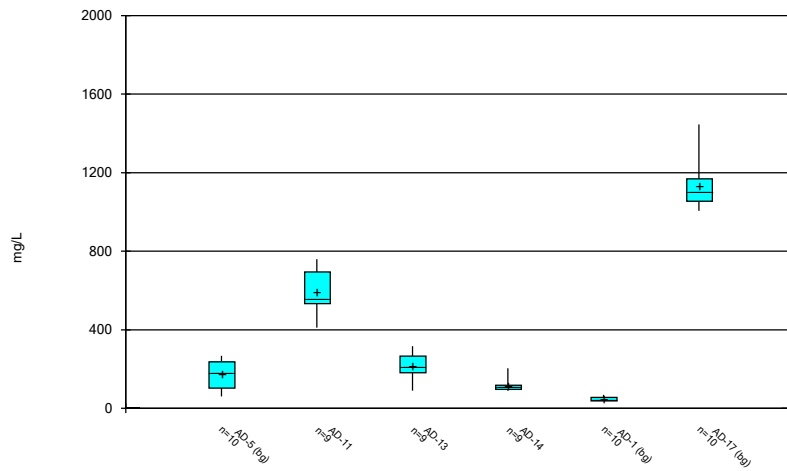
Constituent: pH, field Analysis Run 12/24/2018 8:56 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



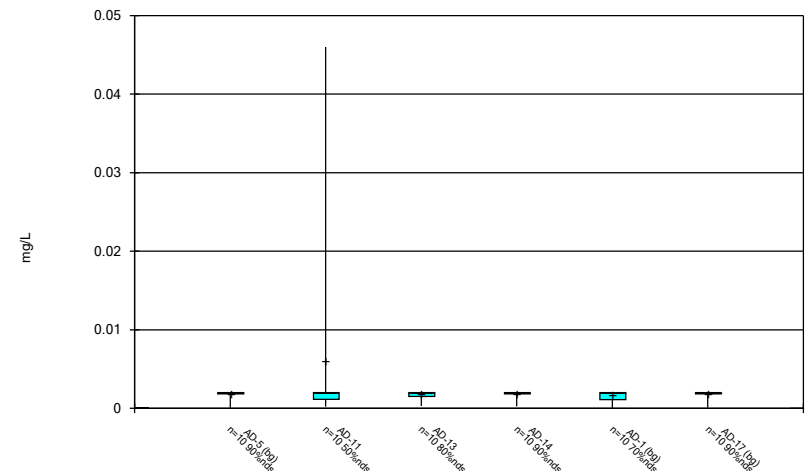
Constituent: Selenium, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



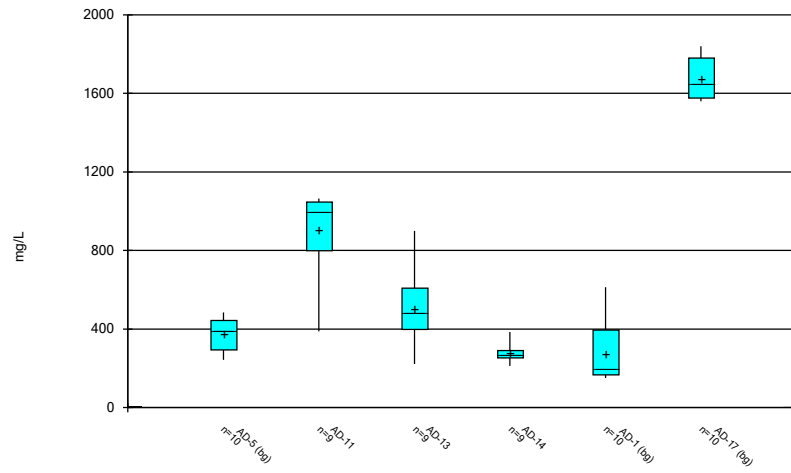
Constituent: Sulfate, total Analysis Run 12/24/2018 8:56 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



Constituent: Thallium, total Analysis Run 12/24/2018 8:57 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 12/24/2018 8:57 AM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Outlier Summary

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/10/2018, 3:33 PM

AD-17 Chromium, total (mg/L)
AD-14 Lithium, total (mg/L)

7/29/2016	0.024 (o)
1/20/2017	0.068 (O)

Analysis of Variance

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/24/2018, 8:59 AM

<u>Constituent</u>	<u>Well</u>	<u>Calc.</u>	<u>Crit.</u>	<u>Sig.</u>	<u>Alpha</u>	<u>Transform</u>	<u>ANOVA Sig.</u>	<u>Alpha</u>	<u>Method</u>
Boron, total (mg/L)	n/a	n/a	n/a	n/a	n/a	ln(x)	Yes	0.05	Param.
Calcium, total (mg/L)	n/a	n/a	n/a	n/a	n/a	No	Yes	0.05	NP (normality)
Chloride, total (mg/L)	n/a	n/a	n/a	n/a	n/a	No	Yes	0.05	NP (normality)
Fluoride, total (mg/L)	n/a	n/a	n/a	n/a	n/a	No	No	0.05	NP (NDs)
pH, field (SU)	n/a	n/a	n/a	n/a	n/a	No	No	0.05	NP (normality)
Sulfate, total (mg/L)	n/a	n/a	n/a	n/a	n/a	No	Yes	0.05	NP (eq. var.)
Total Dissolved Solids (mg/L)	n/a	n/a	n/a	n/a	n/a	No	Yes	0.05	NP (eq. var.)

Parametric ANOVA

Constituent: Boron, total Analysis Run 12/24/2018 8:59 AM View: ANOVA
Welsh LF Client: Geosyntec Data: Welsh LF

For observations made between 5/26/2016 and 8/15/2018 the parametric analysis of variance test (after natural log transformation) indicates VARIATION at the 5% significance level. Because the calculated F statistic is greater than the tabulated F statistic, the hypothesis of a single homogeneous population is rejected.

Calculated F statistic = 248.8

Tabulated F statistic = 3.35 with 2 and 27 degrees of freedom at the 5% significance level.

ONE-WAY PARAMETRIC ANOVA TABLE

Source of Variation	Sum of Squares	Degrees of Freedom	Mean Squares	F
Between Groups	1.521	2	0.7604	8.064
Error Within Groups	2.546	27	0.09429	
Total	4.067	29		

The Shapiro Wilk normality test on the residuals passed after natural log transformation. Alpha = 0.01, calculated = 0.9013, critical = 0.9. Levene's Equality of Variance test passed. Calculated = 0.5384, tabulated = 3.35.

Non-Parametric ANOVA

Constituent: Calcium, total Analysis Run 12/24/2018 8:59 AM View: ANOVA
Welsh LF Client: Geosyntec Data: Welsh LF

For observations made between 5/26/2016 and 8/15/2018, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 20.41

Tabulated Chi-Squared value = 5.991 with 2 degrees of freedom at the 5% significance level.

There were 1 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 20.41

Adjusted Kruskal-Wallis statistic (H') = 20.41

Non-Parametric ANOVA

Constituent: Chloride, total Analysis Run 12/24/2018 8:59 AM View: ANOVA
Welsh LF Client: Geosyntec Data: Welsh LF

For observations made between 5/26/2016 and 8/15/2018, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 26.09

Tabulated Chi-Squared value = 5.991 with 2 degrees of freedom at the 5% significance level.

There were 6 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 25.81

Adjusted Kruskal-Wallis statistic (H') = 26.09

Non-Parametric ANOVA

Constituent: Fluoride, total Analysis Run 12/24/2018 8:59 AM View: ANOVA
Welsh LF Client: Geosyntec Data: Welsh LF

For observations made between 5/26/2016 and 8/15/2018, the non-parametric analysis of variance test indicates NO DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 5.92

Tabulated Chi-Squared value = 5.991 with 2 degrees of freedom at the 5% significance level.

There were 1 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 3.254

Adjusted Kruskal-Wallis statistic (H') = 5.92

Non-Parametric ANOVA

Constituent: pH, field Analysis Run 12/24/2018 8:59 AM View: ANOVA
Welsh LF Client: Geosyntec Data: Welsh LF

For observations made between 5/26/2016 and 8/15/2018, the non-parametric analysis of variance test indicates NO DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is less than or equal to the Chi-squared value, we conclude that no group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 4.842

Tabulated Chi-Squared value = 5.991 with 2 degrees of freedom at the 5% significance level.

There were 1 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 4.841

Adjusted Kruskal-Wallis statistic (H') = 4.842

Non-Parametric ANOVA

Constituent: Sulfate, total Analysis Run 12/24/2018 8:59 AM View: ANOVA
Welsh LF Client: Geosyntec Data: Welsh LF

For observations made between 5/26/2016 and 8/15/2018, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 25.33

Tabulated Chi-Squared value = 5.991 with 2 degrees of freedom at the 5% significance level.

There were 3 groups of ties in the data, consequently the Kruskal-Wallis statistic (H) was adjusted. The adjusted statistic (H') was utilized to determine if the medians were equal.

Kruskal-Wallis statistic (H) = 25.3

Adjusted Kruskal-Wallis statistic (H') = 25.33

Non-Parametric ANOVA

Constituent: Total Dissolved Solids Analysis Run 12/24/2018 8:59 AM View: ANOVA
Welsh LF Client: Geosyntec Data: Welsh LF

For observations made between 5/26/2016 and 8/15/2018, the non-parametric analysis of variance test indicates a DIFFERENCE between the medians of the groups tested at the 5% significance level. Because the calculated Kruskal-Wallis statistic is greater than the Chi-squared value, we conclude that at least one group has a significantly different median concentration of this constituent when compared to another group.

Calculated Kruskal-Wallis statistic = 21.53

Tabulated Chi-Squared value = 5.991 with 2 degrees of freedom at the 5% significance level.

There were 0 groups of ties in the data, so no adjustment to the Kruskal-Wallis statistic (H) was necessary.

Upper Tolerance Limits - Appendix III

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/10/2018, 4:12 PM

Constituent	Upper Lim.	Lower Lim.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium, total (mg/L)	200	n/a	29	n/a	n/a	0	n/a	n/a	0.2259	NP Inter(normality)
Chloride, total (mg/L)	43	n/a	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Fluoride, total (mg/L)	1	n/a	30	n/a	n/a	76.67	n/a	n/a	0.2146	NP Inter(NDs)
pH, field (SU)	7.672	3.051	30	34.08	8.719	0	None	x^2	0.01	Inter
Sulfate, total (mg/L)	1445	n/a	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Total Dissolved Solids (mg/L)	1840	n/a	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Boron, total (mg/L)	0.7	n/a	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter

Confidence Intervals Appendix III - Significant Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/10/2018, 4:15 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Lower Lim.</u>	<u>Compliance</u>	<u>Sig.</u>	<u>N</u>	<u>%NDs</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Boron, total (mg/L)	AD-11	3.451	2.36	0.7	Yes	9	0	No	0.01	Param.
Boron, total (mg/L)	AD-13	1.787	0.9379	0.7	Yes	9	0	No	0.01	Param.
Boron, total (mg/L)	AD-14	1.36	1.041	0.7	Yes	9	0	No	0.01	Param.

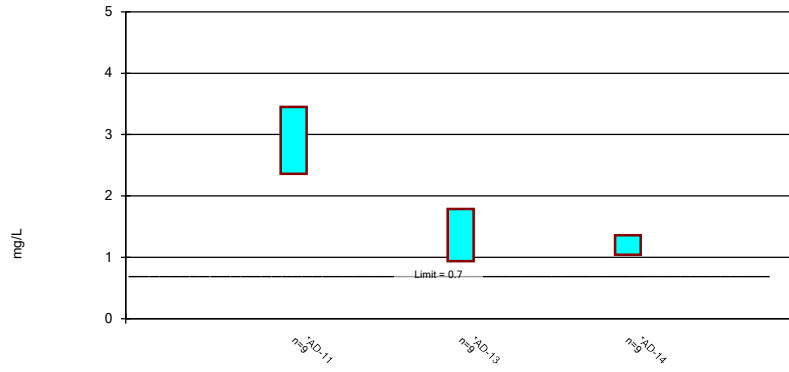
Confidence Intervals Appendix III - All Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/10/2018, 4:15 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Boron, total (mg/L)	AD-11	3.451	2.36	0.7	Yes	9	0	No	0.01	Param.
Boron, total (mg/L)	AD-13	1.787	0.9379	0.7	Yes	9	0	No	0.01	Param.
Boron, total (mg/L)	AD-14	1.36	1.041	0.7	Yes	9	0	No	0.01	Param.
Calcium, total (mg/L)	AD-11	10.26	7.949	200	No	9	0	No	0.01	Param.
Calcium, total (mg/L)	AD-13	33.5	2.7	200	No	9	0	No	0.002	NP (normality)
Calcium, total (mg/L)	AD-14	7.913	1.793	200	No	9	0	sqrt(x)	0.01	Param.
Chloride, total (mg/L)	AD-11	15	9	43	No	9	0	No	0.002	NP (normality)
Chloride, total (mg/L)	AD-13	18.55	11.23	43	No	9	0	No	0.01	Param.
Chloride, total (mg/L)	AD-14	12	4	43	No	9	0	No	0.002	NP (normality)
Fluoride, total (mg/L)	AD-11	3	0.5	4	No	9	11.11	No	0.002	NP (normality)
Fluoride, total (mg/L)	AD-13	1.126	0.4149	4	No	9	22.22	No	0.002	NP (Cohens/xfm)
Fluoride, total (mg/L)	AD-14	0.5	0.5	4	No	9	100	No	0.002	NP (NDs)
pH, field (SU)	AD-11	4.693	3.693	7.67	No	10	0	No	0.005	Param.
pH, field (SU)	AD-13	5.389	4.249	7.67	No	10	0	No	0.005	Param.
pH, field (SU)	AD-14	5.262	3.909	7.67	No	10	0	sqrt(x)	0.005	Param.
Sulfate, total (mg/L)	AD-11	696.6	489	1445	No	9	0	No	0.01	Param.
Sulfate, total (mg/L)	AD-13	277.1	148.9	1445	No	9	0	No	0.01	Param.
Sulfate, total (mg/L)	AD-14	204	90	1445	No	9	0	No	0.002	NP (normality)
Total Dissolved Solids (mg/L)	AD-11	1061	796.3	1840	No	9	0	x^4	0.01	Param.
Total Dissolved Solids (mg/L)	AD-13	687.3	321.8	1840	No	9	0	No	0.01	Param.
Total Dissolved Solids (mg/L)	AD-14	319.6	232.1	1840	No	9	0	sqrt(x)	0.01	Param.

Parametric Confidence Interval

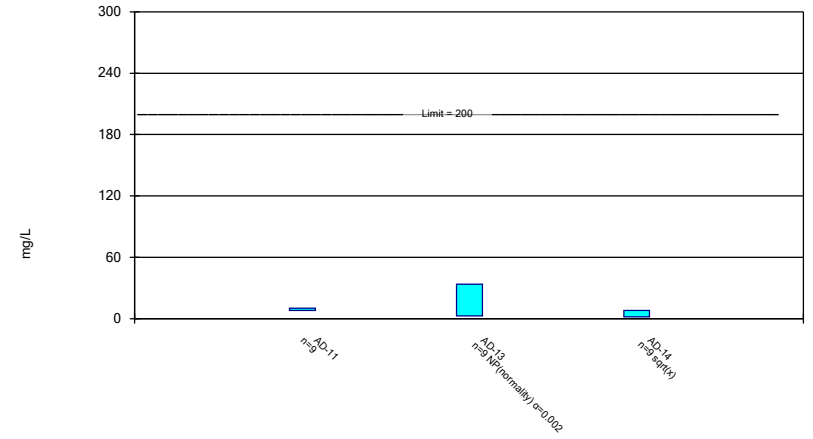
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Boron, total Analysis Run 12/10/2018 4:14 PM View: Confidence Intervals - App III
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

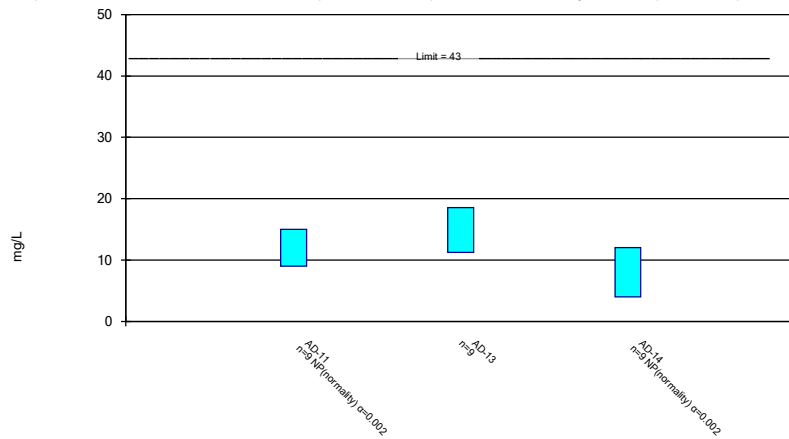
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Calcium, total Analysis Run 12/10/2018 4:14 PM View: Confidence Intervals - App III
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

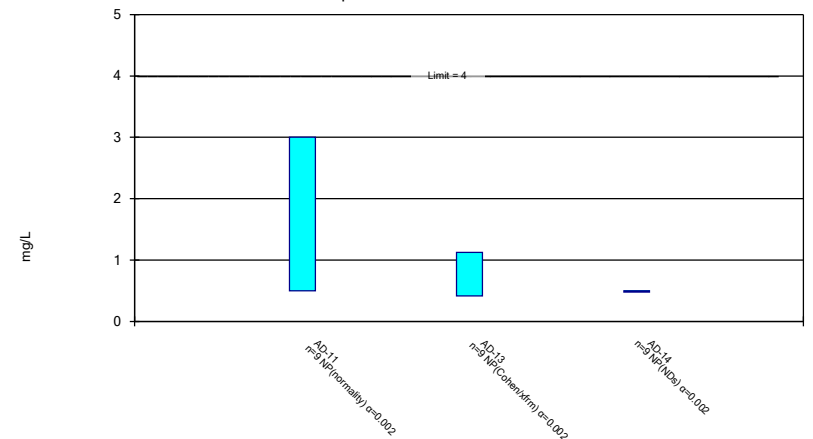
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chloride, total Analysis Run 12/10/2018 4:14 PM View: Confidence Intervals - App III
Welsh LF Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

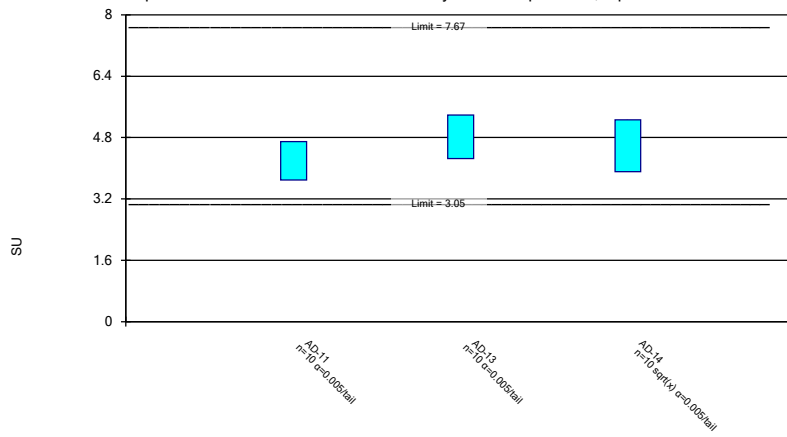
Compliance Limit is not exceeded.



Constituent: Fluoride, total Analysis Run 12/10/2018 4:14 PM View: Confidence Intervals - App III
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

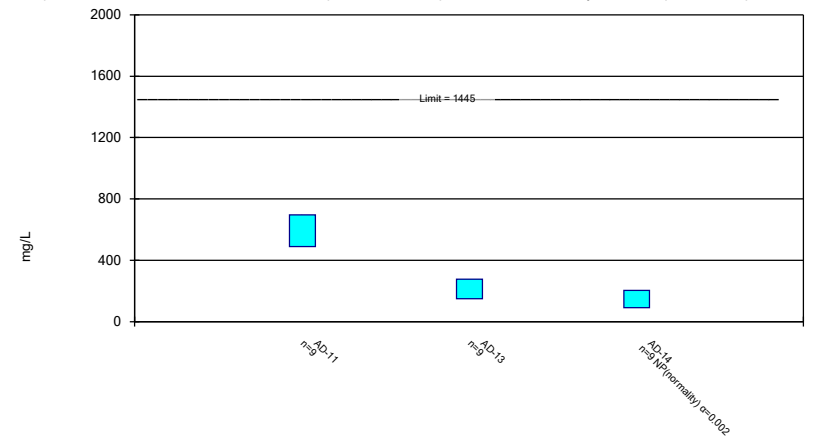
Compliance Limit is not exceeded. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: pH, field Analysis Run 12/10/2018 4:14 PM View: Confidence Intervals - App III
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

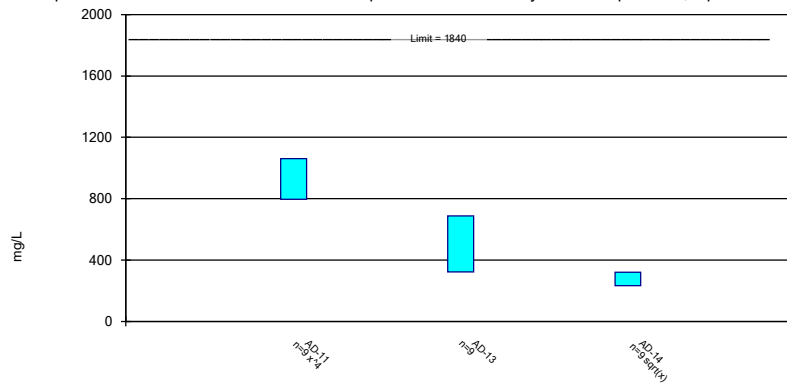
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Sulfate, total Analysis Run 12/10/2018 4:14 PM View: Confidence Intervals - App III
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Total Dissolved Solids Analysis Run 12/10/2018 4:14 PM View: Confidence Intervals - App III
Welsh LF Client: Geosyntec Data: Welsh LF

Intrawell Prediction Limit Summary Table - Significant Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 1/5/2019, 11:10 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig. Bg.N	Bg Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method
Chloride, total (mg/L)	AD-5	16.78	n/a	8/15/2018	19	Yes8	14.5	0.9258	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-11	12.63	n/a	9/17/2018	15	Yes8	10.38	0.9161	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-14	6.454	n/a	9/17/2018	12	Yes8	4.625	0.744	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-14	131.3	n/a	9/17/2018	204	Yes8	105.8	10.39	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-14	325.3	n/a	9/17/2018	384	Yes8	262.3	25.65	0	None	No	0.002505	Param Intra 1 of 2

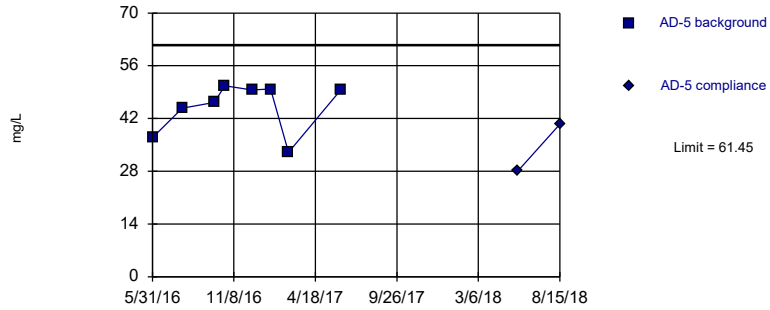
Intrawell Prediction Limit Summary Table - All Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 1/5/2019, 11:10 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig. Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method
Calcium, total (mg/L)	AD-5	61.45	n/a	8/15/2018	40.5	No 8	45.09	6.656	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-11	11.39	n/a	9/17/2018	6.61	No 8	9.419	0.8002	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-13	38.48	n/a	9/17/2018	10.1	No 8	1.861	0.6165	0	None	x^(1/3)	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-14	13.85	n/a	9/17/2018	4.51	No 8	4.868	3.655	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-1	224.6	n/a	8/14/2018	5.95	No 8	6.363	3.508	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-17	203.5	n/a	8/15/2018	187	No 8	193.6	4.033	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-5	16.78	n/a	8/15/2018	19	Yes 8	14.5	0.9258	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-11	12.63	n/a	9/17/2018	15	Yes 8	10.38	0.9161	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-13	23.97	n/a	9/17/2018	18	No 8	14.5	3.854	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-14	6.454	n/a	9/17/2018	12	Yes 8	4.625	0.744	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-1	9	n/a	8/14/2018	5	No 8	n/a	n/a	0	n/a	n/a	0.02144	NP Intra (normality) ...
Chloride, total (mg/L)	AD-17	44.04	n/a	8/15/2018	40	No 8	33.38	4.34	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-5	336.4	n/a	8/15/2018	240	No 8	177.4	64.69	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-11	833.3	n/a	9/17/2018	410	No 8	615.6	88.57	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-13	342	n/a	9/17/2018	316	No 8	200.1	57.71	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-14	131.3	n/a	9/17/2018	204	Yes 8	105.8	10.39	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-1	82.3	n/a	8/14/2018	44	No 8	6.772	0.9358	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-17	1471	n/a	8/15/2018	1170	No 8	1136	136.3	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-5	563.5	n/a	8/15/2018	428	No 8	383.6	73.17	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-11	1224	n/a	9/17/2018	720	No 8	9.0e8	3.8e8	0	None	x^3	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-13	974.4	n/a	9/17/2018	620	No 8	490.1	197	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-14	325.3	n/a	9/17/2018	384	Yes 8	262.3	25.65	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-1	784.8	n/a	8/14/2018	160	No 8	16.71	4.598	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-17	1840	n/a	8/15/2018	1750	No 8	1639	81.77	0	None	No	0.002505	Param Intra 1 of 2

Within Limit

Prediction Limit
Intrawell Parametric

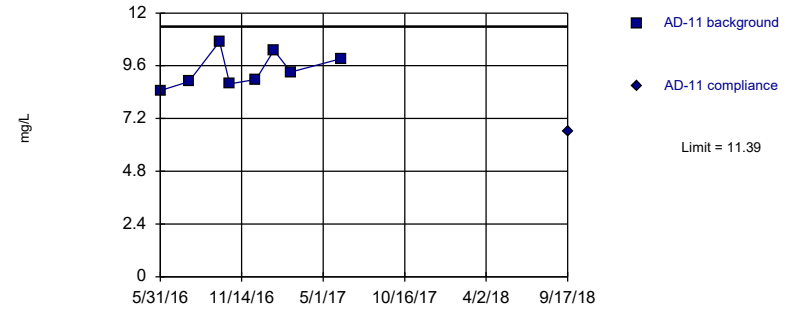


Background Data Summary: Mean=45.09, Std. Dev.=6.656, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8101, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Parametric

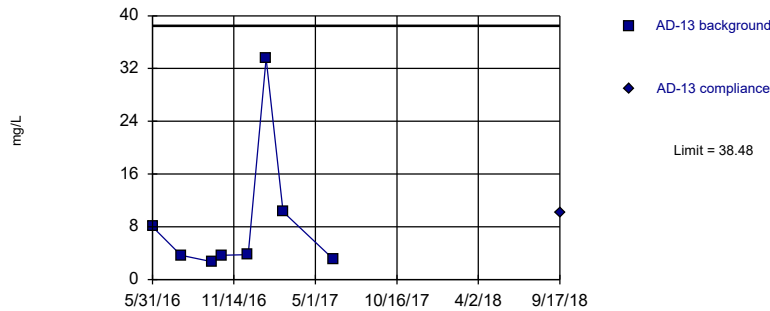


Background Data Summary: Mean=9.419, Std. Dev.=0.8002, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9212, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Parametric

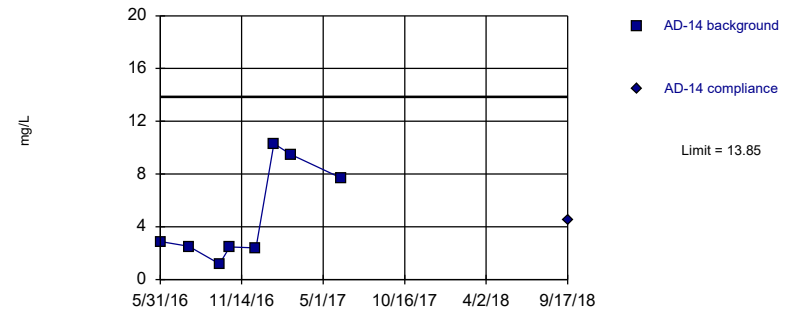


Background Data Summary (based on cube root transformation): Mean=1.861, Std. Dev.=0.6165, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7575, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

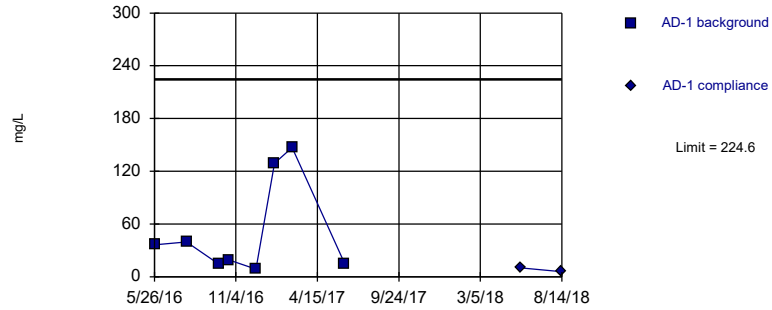
Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=4.868, Std. Dev.=3.655, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8054, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

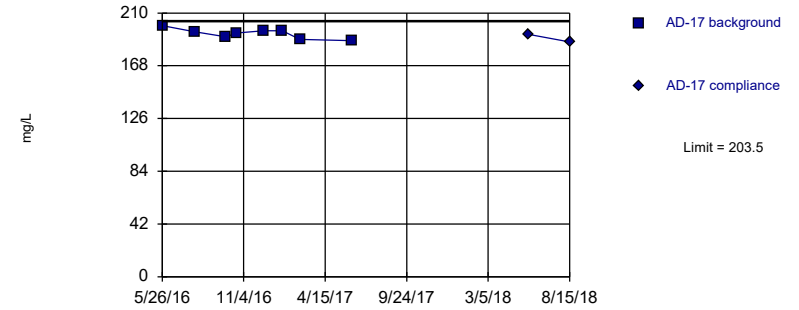
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=6.363, Std. Dev.=3.508, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8248, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

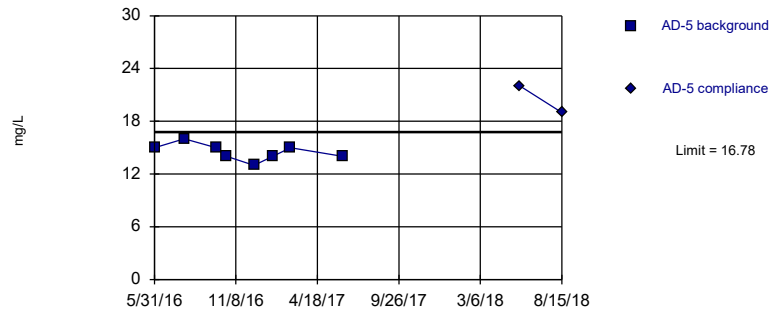
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=193.6, Std. Dev.=4.033, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9507, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

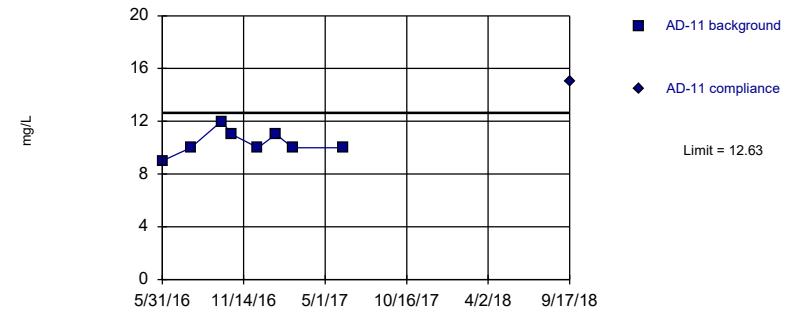
Exceeds Limit Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=14.5, Std. Dev.=0.9258, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9302, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Exceeds Limit Prediction Limit
Intrawell Parametric

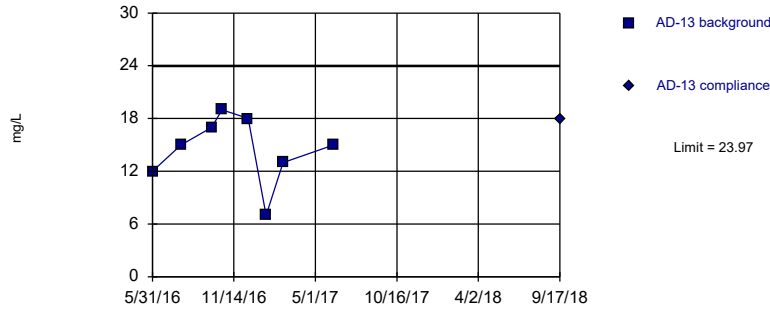


Background Data Summary: Mean=10.38, Std. Dev.=0.9161, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9054, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Parametric

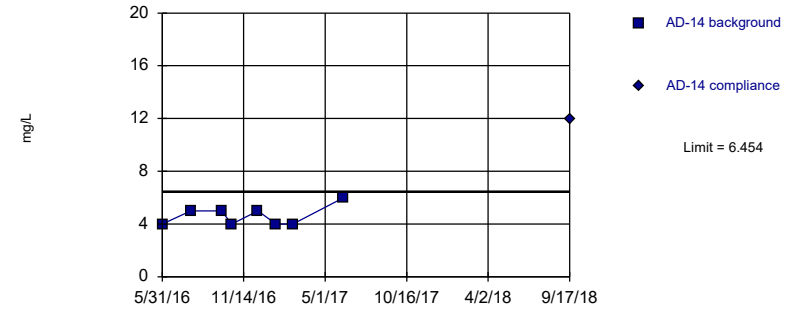


Background Data Summary: Mean=14.5, Std. Dev.=3.854, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9344, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Exceeds Limit

Prediction Limit
Intrawell Parametric

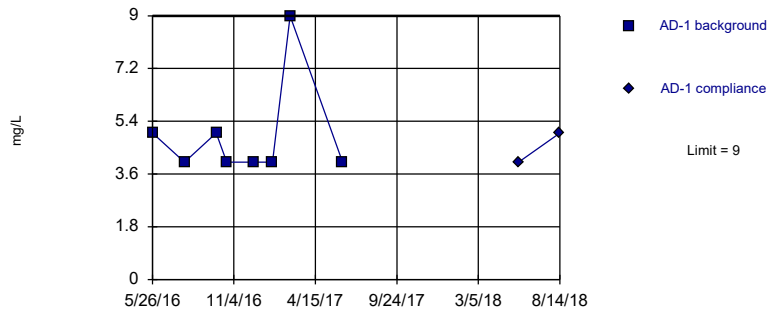


Background Data Summary: Mean=4.625, Std. Dev.=0.744, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7968, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Non-parametric

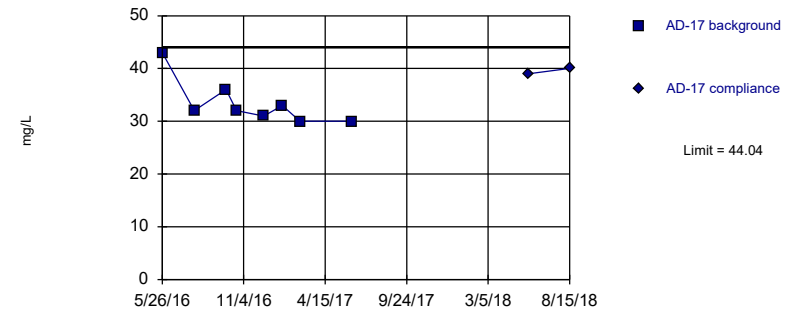


Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 8 background values. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

Constituent: Chloride, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Parametric

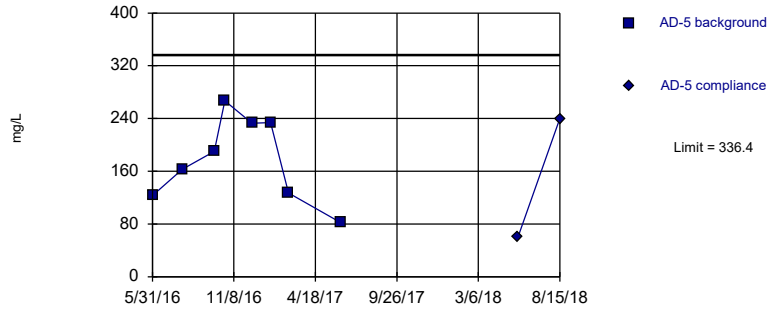


Background Data Summary: Mean=33.38, Std. Dev.=4.34, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7758, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Parametric

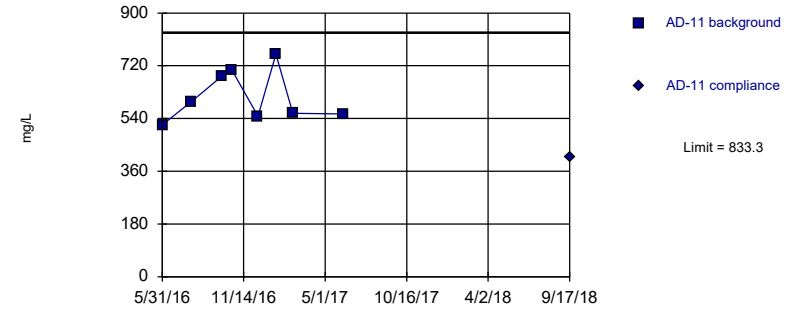


Background Data Summary: Mean=177.4, Std. Dev.=64.69, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.953, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Sulfate, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Parametric

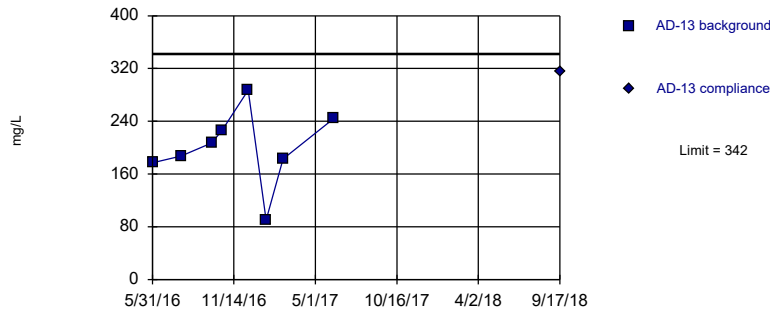


Background Data Summary: Mean=615.6, Std. Dev.=88.57, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8871, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Sulfate, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Intrawell Parametric

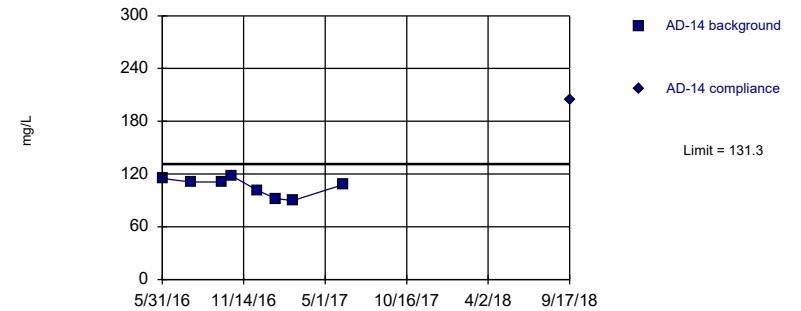


Background Data Summary: Mean=200.1, Std. Dev.=57.71, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9527, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Sulfate, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Exceeds Limit

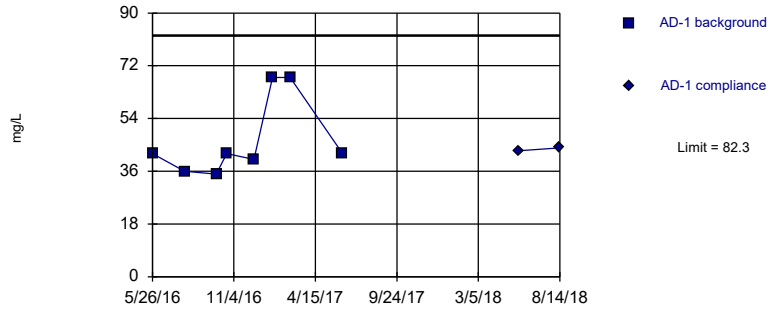
Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=105.8, Std. Dev.=10.39, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.904, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Sulfate, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

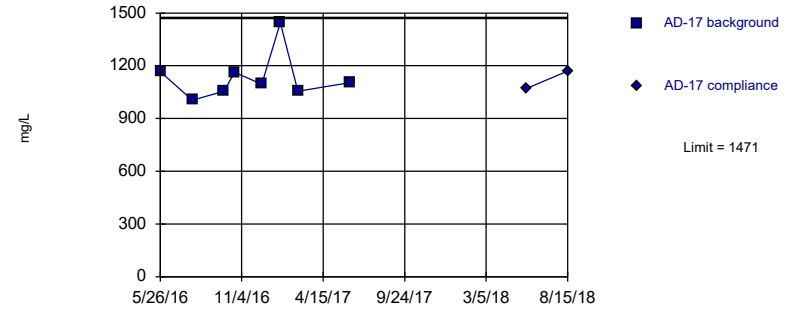
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=6.772, Std. Dev.=0.9358, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7528, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Sulfate, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

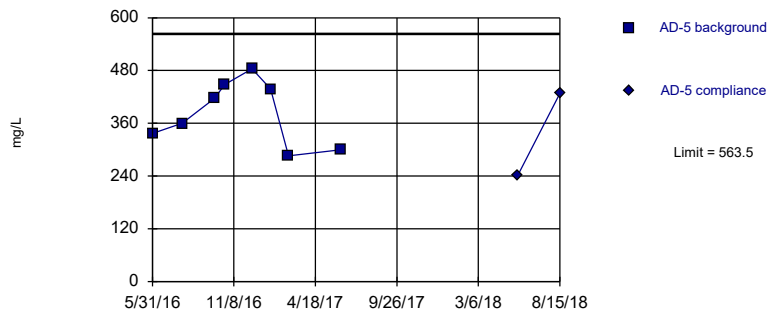
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=1136, Std. Dev.=136.3, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7916, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Sulfate, total Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

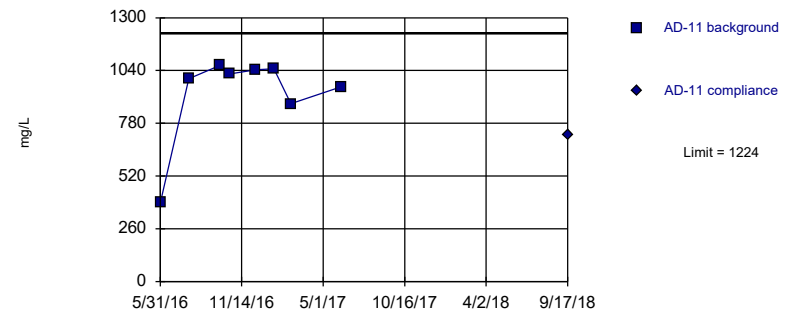
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=383.6, Std. Dev.=73.17, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.937, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

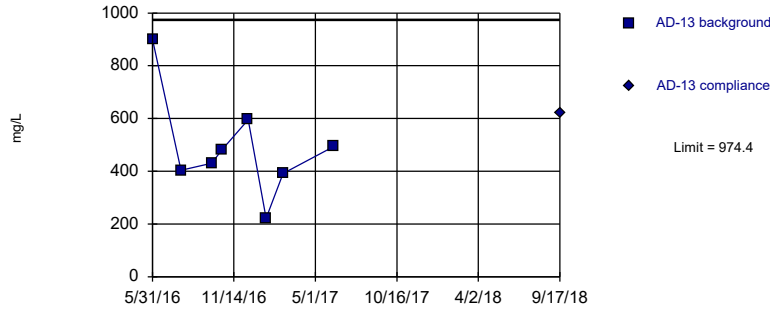
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary (based on cube transformation): Mean=9.0e8, Std. Dev.=3.8e8, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.79, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

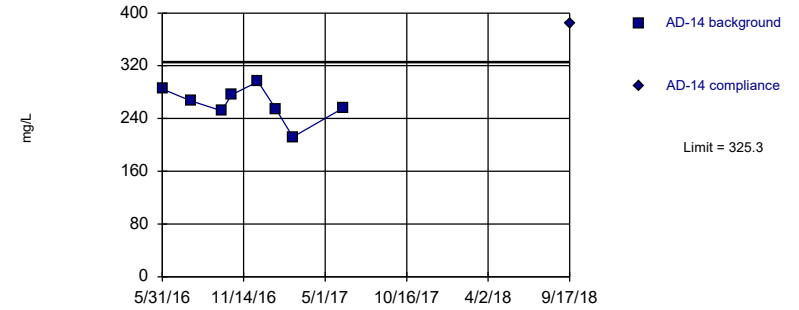
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=490.1, Std. Dev.=197, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.896, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

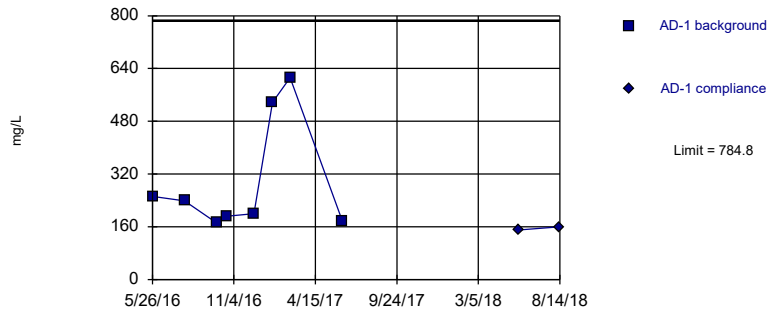
Exceeds Limit Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=262.3, Std. Dev.=25.65, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9381, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

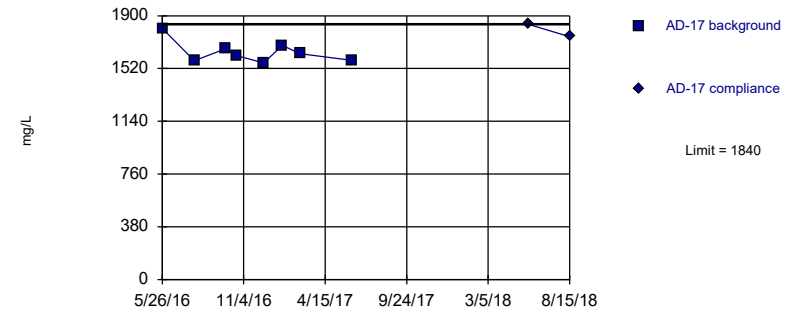
Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary (based on square root transformation): Mean=16.71, Std. Dev.=4.598, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.756, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit Prediction Limit
Intrawell Parametric



Background Data Summary: Mean=1639, Std. Dev.=81.77, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8702, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 1/5/2019 11:06 AM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Interwell Prediction Limit Summary Table - Significant Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 1/5/2019, 11:13 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig. Bg.N	Bg Mean	Std. Dev.	%NDs	ND Adj Transform	Alpha	Method
Boron, total (mg/L)	AD-11	0.765	n/a	9/17/2018	1.84	Yes30	-2.011	0.9717	0	None ln(x)	0.002505	Param 1 of 2
Boron, total (mg/L)	AD-13	0.765	n/a	9/17/2018	1.49	Yes30	-2.011	0.9717	0	None ln(x)	0.002505	Param 1 of 2
Boron, total (mg/L)	AD-14	0.765	n/a	9/17/2018	1.51	Yes30	-2.011	0.9717	0	None ln(x)	0.002505	Param 1 of 2
pH, field (SU)	AD-14	7.051	4.294	8/14/2018	4.27	Yes30	34.08	8.719	0	None x^2	0.001253	Param 1 of 2

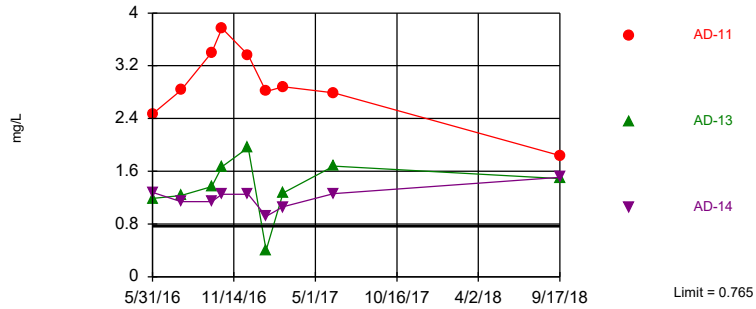
Interwell Prediction Limit Summary Table - All Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 1/5/2019, 11:13 AM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig. Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj	Transform	Alpha	Method
Boron, total (mg/L)	AD-11	0.765	n/a	9/17/2018	1.84	Yes30	-2.011	0.9717	0	None	ln(x)	0.002505	Param 1 of 2
Boron, total (mg/L)	AD-13	0.765	n/a	9/17/2018	1.49	Yes30	-2.011	0.9717	0	None	ln(x)	0.002505	Param 1 of 2
Boron, total (mg/L)	AD-14	0.765	n/a	9/17/2018	1.51	Yes30	-2.011	0.9717	0	None	ln(x)	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-11	1	n/a	8/15/2018	1ND	No 30	n/a	n/a	76.67	n/a	n/a	0.00197	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-13	1	n/a	8/14/2018	0.7442	No 30	n/a	n/a	76.67	n/a	n/a	0.00197	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-14	1	n/a	8/14/2018	1ND	No 30	n/a	n/a	76.67	n/a	n/a	0.00197	NP (NDs) 1 of 2
pH, field (SU)	AD-11	7.051	4.294	8/15/2018	4.73	No 30	34.08	8.719	0	None	x^2	0.001253	Param 1 of 2
pH, field (SU)	AD-13	7.051	4.294	8/14/2018	4.82	No 30	34.08	8.719	0	None	x^2	0.001253	Param 1 of 2
pH, field (SU)	AD-14	7.051	4.294	8/14/2018	4.27	Yes30	34.08	8.719	0	None	x^2	0.001253	Param 1 of 2

Exceeds Limit: AD-11, AD-13, AD-14

Prediction Limit
Interwell Parametric

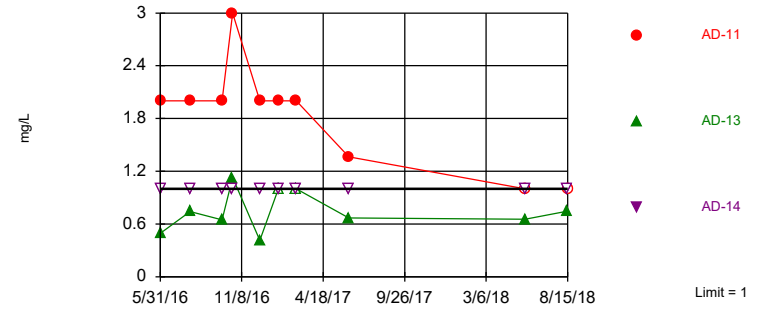


Background Data Summary (based on natural log transformation): Mean=-2.011, Std. Dev.=0.9717, n=30. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9108, critical = 0.9. Kappa = 1.794 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Comparing 3 points to limit.

Constituent: Boron, total Analysis Run 1/5/2019 11:11 AM View: PL's - Interwell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Interwell Non-parametric

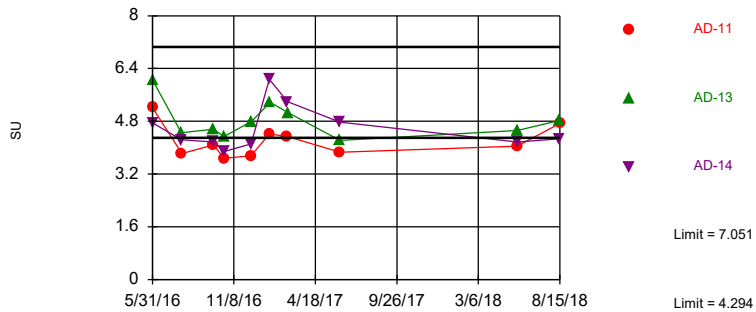


Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 30 background values. 76.67% NDs. Annual per-constituent alpha = 0.01176. Individual comparison alpha = 0.00197 (1 of 2). Comparing 3 points to limit.

Constituent: Fluoride, total Analysis Run 1/5/2019 11:11 AM View: PL's - Interwell
Welsh LF Client: Geosyntec Data: Welsh LF

Exceeds Limits: AD-14

Prediction Limit
Interwell Parametric



Background Data Summary (based on square transformation): Mean=34.08, Std. Dev.=8.719, n=30. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9102, critical = 0.9. Kappa = 1.794 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.001253. Comparing 3 points to limit.

Constituent: pH, field Analysis Run 1/5/2019 11:11 AM View: PL's - Interwell
Welsh LF Client: Geosyntec Data: Welsh LF

Prediction Limit

Constituent: Boron, total (mg/L) Analysis Run 1/5/2019 11:13 AM View: PL's - Interwell

Welsh LF Client: Geosyntec Data: Welsh LF

	AD-17 (bg)	AD-1 (bg)	AD-5 (bg)	AD-13	AD-11	AD-14
5/26/2016	0.121	0.346				
5/31/2016			0.03	1.19	2.47	1.28
7/29/2016	0.119	0.35	0.04	1.23	2.83	1.14
9/30/2016	0.111	0.332	0.04	1.37	3.4	1.14
10/21/2016	0.124	0.398	0.05	1.67	3.77	1.25
12/14/2016	0.135	0.394	0.05	1.96	3.36	1.25
1/20/2017	0.101	0.656	0.04	0.402	2.81	0.915
2/24/2017	0.135	0.7	0.04	1.27	2.88	1.06
6/8/2017	0.121	0.449	0.05281	1.68	2.79	1.26
5/24/2018	0.239	0.345	0.0501			
8/14/2018		0.443				
8/15/2018	0.118		0.05			
9/17/2018				1.49	1.84	1.51

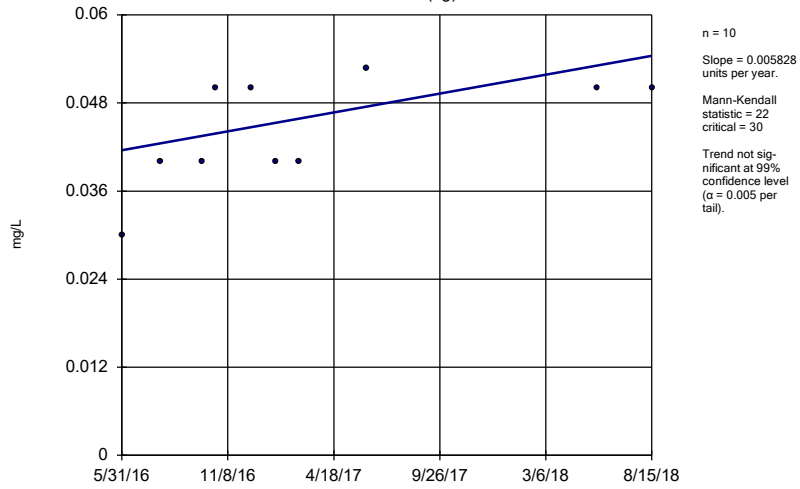
Trend Test Summary Table - All Results (No Significant Results)

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/11/2018, 5:00 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron, total (mg/L)	AD-5 (bg)	0.005828	22	30	No	10	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-11	-0.295	-10	-25	No	9	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-13	0.1357	12	25	No	9	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-14	0.0183	4	25	No	9	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-1 (bg)	0.08093	15	30	No	10	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-17 (bg)	0.007399	7	30	No	10	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-5 (bg)	0	5	30	No	10	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-11	1.168	9	25	No	9	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-14	1.308	11	25	No	9	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-1 (bg)	0	-1	-30	No	10	0	n/a	n/a	0.01	NP
Chloride, total (mg/L)	AD-17 (bg)	-2.005	-5	-30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-5 (bg)	0.1885	11	30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-14	0.01464	2	30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-1 (bg)	-0.4232	-14	-30	No	10	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-17 (bg)	-0.4462	-19	-30	No	10	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	AD-5 (bg)	-14.86	-1	-30	No	10	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	AD-14	-9.409	-7	-25	No	9	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	AD-1 (bg)	2.401	19	30	No	10	0	n/a	n/a	0.01	NP
Sulfate, total (mg/L)	AD-17 (bg)	12.06	8	30	No	10	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	AD-5 (bg)	-33.56	-5	-30	No	10	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	AD-14	-3.767	0	25	No	9	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	AD-1 (bg)	-26.43	-13	-30	No	10	0	n/a	n/a	0.01	NP
Total Dissolved Solids (mg/L)	AD-17 (bg)	40.84	7	30	No	10	0	n/a	n/a	0.01	NP

Sen's Slope Estimator

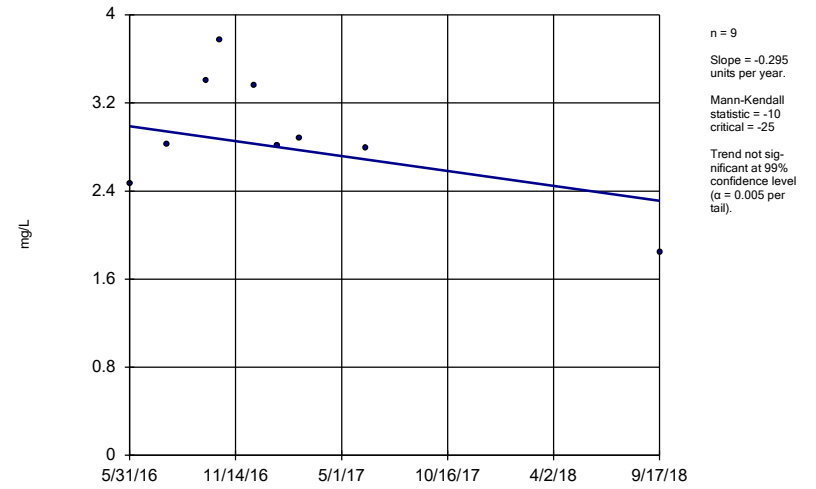
AD-5 (bg)



Constituent: Boron, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

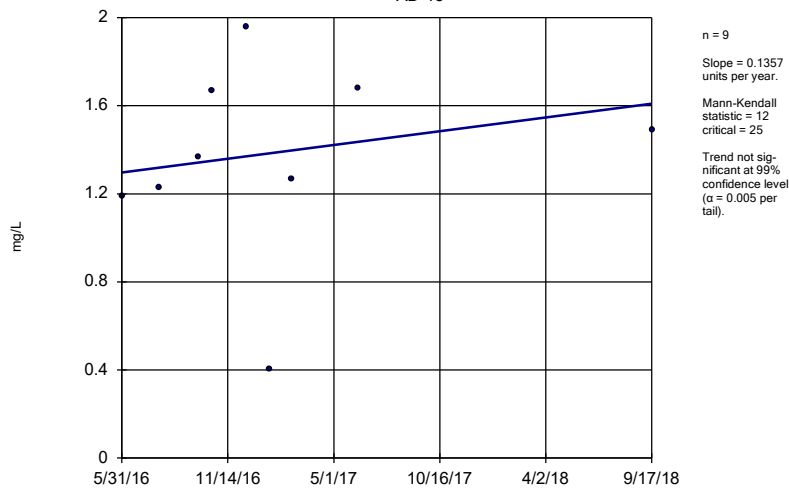
AD-11



Constituent: Boron, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

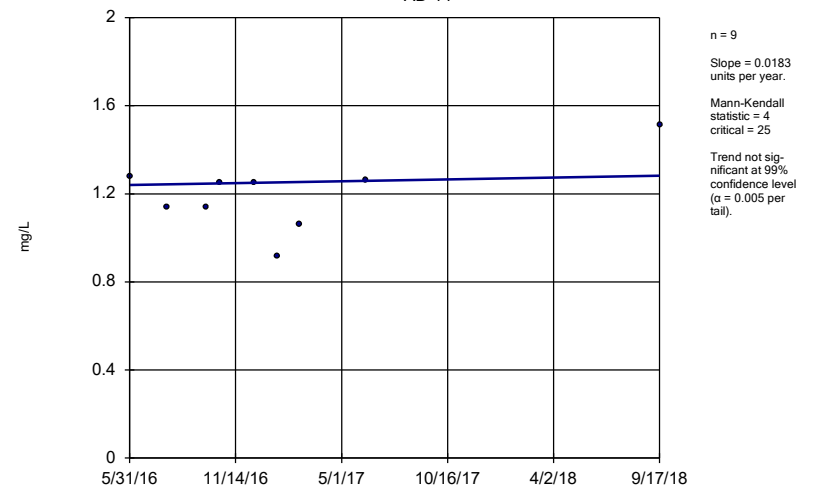
AD-13



Constituent: Boron, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

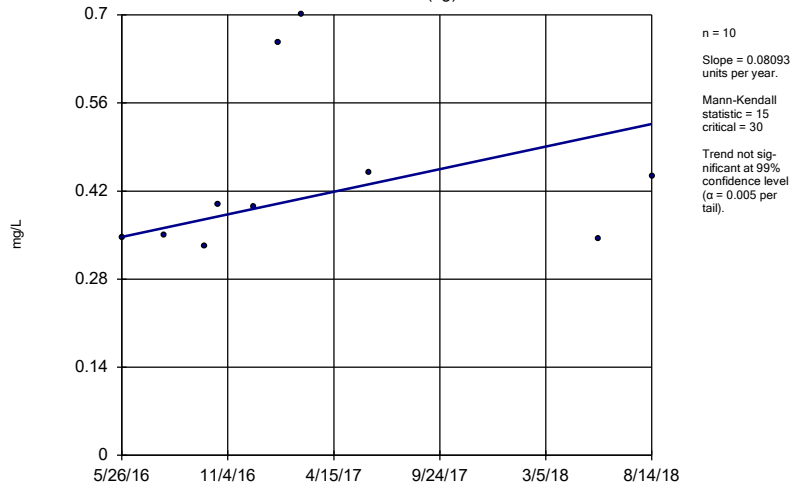
AD-14



Constituent: Boron, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

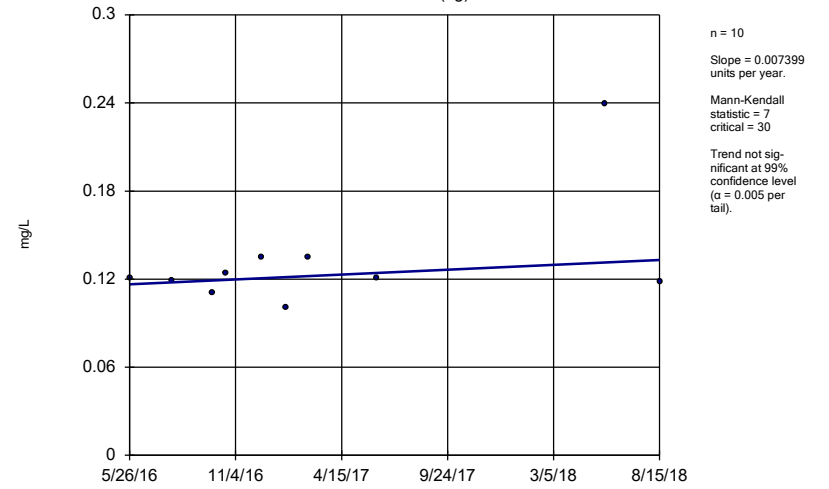
AD-1 (bg)



Constituent: Boron, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

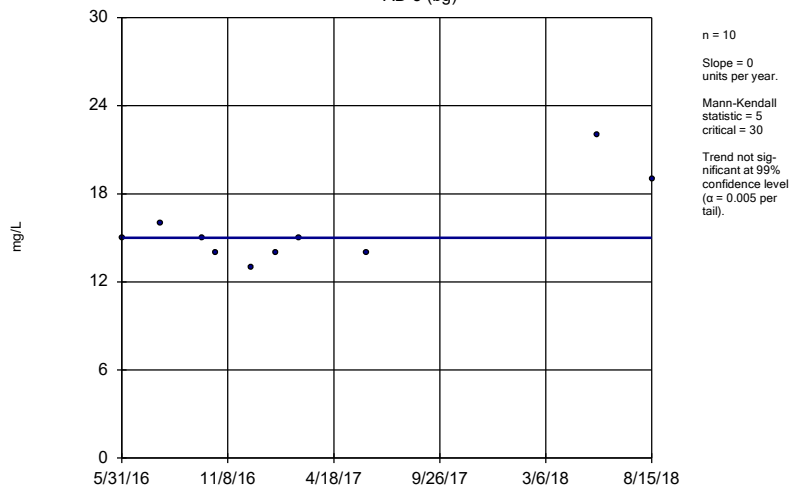
AD-17 (bg)



Constituent: Boron, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

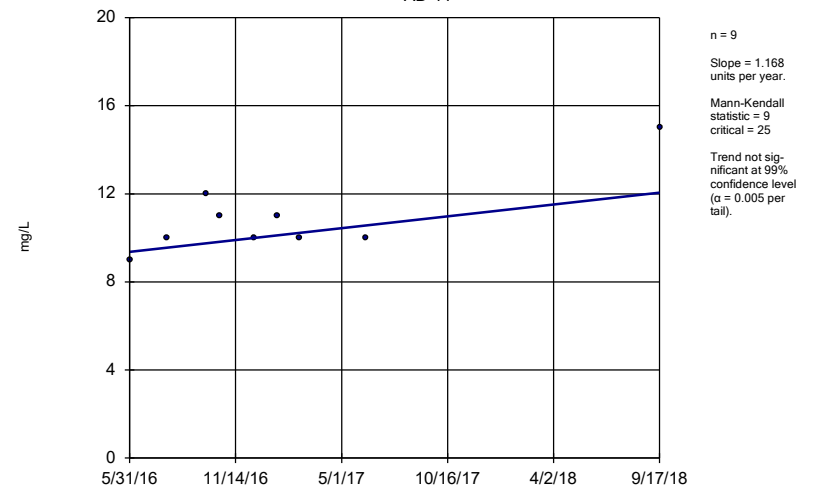
AD-5 (bg)



Constituent: Chloride, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

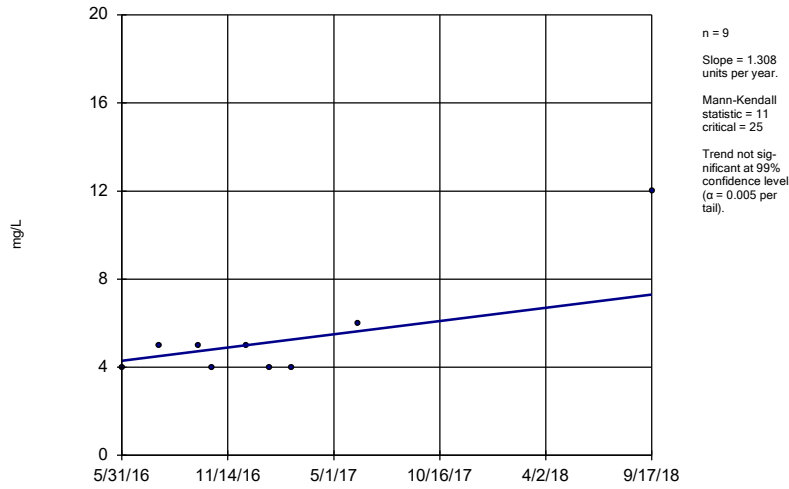
AD-11



Constituent: Chloride, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

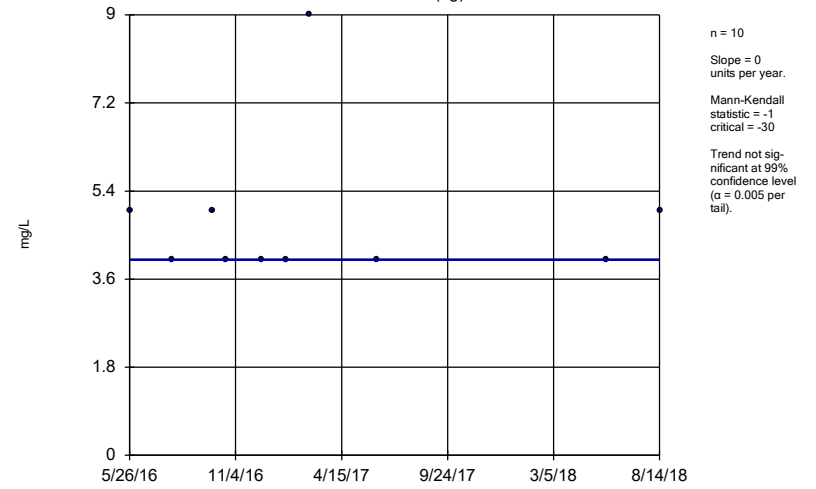
AD-14



Constituent: Chloride, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

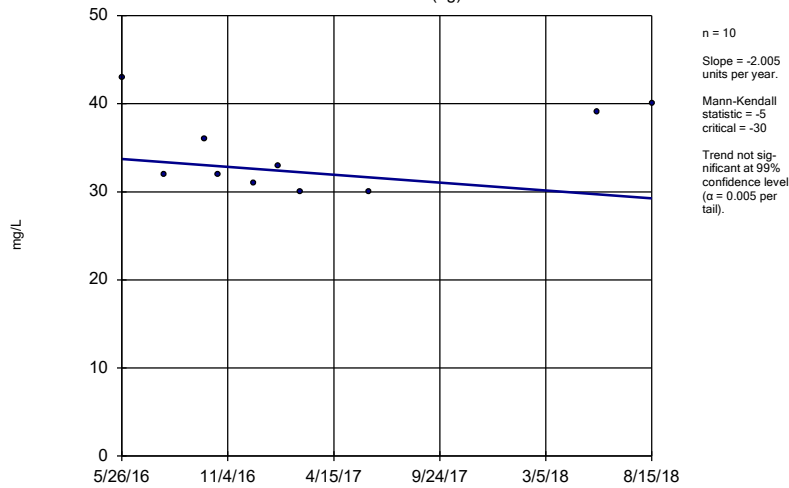
AD-1 (bg)



Constituent: Chloride, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

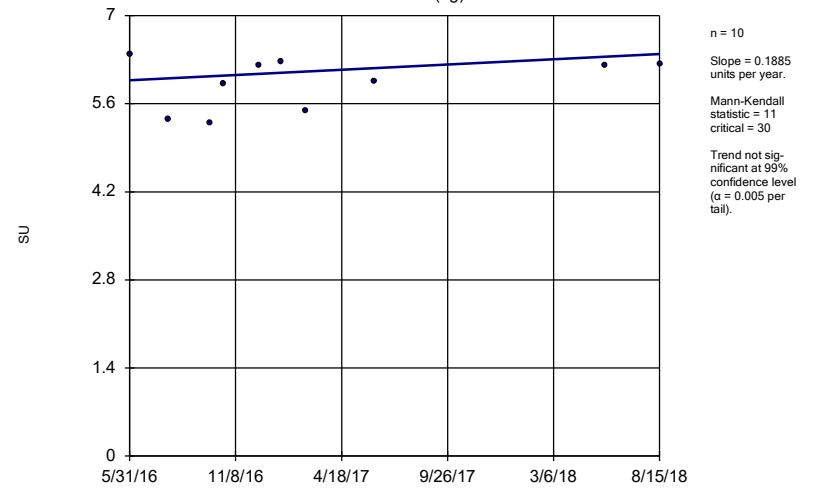
AD-17 (bg)



Constituent: Chloride, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

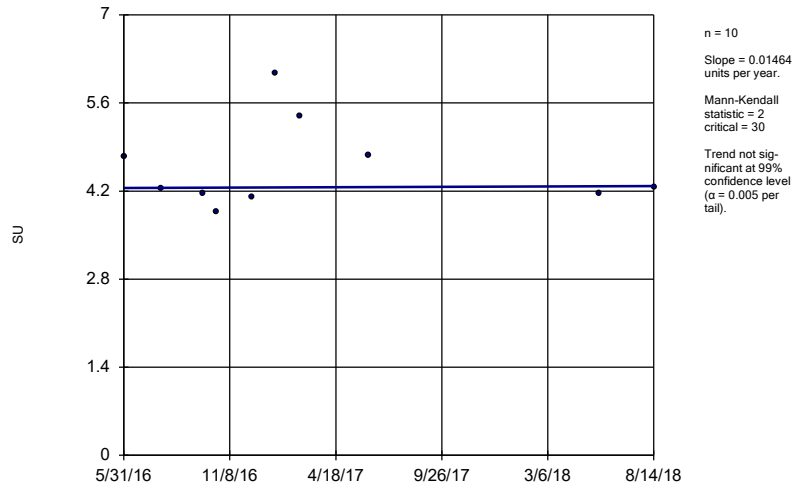
AD-5 (bg)



Constituent: pH, field Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

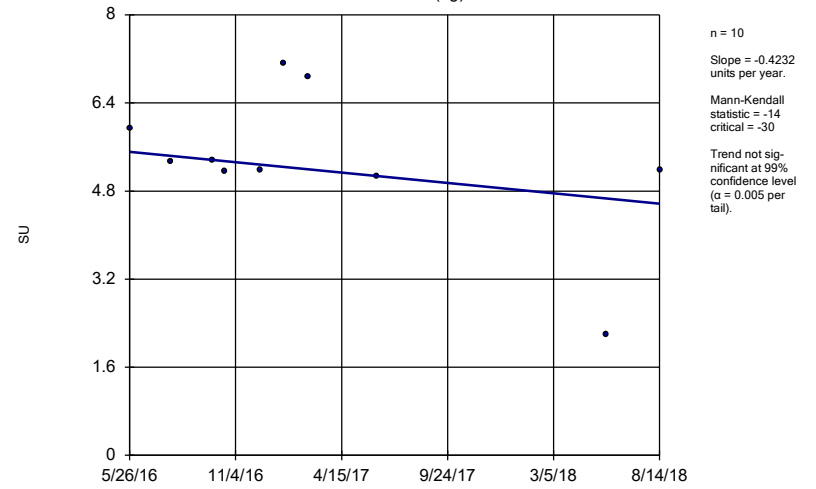
AD-14



Constituent: pH, field Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

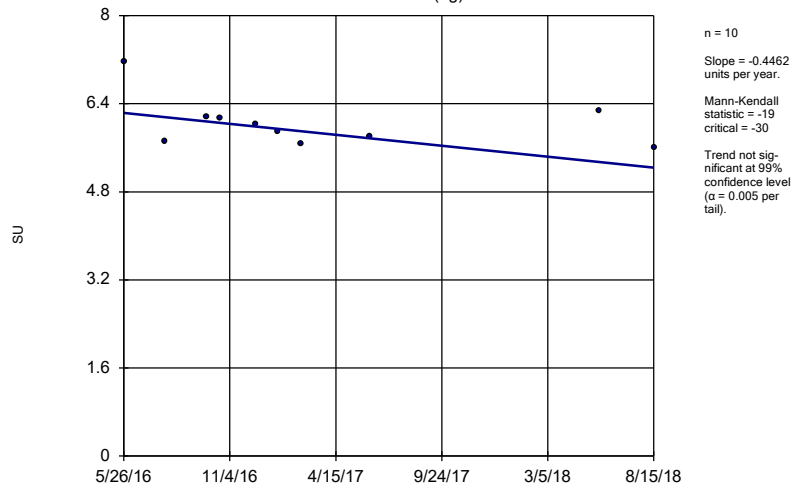
AD-1 (bg)



Constituent: pH, field Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

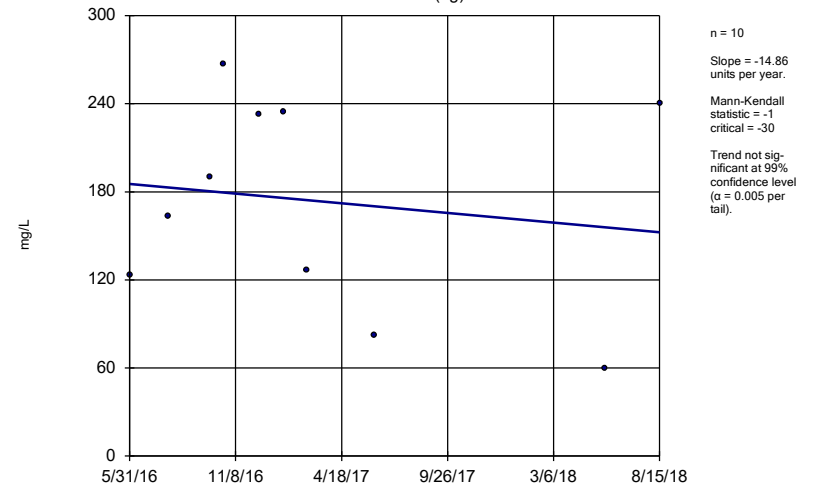
AD-17 (bg)



Constituent: pH, field Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

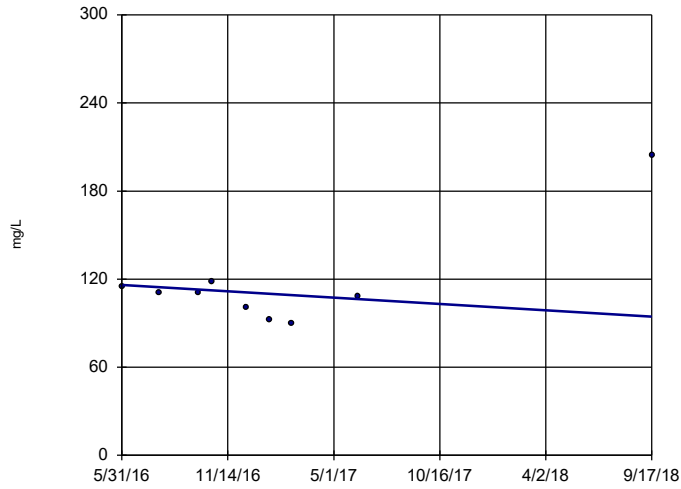
AD-5 (bg)



Constituent: Sulfate, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-14

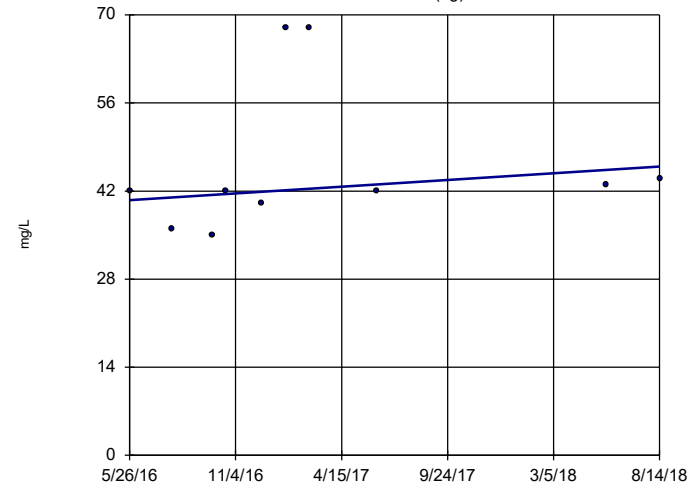


n = 9
 Slope = -9.409 units per year.
 Mann-Kendall statistic = -7
 critical = -25
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-1 (bg)

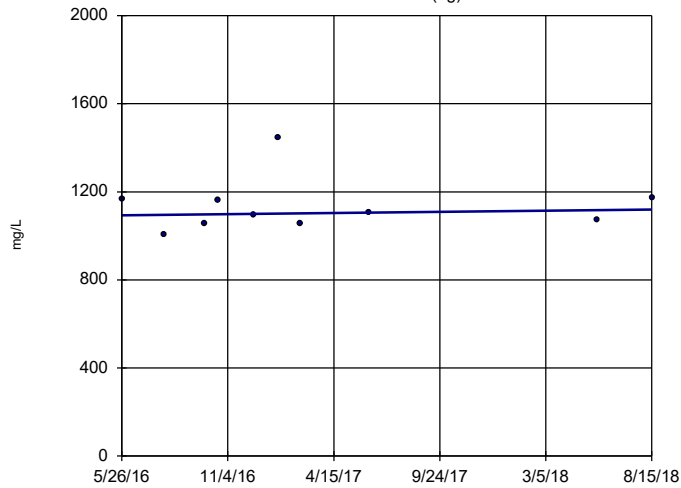


n = 10
 Slope = 2.401 units per year.
 Mann-Kendall statistic = 19
 critical = 30
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-17 (bg)

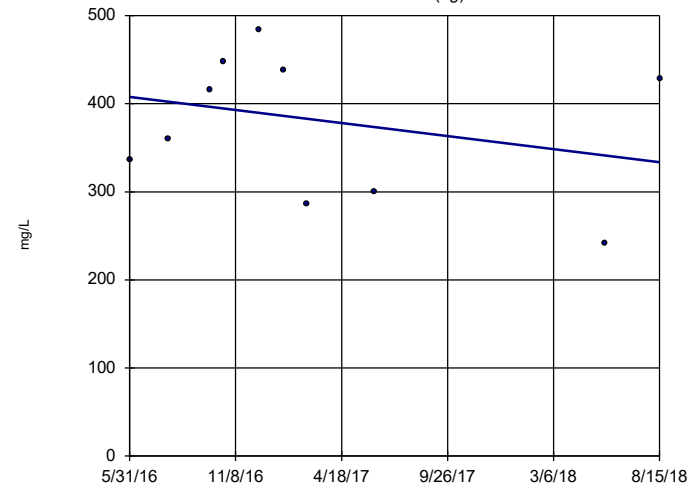


n = 10
 Slope = 12.06 units per year.
 Mann-Kendall statistic = 8
 critical = 30
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Sulfate, total Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-5 (bg)

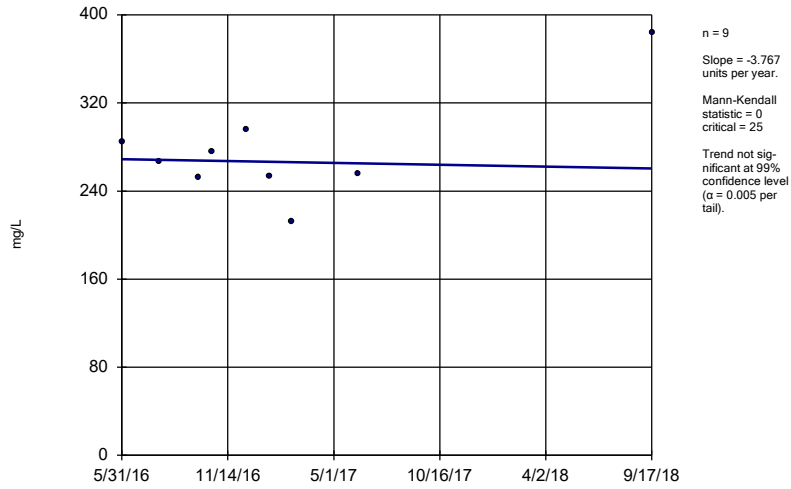


n = 10
 Slope = -33.56 units per year.
 Mann-Kendall statistic = -5
 critical = -30
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Total Dissolved Solids Analysis Run 12/11/2018 4:59 AM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

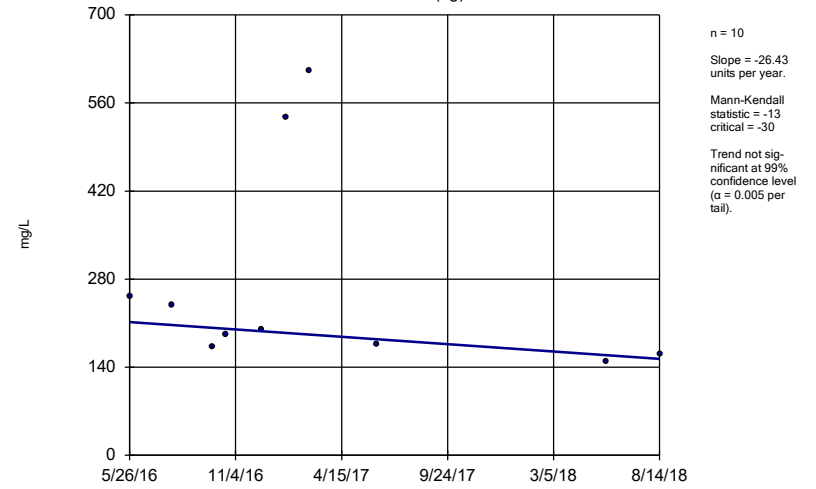
AD-14



Constituent: Total Dissolved Solids Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

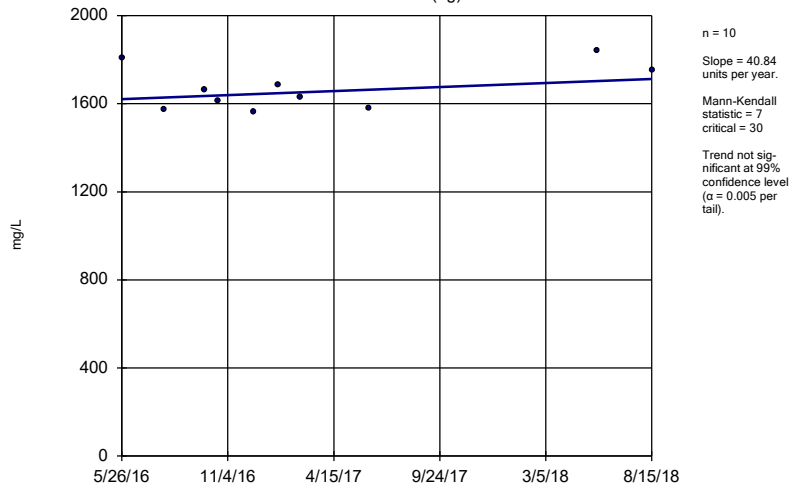
AD-1 (bg)



Constituent: Total Dissolved Solids Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-17 (bg)



Constituent: Total Dissolved Solids Analysis Run 12/11/2018 4:59 AM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Upper Tolerance Limits - Appendix IV

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/10/2018, 1:51 PM

Constituent	Upper Lim.	Bg.N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Antimony, total (mg/L)	0.005	30	n/a	n/a	80	n/a	n/a	0.2146	NP Inter(NDs)
Arsenic, total (mg/L)	0.005	30	n/a	n/a	63.33	n/a	n/a	0.2146	NP Inter(normality)
Barium, total (mg/L)	0.362	30	0.4014	0.1402	0	None	x^(1/3)	0.05	Inter
Beryllium, total (mg/L)	0.0007706	30	0.01454	0.005955	13.33	None	sqrt(x)	0.05	Inter
Cadmium, total (mg/L)	0.00646	30	n/a	n/a	30	n/a	n/a	0.2146	NP Inter(Cohens/xform)
Chromium, total (mg/L)	0.004	29	n/a	n/a	31.03	n/a	n/a	0.2259	NP Inter(normality)
Cobalt, total (mg/L)	0.0748	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	4.205	30	2	0.9933	0	None	No	0.05	Inter
Fluoride, total (mg/L)	1	30	n/a	n/a	76.67	n/a	n/a	0.2146	NP Inter(NDs)
Lead, total (mg/L)	0.005	30	n/a	n/a	86.67	n/a	n/a	0.2146	NP Inter(NDs)
Lithium, total (mg/L)	0.394	30	n/a	n/a	0	n/a	n/a	0.2146	NP Inter(normality)
Mercury, total (mg/L)	0.000033	30	n/a	n/a	46.67	n/a	n/a	0.2146	NP Inter(normality)
Molybdenum, total (mg/L)	0.005	30	n/a	n/a	73.33	n/a	n/a	0.2146	NP Inter(normality)
Selenium, total (mg/L)	0.005	30	n/a	n/a	53.33	n/a	n/a	0.2146	NP Inter(normality)
Thallium, total (mg/L)	0.002	30	n/a	n/a	83.33	n/a	n/a	0.2146	NP Inter(NDs)

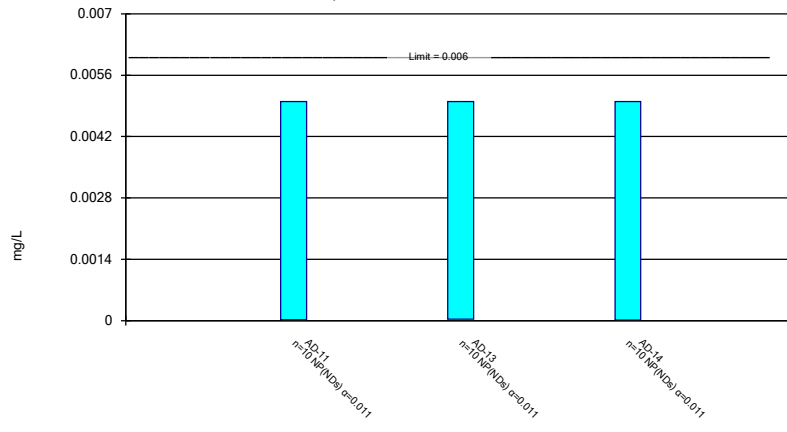
Confidence Interval Summary Table - All Appendix IV (No Significant Results)

Welsh LF Client: Geosyntec Data: Welsh LF Printed 1/5/2019, 11:18 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	AD-11	0.005	0.00002	0.006	No	10	90	No	0.011	NP (NDs)
Antimony, total (mg/L)	AD-13	0.005	0.00003	0.006	No	10	80	No	0.011	NP (NDs)
Antimony, total (mg/L)	AD-14	0.005	0.00001	0.006	No	10	90	No	0.011	NP (NDs)
Arsenic, total (mg/L)	AD-11	0.005	0.00105	0.01	No	10	60	No	0.011	NP (normality)
Arsenic, total (mg/L)	AD-13	0.005	0.00137	0.01	No	10	70	No	0.011	NP (normality)
Arsenic, total (mg/L)	AD-14	0.005	0.00039	0.01	No	10	70	No	0.011	NP (normality)
Barium, total (mg/L)	AD-11	0.02	0.01012	2	No	10	0	No	0.011	NP (normality)
Barium, total (mg/L)	AD-13	0.0645	0.02124	2	No	10	0	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-14	0.05407	0.02723	2	No	10	0	sqrt(x)	0.01	Param.
Beryllium, total (mg/L)	AD-11	0.004635	0.002551	0.004	No	10	0	x^2	0.01	Param.
Beryllium, total (mg/L)	AD-13	0.0009722	0.0006411	0.004	No	10	0	x^2	0.01	Param.
Beryllium, total (mg/L)	AD-14	0.0007222	0.0003541	0.004	No	10	0	No	0.01	Param.
Cadmium, total (mg/L)	AD-11	0.0004992	0.0003061	0.005	No	10	0	No	0.01	Param.
Cadmium, total (mg/L)	AD-13	0.001	0.000085	0.005	No	10	40	No	0.011	NP (normality)
Cadmium, total (mg/L)	AD-14	0.001452	0.0004738	0.005	No	10	0	No	0.01	Param.
Chromium, total (mg/L)	AD-11	0.003028	0.0002928	0.1	No	10	0	sqrt(x)	0.01	Param.
Chromium, total (mg/L)	AD-13	0.004	0.000503	0.1	No	10	30	No	0.011	NP (normality)
Chromium, total (mg/L)	AD-14	0.001171	0.0005606	0.1	No	10	20	No	0.01	Param.
Cobalt, total (mg/L)	AD-11	0.02786	0.01857	0.075	No	10	0	x^2	0.01	Param.
Cobalt, total (mg/L)	AD-13	0.008863	0.003162	0.075	No	10	0	No	0.01	Param.
Cobalt, total (mg/L)	AD-14	0.01305	0.005173	0.075	No	10	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-11	2.806	1.388	5	No	10	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-13	3.082	1.427	5	No	10	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-14	2.552	0.8154	5	No	10	0	sqrt(x)	0.01	Param.
Fluoride, total (mg/L)	AD-11	2	0.083	4	No	10	20	No	0.011	NP (normality)
Fluoride, total (mg/L)	AD-13	0.8623	0.1958	4	No	10	20	No	0.01	Param.
Fluoride, total (mg/L)	AD-14	0.083	0.083	4	No	10	100	No	0.011	NP (NDs)
Lead, total (mg/L)	AD-11	0.005	0.001183	0.015	No	10	70	No	0.011	NP (normality)
Lead, total (mg/L)	AD-13	0.005	0.001	0.015	No	10	70	No	0.011	NP (normality)
Lead, total (mg/L)	AD-14	0.005	0.000174	0.015	No	10	90	No	0.011	NP (NDs)
Lithium, total (mg/L)	AD-11	0.04681	0.02675	0.39	No	10	0	No	0.01	Param.
Lithium, total (mg/L)	AD-13	0.02811	0.01289	0.39	No	10	0	No	0.01	Param.
Lithium, total (mg/L)	AD-14	0.01446	0.01174	0.39	No	9	0	No	0.01	Param.
Mercury, total (mg/L)	AD-11	0.00001756	0.000001904	0.002	No	10	30	No	0.01	Param.
Mercury, total (mg/L)	AD-13	0.00001565	0.000005	0.002	No	10	50	No	0.011	NP (normality)
Mercury, total (mg/L)	AD-14	0.000145	0.00001443	0.002	No	10	0	No	0.011	NP (normality)
Molybdenum, total (mg/L)	AD-11	0.005	0.00005	0.1	No	10	80	No	0.011	NP (NDs)
Molybdenum, total (mg/L)	AD-13	0.005	0.00006	0.1	No	10	70	No	0.011	NP (normality)
Molybdenum, total (mg/L)	AD-14	0.005	0.00003	0.1	No	10	80	No	0.011	NP (NDs)
Selenium, total (mg/L)	AD-11	0.005	0.00134	0.05	No	10	40	No	0.011	NP (normality)
Selenium, total (mg/L)	AD-13	0.005	0.00103	0.05	No	10	30	No	0.011	NP (normality)
Selenium, total (mg/L)	AD-14	0.00453	0.002362	0.05	No	10	20	No	0.01	Param.
Thallium, total (mg/L)	AD-11	0.002	0.0002	0.002	No	10	50	No	0.011	NP (normality)
Thallium, total (mg/L)	AD-13	0.002	0.000277	0.002	No	10	80	No	0.011	NP (NDs)
Thallium, total (mg/L)	AD-14	0.002	0.000242	0.002	No	10	90	No	0.011	NP (NDs)

Non-Parametric Confidence Interval

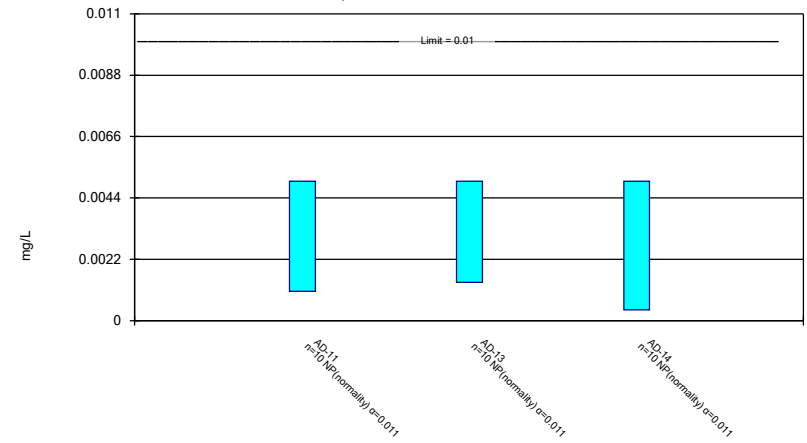
Compliance Limit is not exceeded.



Constituent: Antimony, total Analysis Run 1/5/2019 11:15 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

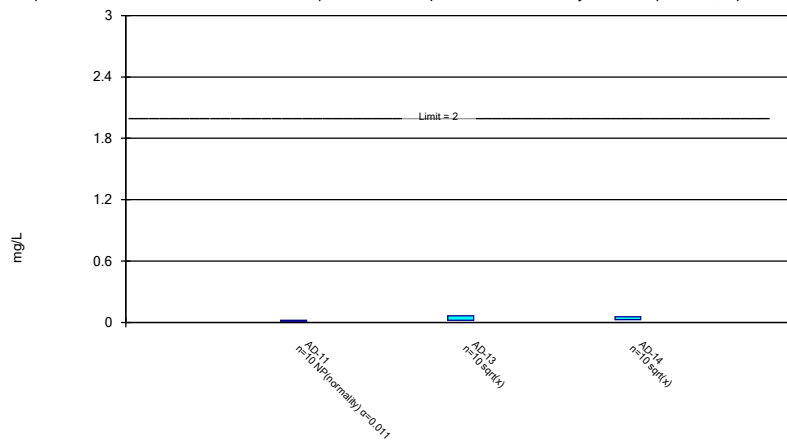
Compliance Limit is not exceeded.



Constituent: Arsenic, total Analysis Run 1/5/2019 11:15 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

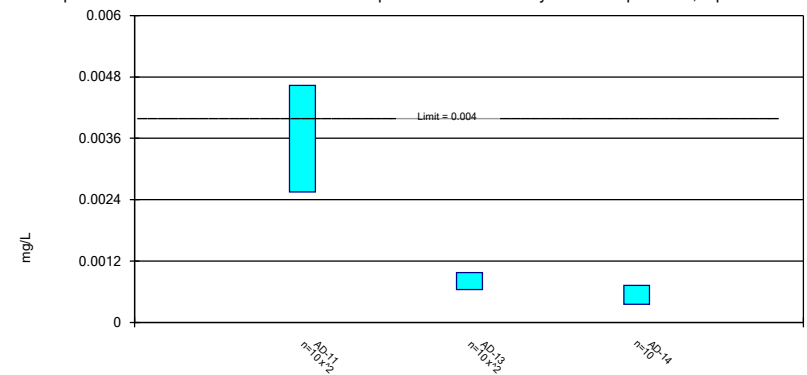
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium, total Analysis Run 1/5/2019 11:15 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

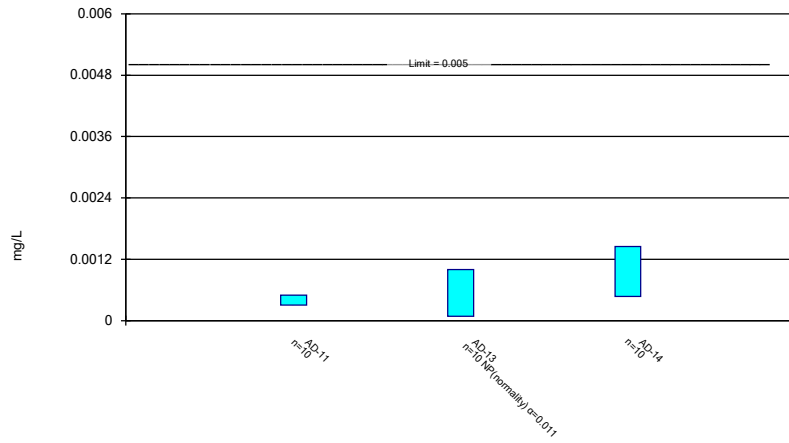
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Beryllium, total Analysis Run 1/5/2019 11:15 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

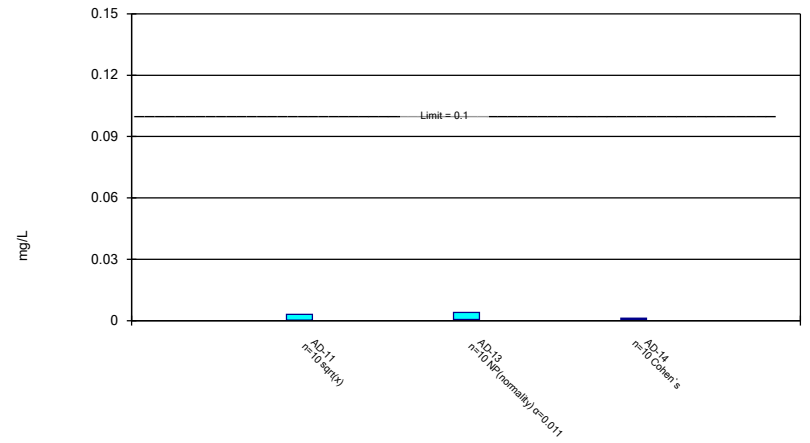
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

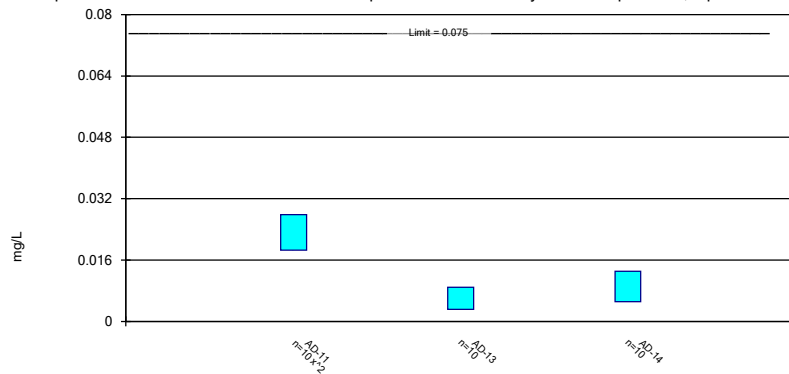
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

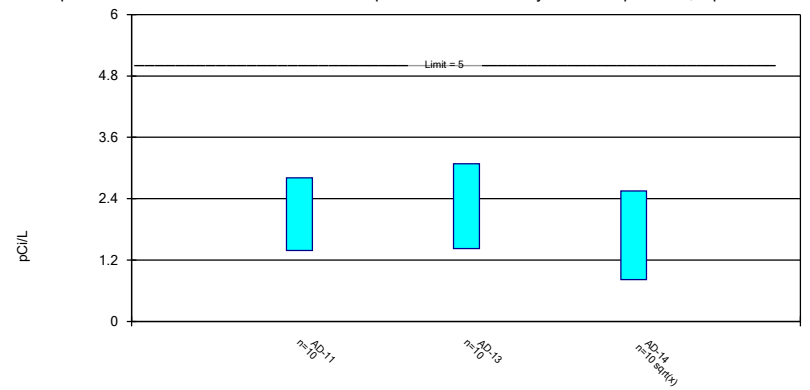
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

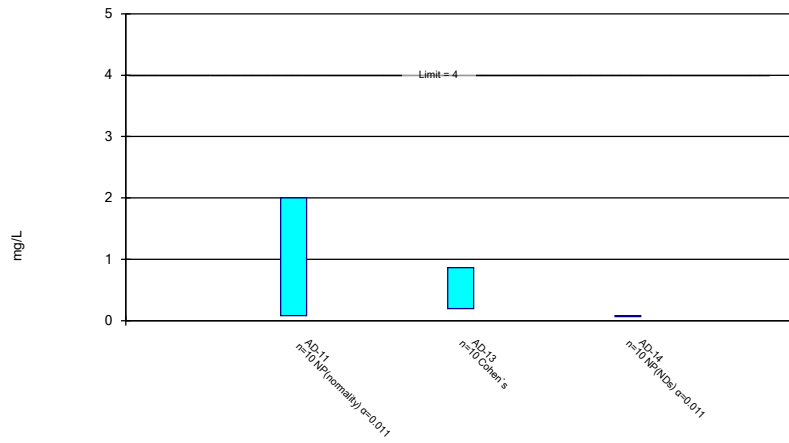
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - A
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

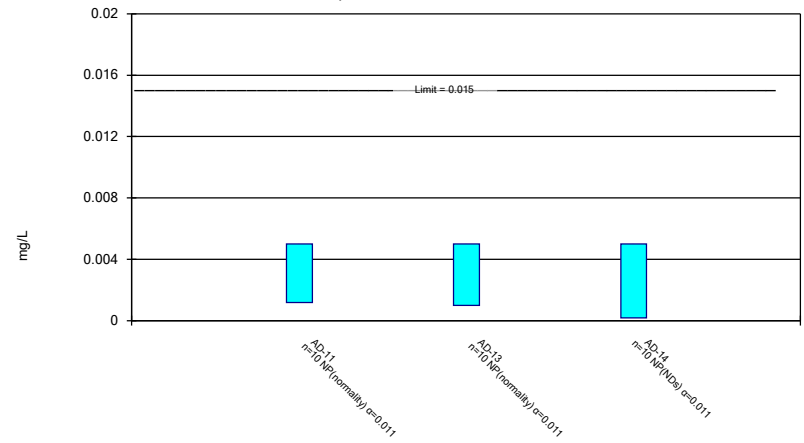
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

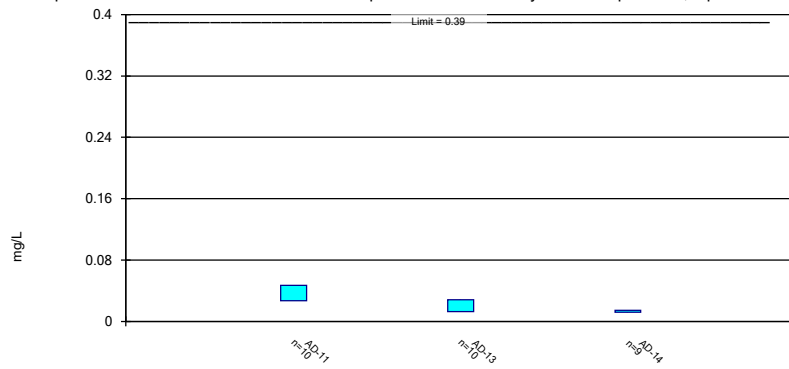
Compliance Limit is not exceeded.



Constituent: Lead, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

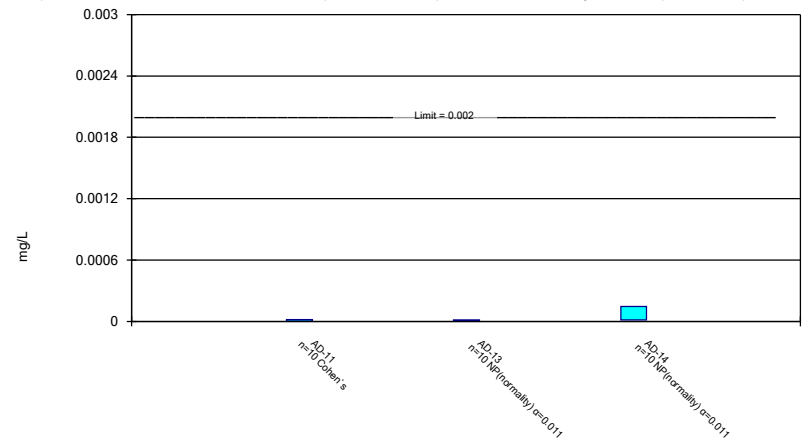
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

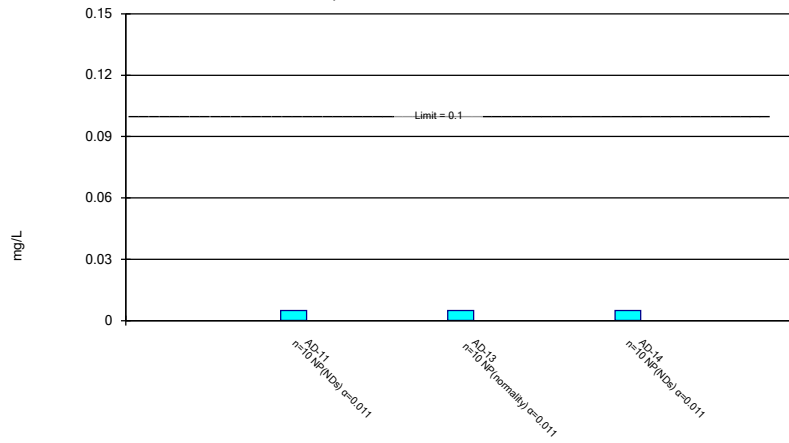
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Mercury, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

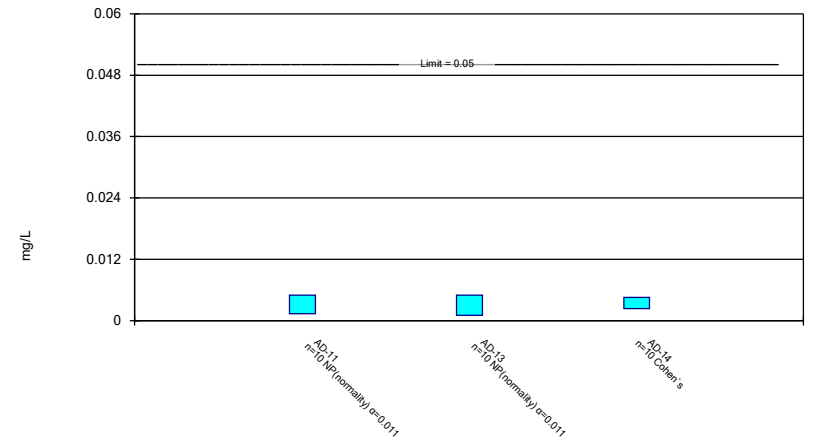
Compliance Limit is not exceeded.



Constituent: Molybdenum, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

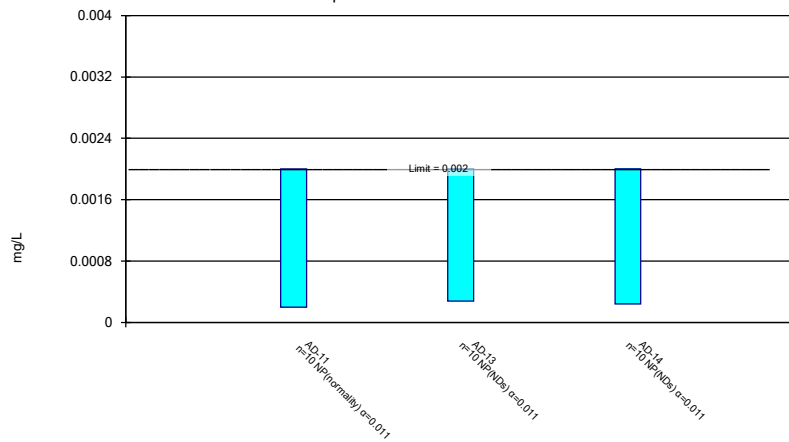
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Thallium, total Analysis Run 1/5/2019 11:16 AM View: Confidence Interval - App IV
Welsh LF Client: Geosyntec Data: Welsh LF

**STATISTICAL ANALYSIS SUMMARY
LANDFILL**

**J. Robert Welsh Plant
Pittsburg, Texas**

Submitted to



1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec 
consultants

engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, Ohio 43221

July 9, 2019

CHA8473

TABLE OF CONTENTS

SECTION 1 Executive Summary	1
SECTION 2 Landfill Evaluation	2-1
2.1 Data Validation & QA/QC	2-1
2.2 Statistical Analysis.....	2-1
2.2.1 Establishment of GWPSs.....	2-1
2.2.2 Evaluation of Potential Appendix IV SSLs	2-2
2.2.3 Evaluation of Potential Appendix III SSIs	2-2
2.3 Conclusions.....	2-3
SECTION 3 References	3-1

LIST OF TABLES

Table 1	Groundwater Data Summary
Table 2	Groundwater Protection Standards
Table 3	Appendix III Data Summary

LIST OF ATTACHMENTS

Attachment A	Certification by Qualified Professional Engineer
Attachment B	Statistical Analysis Output

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LF	Landfill
LFB	Laboratory Fortified Blanks
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
QA	Quality Assurance
QC	Quality Control
RSL	Regional Screening Level
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Landfill (LF), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, total dissolved solids (TDS), and sulfate at the LF. An alternative source was not identified at the time, so two assessment monitoring events were conducted at the LF in 2018, in accordance with 40 CFR 257.95. No SSLs were identified during these events and the unit remained in assessment monitoring. A semi-annual assessment monitoring event was also completed in February 2019, with the results of the February 2019 event documented in this report.

Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were re-established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. No SSLs were identified, but Appendix III concentrations for boron and calcium remained above background. Thus, either the unit will remain in assessment monitoring or an alternative source demonstration (ASD) will be conducted to evaluate if the unit can return to detection monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

LANDFILL EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, one set of samples was collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(d)(1). Samples from the February 2019 semi-annual sampling event were analyzed for the Appendix III and Appendix IV parameters. A summary of data collected during this assessment monitoring event may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.14 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the LF were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained to meet the requirements of 40 CFR 257.95(d)(1) were screened for potential outliers. No outliers were identified.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with 40 CFR 257.95(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in 40 CFR 257.95(h)(2) for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Generally, tolerance limits were calculated parametrically with 95% coverage and 95% confidence. Non-parametric tolerance limits were calculated for antimony, arsenic, cobalt,

fluoride, lithium, mercury, molybdenum, and selenium due to apparent non-normal distributions, for lead and thallium due to a high non-detect frequency, and for cadmium and chromium due to both apparent non-normal distributions and high non-detect frequencies. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

No SSLs were identified at the Welsh LF.

2.2.3 Evaluation of Potential Appendix III SSIs

The CCR rule allows CCR units to move from assessment monitoring to detection monitoring if all Appendix III and Appendix IV parameters were at or below background levels for two consecutive sampling events [40 CFR 257.95(e)]. Since no Appendix IV SSLs were identified, Appendix III results were analyzed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations.

Prediction limits were calculated for the Appendix III parameters to represent background values. As described in the January 2018 *Statistical Analysis Summary* report (Geosyntec, 2018), intrawell tests were used to evaluate potential SSIs for calcium, chloride, TDS, and sulfate, whereas interwell tests were used to evaluate potential SSIs for boron, fluoride, and pH.

Prediction limits for the interwell tests were recalculated using data collected during the February 2019 assessment monitoring event and another monitoring event also conducted in February 2019. Three data points (i.e., one sample from three background wells) were added to the background dataset for each interwell test. An additional three data points (i.e., one sample from three background wells) were added for boron, fluoride, and pH. New data were tested for outliers prior to being added to the background dataset. The updated prediction limits were calculated for a one-of-two retesting procedure, as during detection monitoring. The values of the updated prediction limits were similar to the values of the prediction limits calculated during detection monitoring. The revised interwell prediction limits were used to evaluate potential SSIs for boron, fluoride, and pH.

For the intrawell tests, limited data made it possible to add only one data point (i.e., one sample from each compliance well) to each background dataset. Because one sample result is insufficient to compare against the existing background dataset, the prediction limits were not updated for the intrawell tests at this time. The intrawell prediction limits calculated during detection monitoring were used to evaluate potential SSIs for calcium, chloride, sulfate, and TDS.

Data collected during the February 2019 assessment monitoring events from each compliance well were compared to the prediction limits to evaluate results above background values. Verification sampling was completed in April 2019. The results from this event and the prediction limits are summarized in Table 3. The following exceedances of the upper prediction limits (UPLs) were noted:

- Boron concentrations exceeded the interwell UPL of 0.775 mg/L at AD-11 (1.63 mg/L and 1.34 mg/L) and AD-14 (1.20 mg/L and 1.04 mg/L).

Based on these results, concentrations of Appendix III parameters exceeded background levels at compliance wells at the Welsh LF during assessment monitoring. As a result, the Welsh LF CCR unit will remain in assessment monitoring.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the February 2019 data. GWPSs were re-established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. No SSLs were identified.

The Appendix III results were evaluated to assess whether concentrations of Appendix III parameters exceeded background levels. Interwell tests were used to evaluate potential SSIs for boron, fluoride, and pH, and intrawell tests were used to evaluate potential SSIs for calcium, chloride, sulfate, and TDS. The prediction limits for the interwell tests were updated with additional data collected from the background wells. Prediction limits were recalculated using a one-of-two retesting procedure. The prediction limits calculated during detection monitoring were used for the intrawell tests. SSIs were identified for boron.

Based on this evaluation, either the Welsh LF CCR unit will remain in assessment monitoring or an ASD will be conducted to evaluate if the unit can return to detection monitoring.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – Welsh Plant. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Landfill, J. Robert Welsh Plant, Pittsburg, Texas. January 15, 2018.

TABLES

**Table 1 - Groundwater Data Summary
Welsh - Landfill**

Parameter	Unit	AD-1	AD-5	AD-11	AD-13	AD-14	AD-17
		2/20/2019	2/21/2019	2/21/2019	2/20/2019	2/20/2019	2/21/2019
Antimony	µg/L	0.160	0.0200 J	0.0300 J	0.0200 J	0.0300 J	0.0800 J
Arsenic	µg/L	0.460	1.59	0.510	0.380	0.340	2.51
Barium	µg/L	457	69.4	40.3	55.2	41.2	120
Beryllium	µg/L	0.0900 J	0.0800 J	0.824	0.302	0.387	0.240
Boron	mg/L	0.504	0.0330	1.63	0.484	1.20	0.151
Cadmium	µg/L	0.0100 J	0.0500 U	0.190	0.0500	0.350	0.270
Calcium	mg/L	142	33.9	19.1	17.7	10.3	207
Chloride	mg/L	2.82	24.7	9.23	3.95	2.20	43.2
Chromium	µg/L	0.306	0.432	0.259	0.200 J	0.247	3.34
Cobalt	µg/L	0.399	8.58	8.58	2.35	4.37	64.5
Combined Radium	pCi/L	3.16	1.27	1.51	2.53	1.17	2.66
Fluoride	mg/L	0.240	0.210	0.410	0.280	0.140	0.180
Lead	µg/L	0.124	0.147	0.523	0.0500 J	0.0900 J	2.49
Lithium	mg/L	0.00155	0.0807	0.0157	0.00940	0.0114	0.268
Mercury	mg/L	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.00000700 J
Molybdenum	µg/L	1.00 J	2.00 U	2.00 U	2.00 U	2.00 U	0.700 J
Selenium	µg/L	0.700	0.100 J	1.50	0.400	0.800	0.800
Total Dissolved Solids	mg/L	522	220	542	234	236	1720
Sulfate	mg/L	49.2	46.5	306	96.3	90.4	1060
Thallium	µg/L	0.500 U	0.500 U	0.100 J	0.500 U	0.500 U	0.500 U
pH	SU	7.31	5.38	4.85	4.86	4.28	6.93

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Non-detect value. For statistical analysis, parameters which were not detected were replaced with the reporting limit.

J: Estimated value. Parameter was detected in concentrations below the reporting limit.

Wells AD-1, AD-5, and AD-17 are background wells

**Table 2: Groundwater Protection Standards
Welsh Plant - Landfill**

Constituent Name	MCL	CCR Rule-Specified	Background Limit
Antimony, Total (mg/L)	0.006		0.005
Arsenic, Total (mg/L)	0.01		0.005
Barium, Total (mg/L)	2		0.58
Beryllium, Total (mg/L)	0.004		0.00070
Cadmium, Total (mg/L)	0.005		0.0065
Chromium, Total (mg/L)	0.1		0.004
Cobalt, Total (mg/L)	n/a	0.006	0.075
Combined Radium, Total (pCi/L)	5		4.18
Fluoride, Total (mg/L)	4		1
Lead, Total (mg/L)	n/a	0.015	0.005
Lithium, Total (mg/L)	n/a	0.04	0.39
Mercury, Total (mg/L)	0.002		0.000033
Molybdenum, Total (mg/L)	n/a	0.1	0.002
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.001

Notes:

Grey cell indicates calculated UTL (Upper Tolerance Limit) is higher than MCL.

MCL = Maximum Contaminant Level

Calculated UTL represents site-specific background values.

The higher of the calculated UTL or MCL/RSL is used as the GWPS.

**Table 3: Detection Monitoring Data Evaluation
Welsh Plant - Landfill**

Parameter	Units	Description	AD-11		AD-13		AD-14	
			2/21/2019	4/30/2019	2/20/2019	4/30/2019	2/20/2019	4/30/2019
Boron	mg/L	Interwell Background Value (UPL)	0.775					
		Detection Monitoring Result	1.63	1.34	0.484	0.483	1.20	1.04
Calcium	mg/L	Intrawell Background Value (UPL)	11.4		38.5		13.9	
		Detection Monitoring Result	19.1	7.53	17.7	--	10.3	--
Chloride	mg/L	Intrawell Background Value (UPL)	12.6		24.0		6.45	
		Detection Monitoring Result	9.23	--	3.95	--	2.2	--
Fluoride	mg/L	Interwell Background Value (UPL)	1.00					
		Detection Monitoring Result	0.41	--	0.28	--	0.14	--
pH	SU	Interwell Background Value (UPL)	7.2					
		Interwell Background Value (LPL)	4.3					
		Detection Monitoring Result	4.9	--	4.9	--	4.3	--
Sulfate	mg/L	Intrawell Background Value (UPL)	833		342		131	
		Detection Monitoring Result	306	--	96.3	--	90.4	--
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1224		974		325	
		Detection Monitoring Result	542	--	234	--	236	--

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

*: Designates results for a duplicate sample

-: Not Sampled

Background values exceed the background value.

Background values are shaded gray.

Based on a 1-of-2 resampling, a statistically significant increase (SSI) is only identified when both samples in the detection monitoring period are above the calculated background value.

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Welsh Landfill CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



112498

License Number

TEXAS

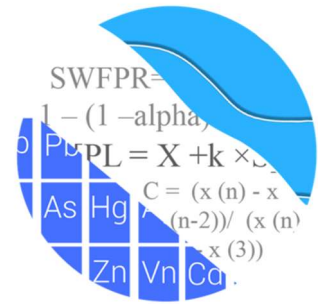
Licensing State

07.09.19

Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING



July 11, 2019

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221

Re: Welsh Landfill
Assessment Monitoring Event – February 2019

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis of the February 2019 data for American Electric Power Inc.'s Welsh Landfill. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at the site for the CCR program in 2016. The monitoring well network, as provided by Geosyntec Consultants, consists of the following:

- **Upgradient wells:** AD-1, AD-5, and AD-17; and
- **Downgradient wells:** AD-11, AD-13 and AD-14

Data were sent electronically, and the statistical analysis was conducted according to the Statistical Analysis Plan and screening evaluation prepared by GSC and approved by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC.

The CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) - boron, calcium, chloride, fluoride, pH, sulfate, and TDS;
- **Appendix IV** (Assessment Monitoring) – antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium.

Time series plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figure A). Values previously flagged during the screening as outliers may be seen in a lighter font and disconnected symbol on the time series graphs. A summary of flagged values follows this letter (Figure B).

Evaluation of Appendix III Parameters

Interwell prediction limits, based on a 1-of-2 resample plan, were constructed to evaluate the following Appendix III Detection Monitoring parameters: boron, fluoride and TDS (Figure C). The statistical method selected for each parameter was determined based on the results of the evaluation performed in December 2017; and all proposed background data were screened for outliers and trends at that time. The findings of those reports were submitted with that analysis.

Interwell prediction limits utilize all upgradient well data for construction of statistical limits. During each sample event, upgradient well data are screened for any newly suspected outliers or obvious trending patterns using time series plots. All values flagged as outliers may be seen on the Outlier Summary report following this letter. No obvious trending patterns were observed in the upgradient wells.

In the event of an initial exceedance of compliance well data, the 1-of-2 resample plan allows for collection of one additional sample to determine whether the initial exceedance is confirmed. When the resample confirms the initial exceedance, a statistically significant increase (SSI) is identified and further research would be required to identify the cause of the exceedance (i.e. impact from the site, natural variation, or an off-site source). If the resample falls within the statistical limit, the initial exceedance is considered a false positive result and, therefore, no further action is necessary.

No prediction limits exceedances were noted except for boron in wells AD-11 and AD-14; and pH in well AD-14 which exceeded its lower limit.

When a statistically significant increase is identified, the data are further evaluated using the Sen's Slope/Mann Kendall trend test to determine whether concentrations are statistically increasing, decreasing or stable. Upgradient wells are included in the trend analyses to identify whether similar patterns exist upgradient of the site which is an indication of natural variability in groundwater unrelated to practices at the site. No statistically significant trends were noted (Figure D).

Evaluation of Appendix IV Parameters

Interwell Tolerance limits were used to calculate background limits from all available pooled upgradient well data for Appendix IV parameters to determine the Alternate Contaminant Level (ACL) for each constituent (Figure E). Background data are screened for outliers and extreme trending patterns that would lead to artificially elevated statistical limits. Any flagged values may be seen on the Outlier Summary following this letter.

Parametric limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels in the Groundwater Protection Standard (GWPS) table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure F).

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters using the highest limit of either the MCL, CCR-rule specified, or ACL as discussed above (Figure G). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence intervals exceedances were found for any of the downgradient wells. A summary of the confidence interval results follows this letter.

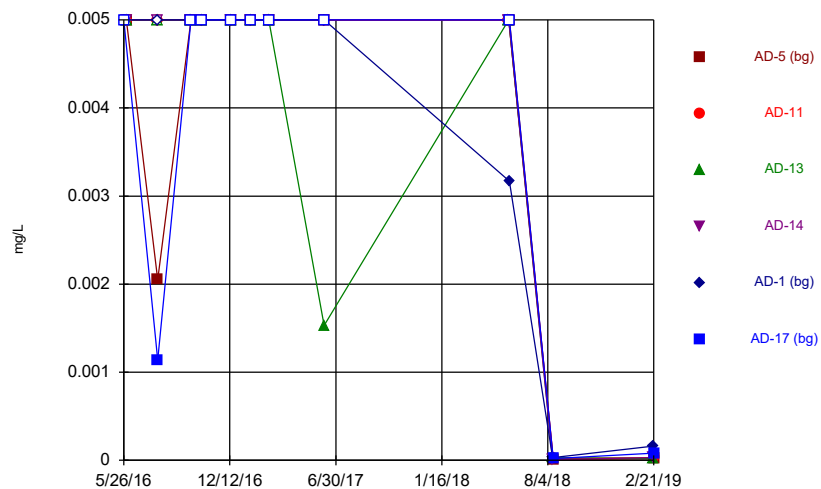
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Welsh Landfill. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,



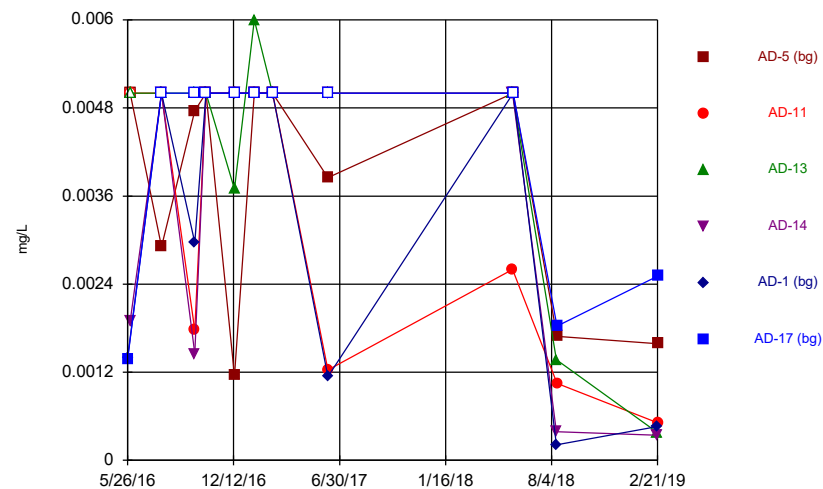
Kristina L. Rayner
Groundwater Statistician

Time Series



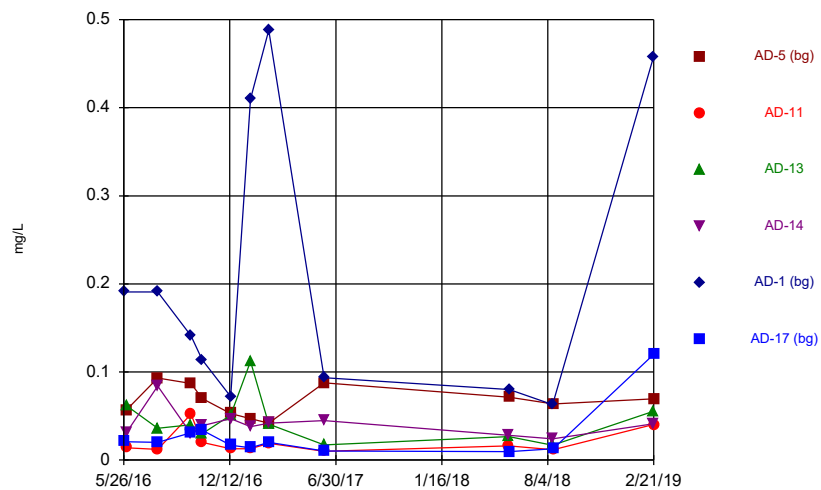
Constituent: Antimony, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



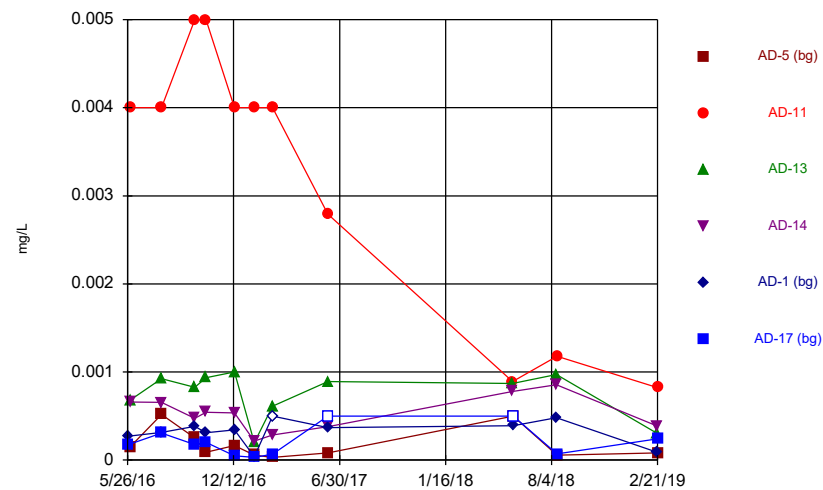
Constituent: Arsenic, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



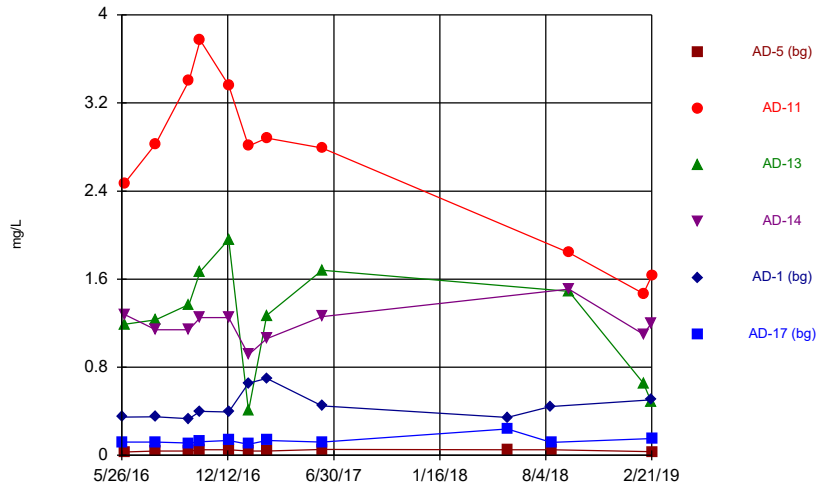
Constituent: Barium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



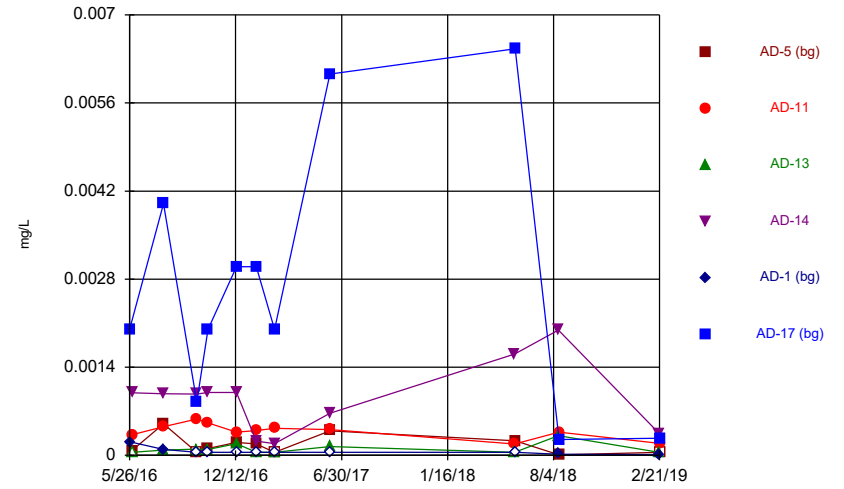
Constituent: Beryllium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



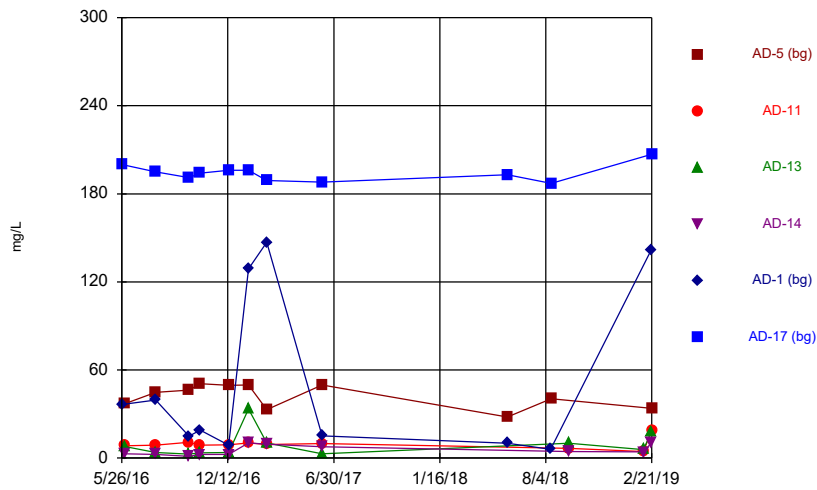
Constituent: Boron, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



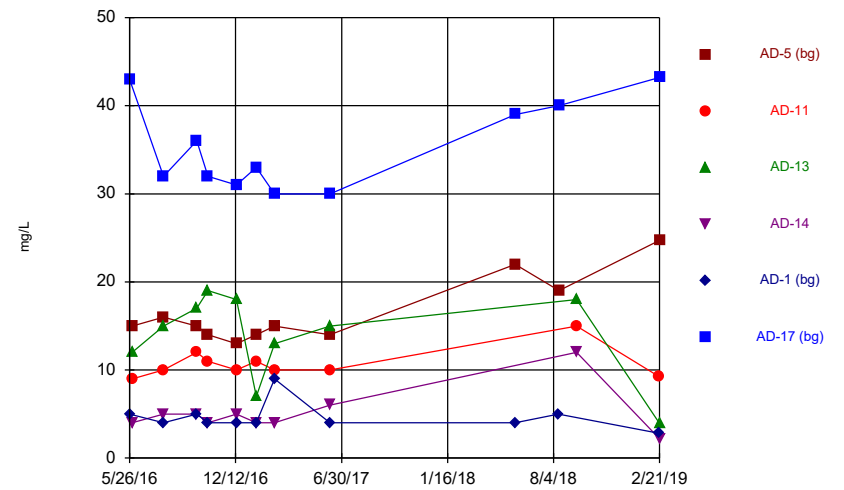
Constituent: Cadmium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



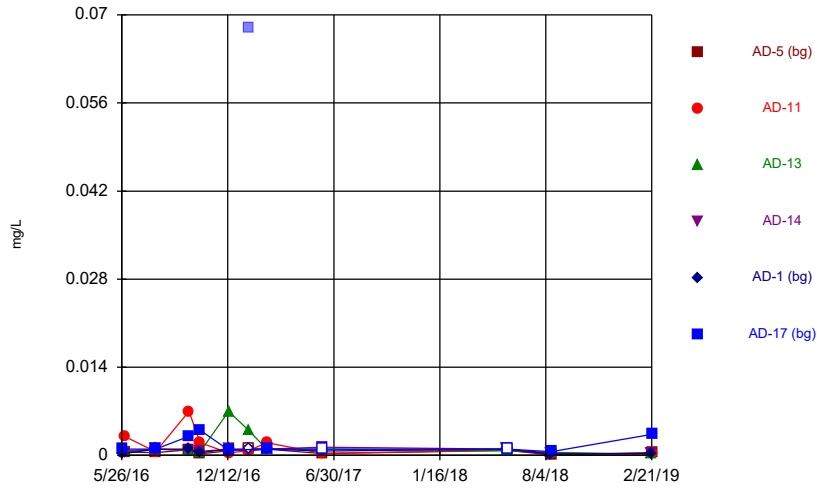
Constituent: Calcium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



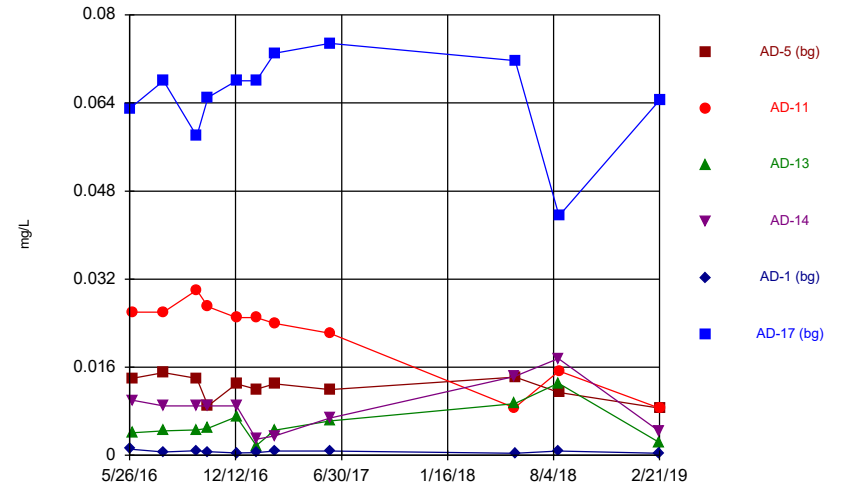
Constituent: Chloride, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



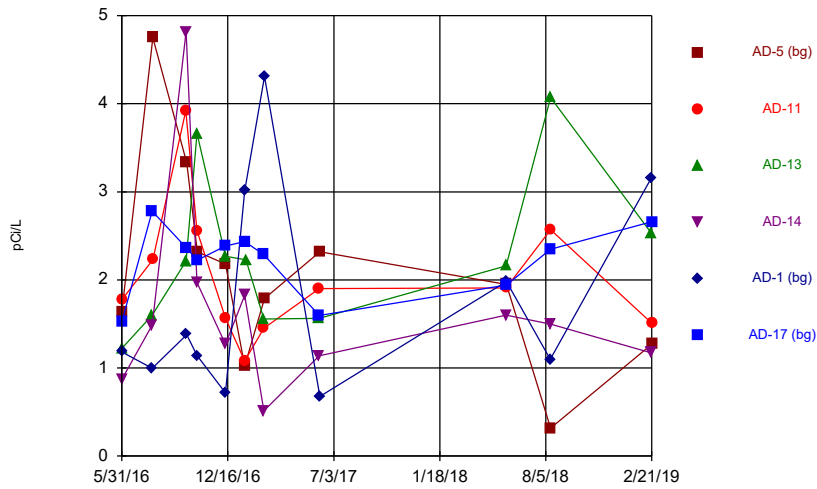
Constituent: Chromium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



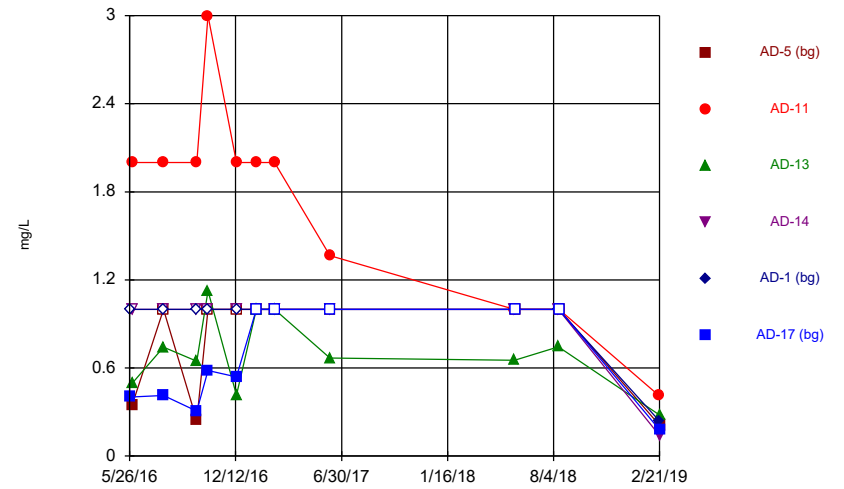
Constituent: Cobalt, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



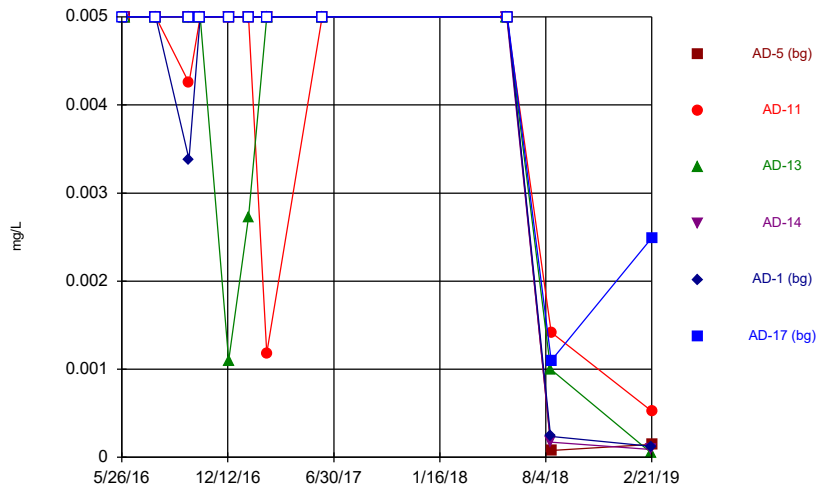
Constituent: Combined Radium 226 + 228 Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



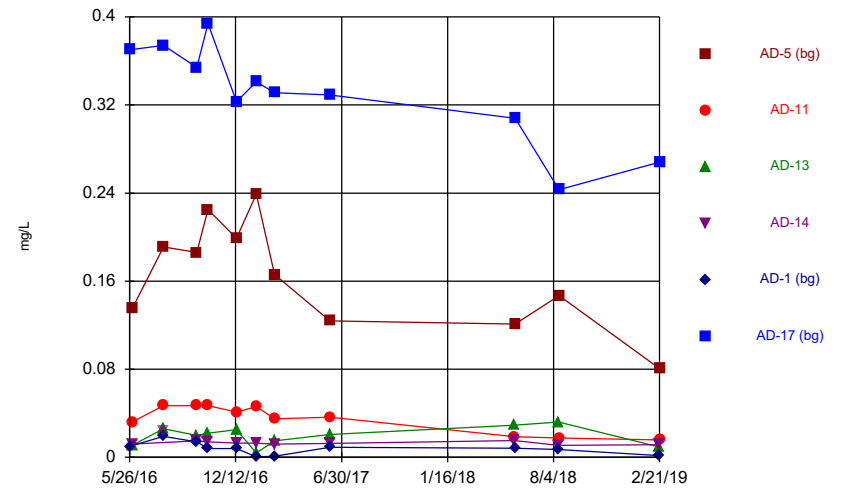
Constituent: Fluoride, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



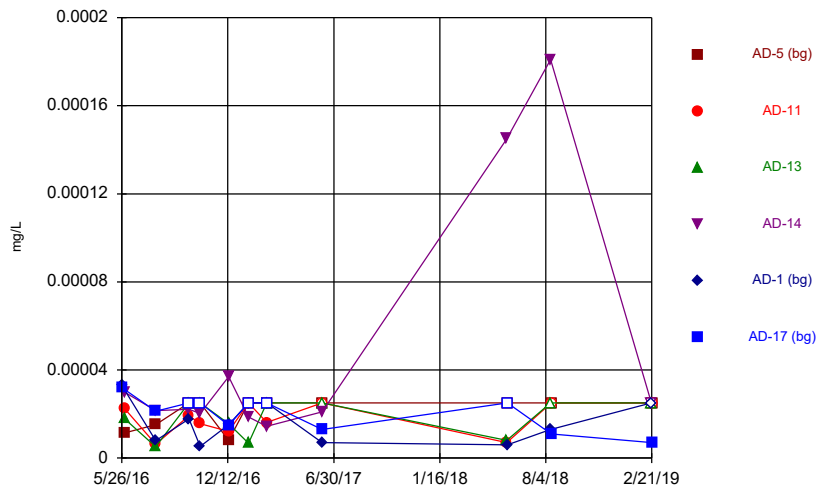
Constituent: Lead, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



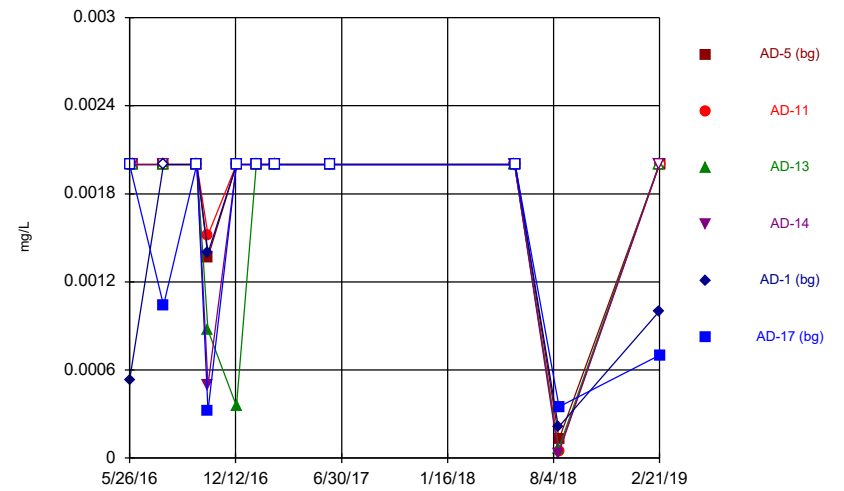
Constituent: Lithium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



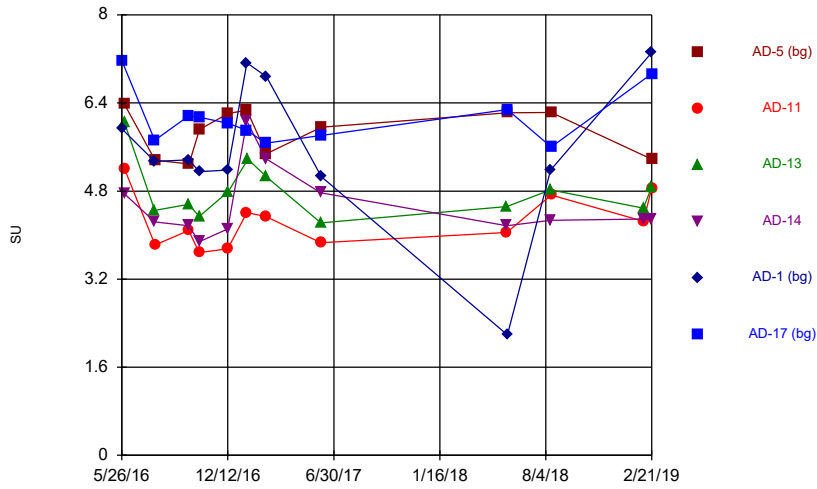
Constituent: Mercury, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



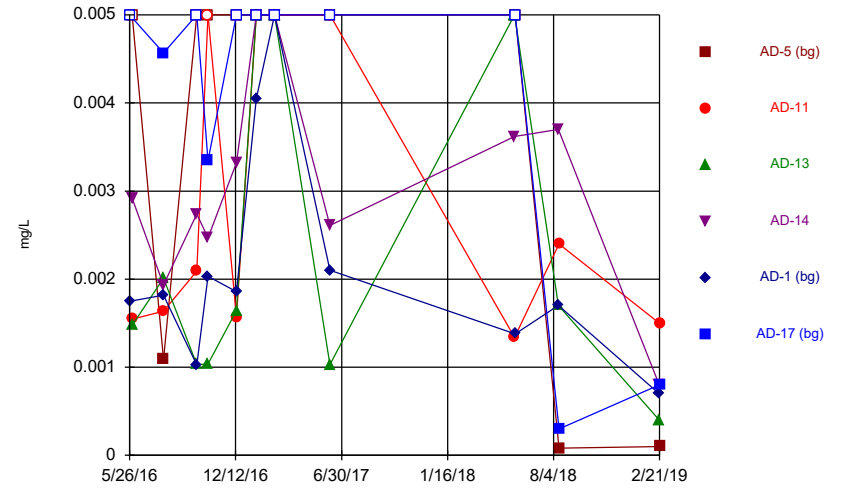
Constituent: Molybdenum, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



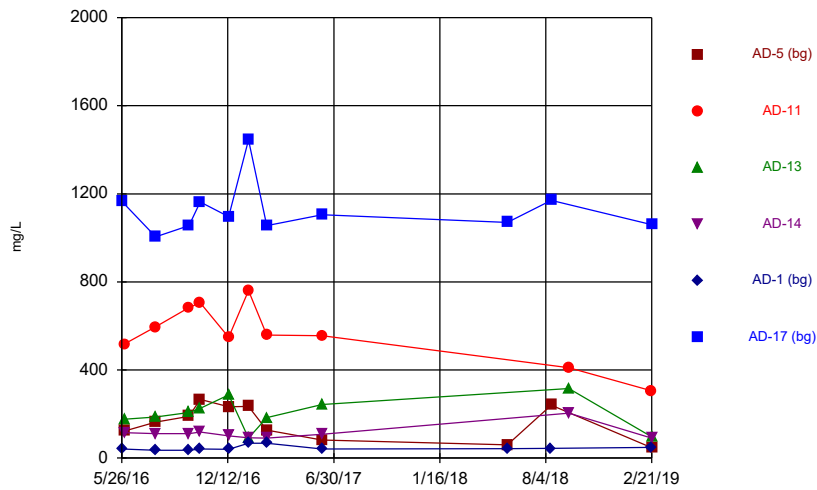
Constituent: pH, field Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



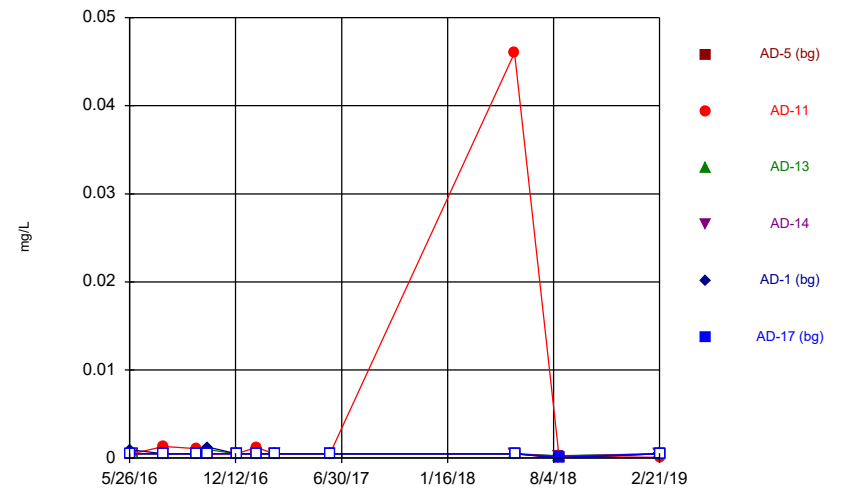
Constituent: Selenium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



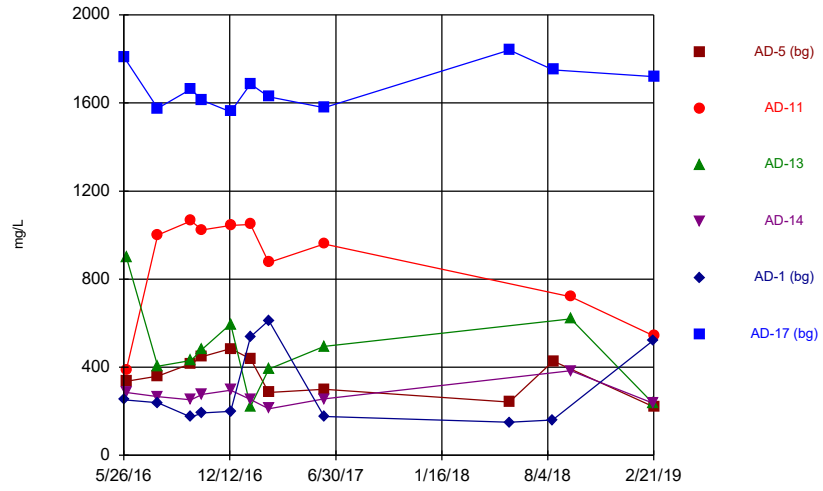
Constituent: Sulfate, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



Constituent: Thallium, total Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



Constituent: Total Dissolved Solids Analysis Run 6/24/2019 12:01 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Outlier Summary

Welsh LF Client: Geosyntec Data: Welsh LF Printed 7/11/2019, 2:01 PM

AD-17 Chromium, total (mg/L)
AD-14 Lithium, total (mg/L)

7/29/2016	0.024 (o)
1/20/2017	0.068 (O)

Interwell Prediction Limit Summary - Significant Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 6/24/2019, 12:10 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	AD-11	0.775	n/a	2/21/2019	1.63	Yes	33	-2.01	0.986	0	None	ln(x)	0.002505	Param Inter 1 of 2
Boron, total (mg/L)	AD-14	0.775	n/a	2/20/2019	1.2	Yes	33	-2.01	0.986	0	None	ln(x)	0.002505	Param Inter 1 of 2
pH, field (SU)	AD-14	7.177	4.285	2/20/2019	4.28	Yes	33	34.93	9.314	0	None	x^2	0.001253	Param Inter 1 of 2

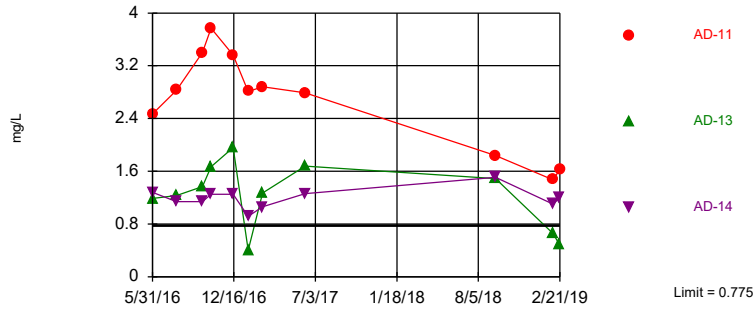
Interwell Prediction Limit Summary - All Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 6/24/2019, 12:10 PM

Constituent	Well	Upper Lim.	Lower Lim.	Date	Observ.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	AD-11	0.775	n/a	2/21/2019	1.63	Yes	33	-2.01	0.986	0	None	ln(x)	0.002505	Param Inter 1 of 2
Boron, total (mg/L)	AD-13	0.775	n/a	2/20/2019	0.484	No	33	-2.01	0.986	0	None	ln(x)	0.002505	Param Inter 1 of 2
Boron, total (mg/L)	AD-14	0.775	n/a	2/20/2019	1.2	Yes	33	-2.01	0.986	0	None	ln(x)	0.002505	Param Inter 1 of 2
Fluoride, total (mg/L)	AD-11	1	n/a	2/20/2019	0.41	No	33	n/a	n/a	69.7	n/a	n/a	0.001673	NP Inter (NDs) 1 of 2
Fluoride, total (mg/L)	AD-13	1	n/a	2/21/2019	0.28	No	33	n/a	n/a	69.7	n/a	n/a	0.001673	NP Inter (NDs) 1 of 2
Fluoride, total (mg/L)	AD-14	1	n/a	2/21/2019	0.14	No	33	n/a	n/a	69.7	n/a	n/a	0.001673	NP Inter (NDs) 1 of 2
pH, field (SU)	AD-11	7.177	4.285	2/21/2019	4.85	No	33	34.93	9.314	0	None	x^2	0.001253	Param Inter 1 of 2
pH, field (SU)	AD-13	7.177	4.285	2/20/2019	4.86	No	33	34.93	9.314	0	None	x^2	0.001253	Param Inter 1 of 2
pH, field (SU)	AD-14	7.177	4.285	2/20/2019	4.28	Yes	33	34.93	9.314	0	None	x^2	0.001253	Param Inter 1 of 2

Exceeds Limit: AD-11, AD-14

Prediction Limit
Interwell Parametric

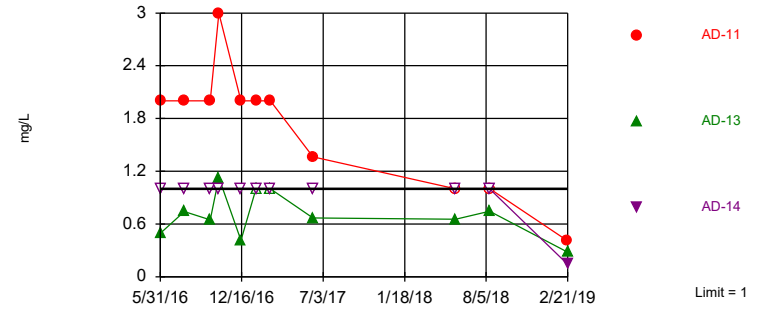


Background Data Summary (based on natural log transformation): Mean=-2.01, Std. Dev.=0.986, n=33. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9116, critical = 0.906. Kappa = 1.78 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.002505. Comparing 3 points to limit.

Constituent: Boron, total Analysis Run 6/24/2019 12:08 PM View: PL's - Interwell
Welsh LF Client: Geosyntec Data: Welsh LF

Within Limit

Prediction Limit
Interwell Non-parametric

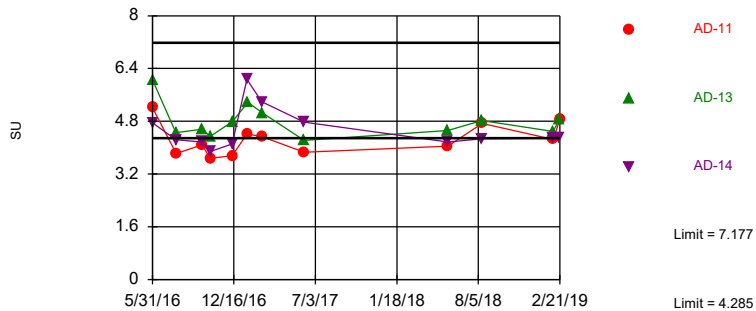


Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 33 background values. 69.7% NDs. Annual per-constituent alpha = 0.009997. Individual comparison alpha = 0.001673 (1 of 2). Comparing 3 points to limit.

Constituent: Fluoride, total Analysis Run 6/24/2019 12:08 PM View: PL's - Interwell
Welsh LF Client: Geosyntec Data: Welsh LF

Exceeds Limits: AD-14

Prediction Limit
Interwell Parametric

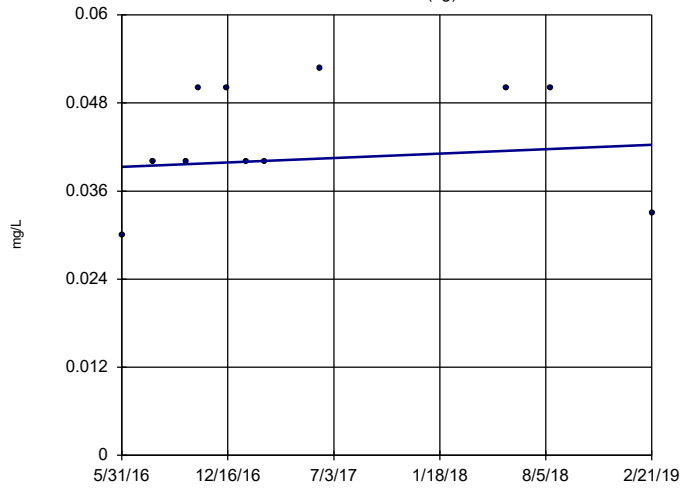


Background Data Summary (based on square transformation): Mean=34.93, Std. Dev.=9.314, n=33. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.927, critical = 0.906. Kappa = 1.78 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.007498. Individual comparison alpha = 0.001253. Comparing 3 points to limit.

Constituent: pH, field Analysis Run 6/24/2019 12:08 PM View: PL's - Interwell
Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-5 (bg)

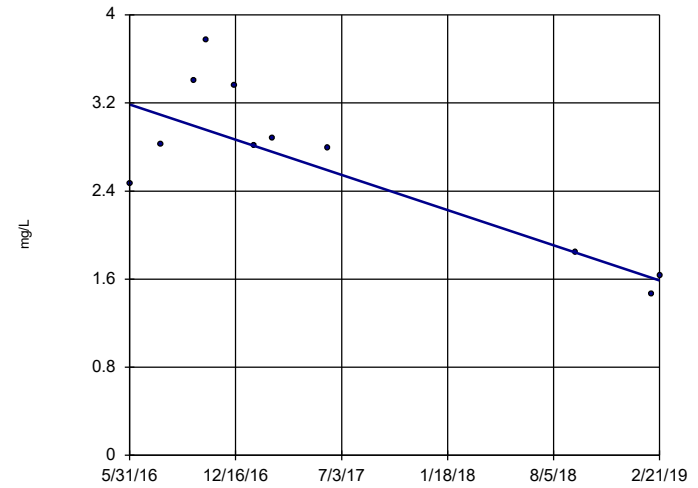


n = 11
 Slope = 0.001099
 units per year.
 Mann-Kendall
 statistic = 14
 critical = 34
 Trend not sig-
 nificant at 99%
 confidence level
 (α = 0.005 per
 tail).

Constituent: Boron, total Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-11

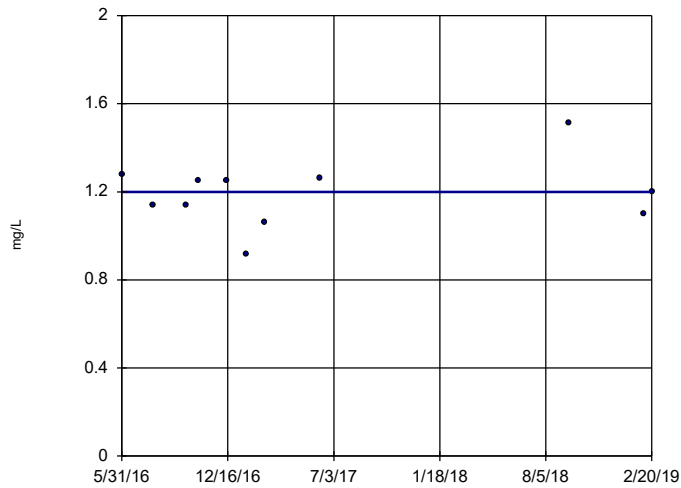


n = 11
 Slope = -0.5852
 units per year.
 Mann-Kendall
 statistic = -27
 critical = -34
 Trend not sig-
 nificant at 99%
 confidence level
 (α = 0.005 per
 tail).

Constituent: Boron, total Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-14

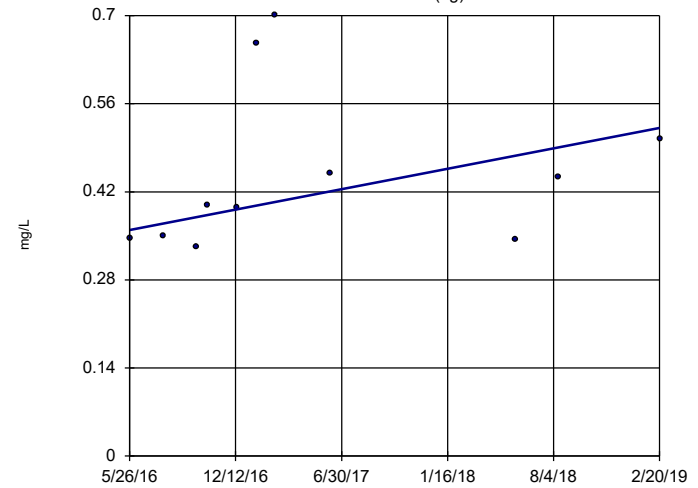


n = 11
 Slope = 0
 units per year.
 Mann-Kendall
 statistic = -1
 critical = -34
 Trend not sig-
 nificant at 99%
 confidence level
 (α = 0.005 per
 tail).

Constituent: Boron, total Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-1 (bg)

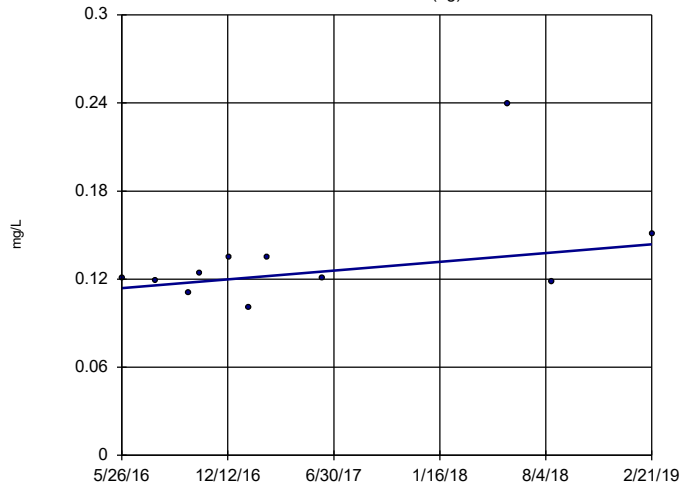


n = 11
 Slope = 0.05932
 units per year.
 Mann-Kendall
 statistic = 21
 critical = 34
 Trend not sig-
 nificant at 99%
 confidence level
 (α = 0.005 per
 tail).

Constituent: Boron, total Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-17 (bg)

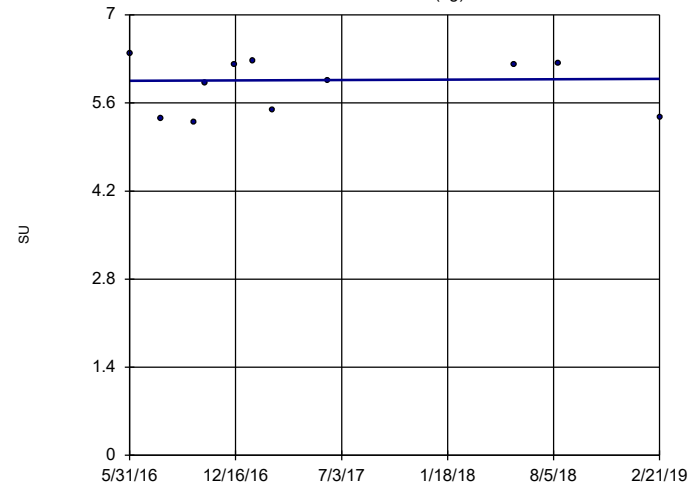


n = 11
 Slope = 0.01094 units per year.
 Mann-Kendall statistic = 15
 critical = 34
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron, total Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-5 (bg)

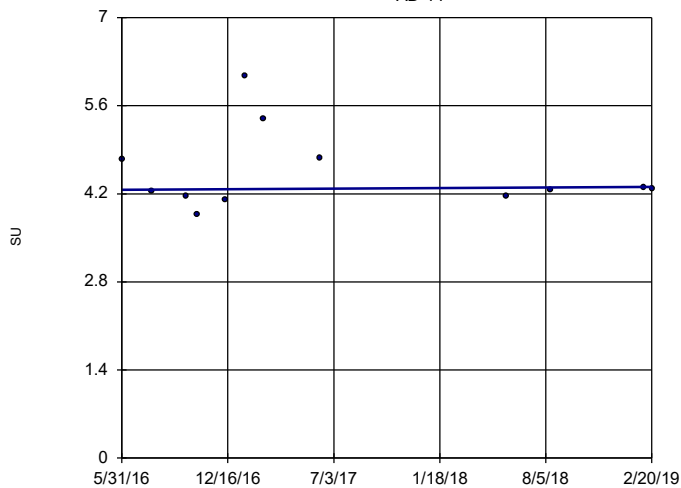


n = 11
 Slope = 0.01197 units per year.
 Mann-Kendall statistic = 5
 critical = 34
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH, field Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-14

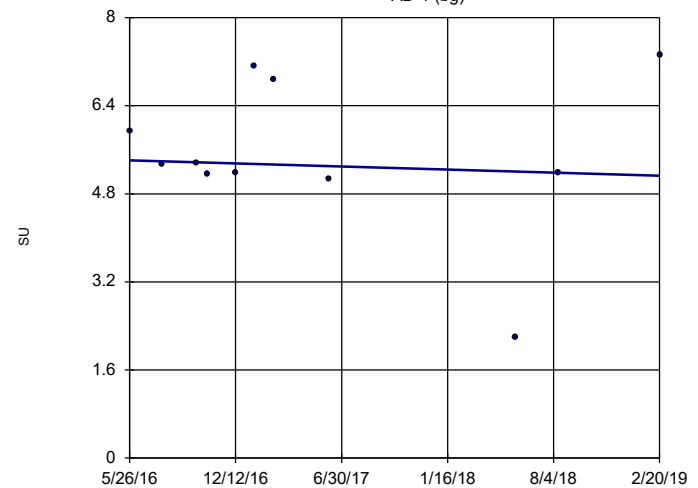


n = 12
 Slope = 0.01739 units per year.
 Mann-Kendall statistic = 5
 critical = 38
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH, field Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-1 (bg)

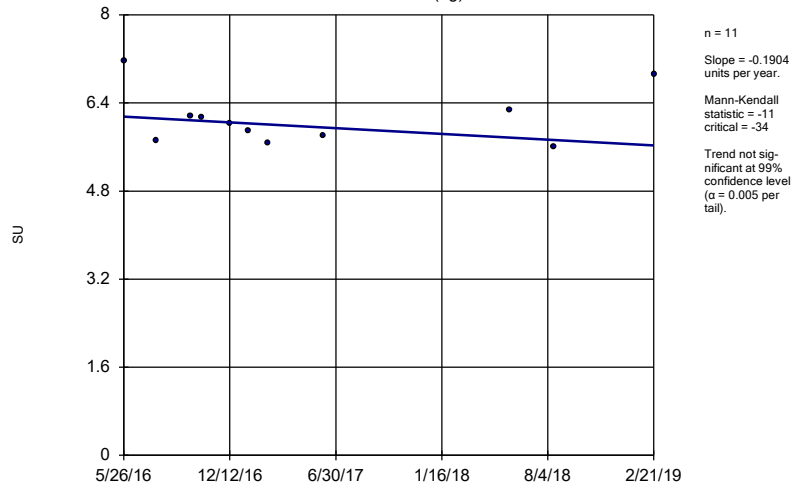


n = 11
 Slope = -0.1015 units per year.
 Mann-Kendall statistic = -4
 critical = -34
 Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH, field Analysis Run 6/24/2019 12:12 PM View: Trend Testing
 Welsh LF Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-17 (bg)



Constituent: pH, field Analysis Run 6/24/2019 12:12 PM View: Trend Testing
Welsh LF Client: Geosyntec Data: Welsh LF

Upper Tolerance Limits - Appendix IV

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 6/18/2019, 9:26 AM

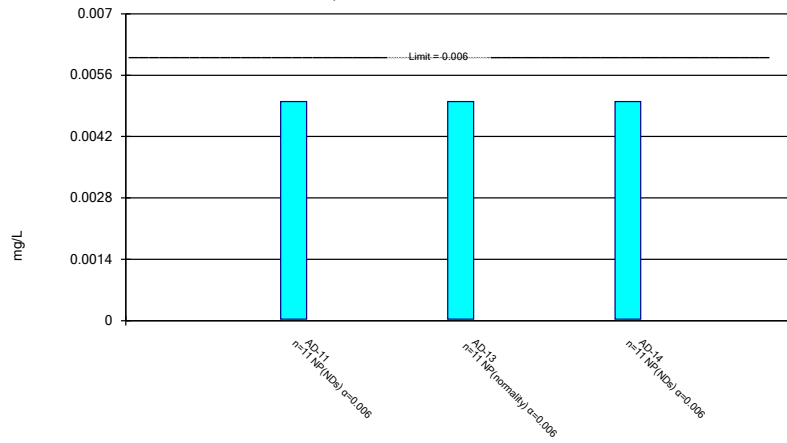
<u>Constituent</u>	<u>Upper Lim.</u>	<u>Bg N</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Antimony, total (mg/L)	0.005	33	n/a	n/a	72.73	n/a	n/a	0.184	NP Inter(normality)
Arsenic, total (mg/L)	0.005	33	n/a	n/a	57.58	n/a	n/a	0.184	NP Inter(normality)
Barium, total (mg/L)	0.5818	33	-2.809	1.037	0	None	ln(x)	0.05	Inter
Beryllium, total (mg/L)	0.0007276	33	0.01425	0.005818	12.12	None	sqrt(x)	0.05	Inter
Cadmium, total (mg/L)	0.00646	33	n/a	n/a	30.3	n/a	n/a	0.184	NP Inter(Cohens/x...
Chromium, total (mg/L)	0.004	32	n/a	n/a	28.13	n/a	n/a	0.1937	NP Inter(Cohens/x...
Cobalt, total (mg/L)	0.0748	33	n/a	n/a	0	n/a	n/a	0.184	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	4.182	33	2.033	0.9825	0	None	No	0.05	Inter
Fluoride, total (mg/L)	1	33	n/a	n/a	69.7	n/a	n/a	0.184	NP Inter(normality)
Lead, total (mg/L)	0.005	33	n/a	n/a	78.79	n/a	n/a	0.184	NP Inter(NDs)
Lithium, total (mg/L)	0.394	33	n/a	n/a	0	n/a	n/a	0.184	NP Inter(normality)
Mercury, total (mg/L)	0.000033	33	n/a	n/a	48.48	n/a	n/a	0.184	NP Inter(normality)
Molybdenum, total (mg/L)	0.002	33	n/a	n/a	69.7	n/a	n/a	0.184	NP Inter(normality)
Selenium, total (mg/L)	0.005	33	n/a	n/a	48.48	n/a	n/a	0.184	NP Inter(normality)
Thallium, total (mg/L)	0.001251	33	n/a	n/a	84.85	n/a	n/a	0.184	NP Inter(NDs)

Confidence Intervals - All Appendix IV (No Significant Results)

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 6/18/2019, 9:34 AM

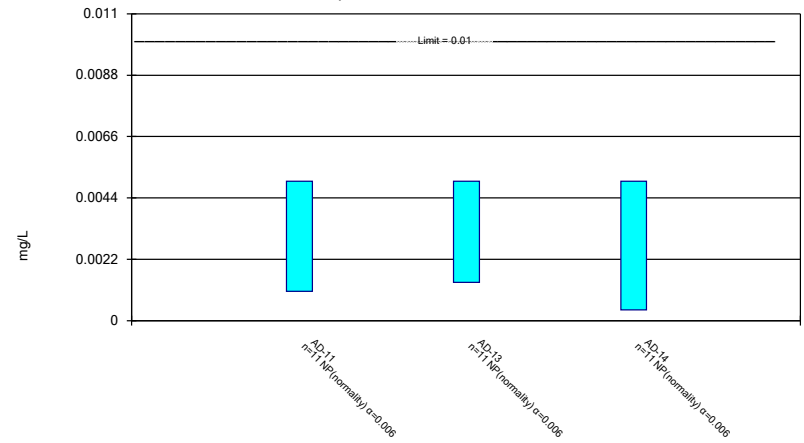
Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	AD-11	0.005	0.00003	0.006	No	11	81.82	No	0.006	NP (NDs)
Antimony, total (mg/L)	AD-13	0.005	0.00003	0.006	No	11	72.73	No	0.006	NP (normality)
Antimony, total (mg/L)	AD-14	0.005	0.00003	0.006	No	11	81.82	No	0.006	NP (NDs)
Arsenic, total (mg/L)	AD-11	0.005	0.00105	0.01	No	11	54.55	No	0.006	NP (normality)
Arsenic, total (mg/L)	AD-13	0.005	0.00137	0.01	No	11	63.64	No	0.006	NP (normality)
Arsenic, total (mg/L)	AD-14	0.005	0.00039	0.01	No	11	63.64	No	0.006	NP (normality)
Barium, total (mg/L)	AD-11	0.0403	0.0119	2	No	11	0	No	0.006	NP (normality)
Barium, total (mg/L)	AD-13	0.0634	0.02381	2	No	11	0	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-14	0.05248	0.02864	2	No	11	0	sqrt(x)	0.01	Param.
Beryllium, total (mg/L)	AD-11	0.004496	0.002314	0.004	No	11	0	x^2	0.01	Param.
Beryllium, total (mg/L)	AD-13	0.0009506	0.0005881	0.004	No	11	0	x^2	0.01	Param.
Beryllium, total (mg/L)	AD-14	0.0006918	0.000357	0.004	No	11	0	No	0.01	Param.
Cadmium, total (mg/L)	AD-11	0.0004842	0.0002825	0.0065	No	11	0	No	0.01	Param.
Cadmium, total (mg/L)	AD-13	0.0005	0.000085	0.0065	No	11	36.36	No	0.006	NP (Cohens/xfrm)
Cadmium, total (mg/L)	AD-14	0.001367	0.0004472	0.0065	No	11	0	No	0.01	Param.
Chromium, total (mg/L)	AD-11	0.002504	0.0003169	0.1	No	11	0	x^(1/3)	0.01	Param.
Chromium, total (mg/L)	AD-13	0.004	0.000503	0.1	No	11	27.27	No	0.006	NP (Cohens/xfrm)
Chromium, total (mg/L)	AD-14	0.001127	0.0004973	0.1	No	11	18.18	No	0.01	Param.
Cobalt, total (mg/L)	AD-11	0.02727	0.01701	0.075	No	11	0	x^2	0.01	Param.
Cobalt, total (mg/L)	AD-13	0.008368	0.002991	0.075	No	11	0	No	0.01	Param.
Cobalt, total (mg/L)	AD-14	0.01236	0.004993	0.075	No	11	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-11	2.689	1.398	5	No	11	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-13	3.016	1.543	5	No	11	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-14	2.333	0.8758	5	No	11	0	x^(1/3)	0.01	Param.
Fluoride, total (mg/L)	AD-11	2	0.083	4	No	11	18.18	No	0.006	NP (normality)
Fluoride, total (mg/L)	AD-13	0.8099	0.2031	4	No	11	18.18	No	0.01	Param.
Fluoride, total (mg/L)	AD-14	0.083	0.083	4	No	11	90.91	No	0.006	NP (NDs)
Lead, total (mg/L)	AD-11	0.005	0.001183	0.015	No	11	63.64	No	0.006	NP (normality)
Lead, total (mg/L)	AD-13	0.005	0.001	0.015	No	11	63.64	No	0.006	NP (normality)
Lead, total (mg/L)	AD-14	0.005	0.000174	0.015	No	11	81.82	No	0.006	NP (NDs)
Lithium, total (mg/L)	AD-11	0.04493	0.02632	0.39	No	11	0	x^2	0.01	Param.
Lithium, total (mg/L)	AD-13	0.02679	0.0122	0.39	No	11	0	No	0.01	Param.
Lithium, total (mg/L)	AD-14	0.01421	0.01165	0.39	No	10	0	No	0.01	Param.
Mercury, total (mg/L)	AD-11	0.00002919	0.00001196	0.002	No	11	36.36	No	0.01	Param.
Mercury, total (mg/L)	AD-13	0.000025	0.00000673	0.002	No	11	54.55	No	0.006	NP (normality)
Mercury, total (mg/L)	AD-14	0.000145	0.00001863	0.002	No	11	9.091	No	0.006	NP (normality)
Molybdenum, total (mg/L)	AD-11	0.002	0.001519	0.1	No	11	81.82	No	0.006	NP (NDs)
Molybdenum, total (mg/L)	AD-13	0.002	0.0003533	0.1	No	11	72.73	No	0.006	NP (normality)
Molybdenum, total (mg/L)	AD-14	0.002	0.000497	0.1	No	11	81.82	No	0.006	NP (NDs)
Selenium, total (mg/L)	AD-11	0.005	0.0015	0.05	No	11	36.36	No	0.006	NP (normality)
Selenium, total (mg/L)	AD-13	0.005	0.00103	0.05	No	11	27.27	No	0.006	NP (Cohens/xfrm)
Selenium, total (mg/L)	AD-14	0.004435	0.002023	0.05	No	11	18.18	No	0.01	Param.
Thallium, total (mg/L)	AD-11	0.001317	0.0002	0.002	No	11	45.45	No	0.006	NP (normality)
Thallium, total (mg/L)	AD-13	0.0005	0.0005	0.002	No	11	81.82	No	0.006	NP (NDs)
Thallium, total (mg/L)	AD-14	0.0005	0.0005	0.002	No	11	90.91	No	0.006	NP (NDs)

Non-Parametric Confidence Interval
Compliance Limit is not exceeded.



Constituent: Antimony, total Analysis Run 6/18/2019 9:32 AM
Welsh Landfill Client: Geosyntec Data: Welsh LF

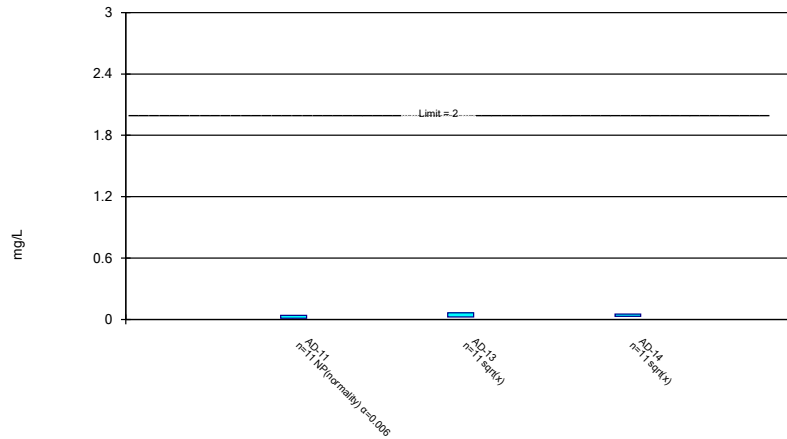
Non-Parametric Confidence Interval
Compliance Limit is not exceeded.



Constituent: Arsenic, total Analysis Run 6/18/2019 9:32 AM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

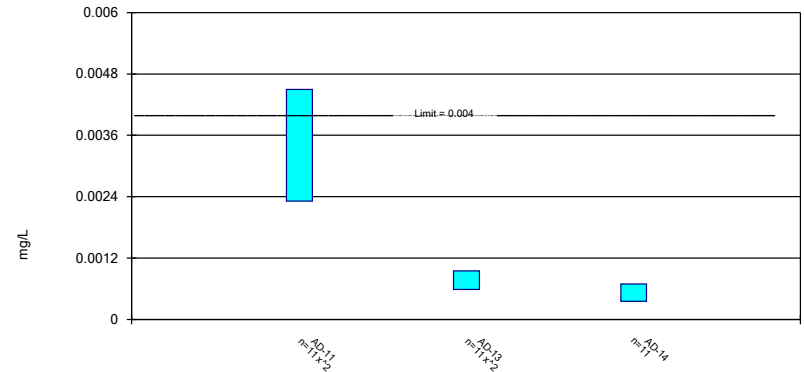
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium, total Analysis Run 6/18/2019 9:32 AM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

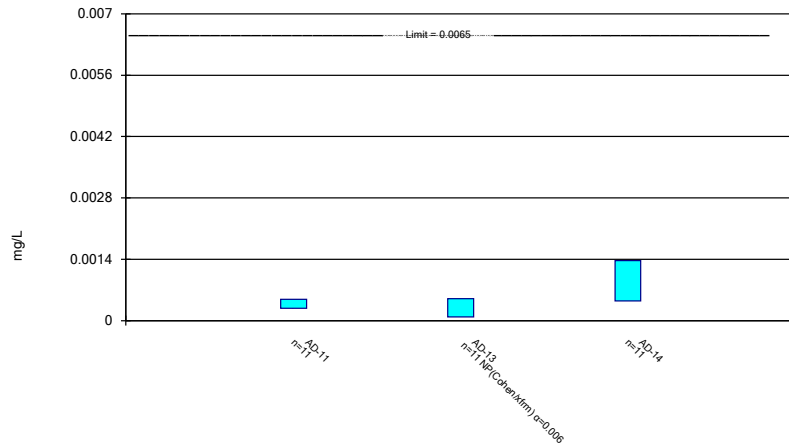
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Beryllium, total Analysis Run 6/18/2019 9:32 AM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

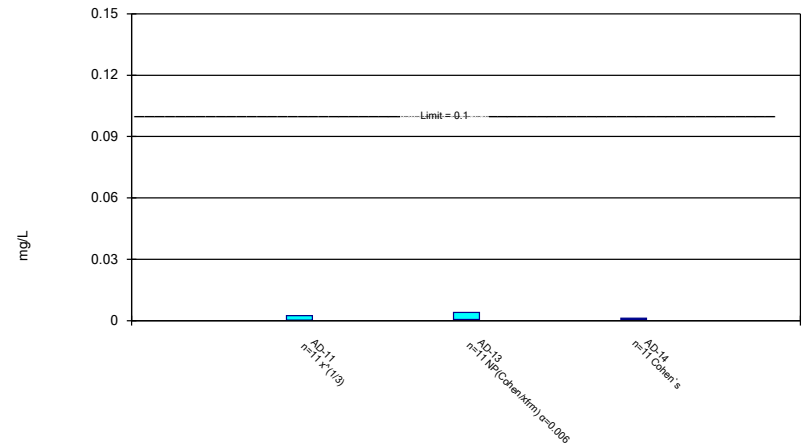
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

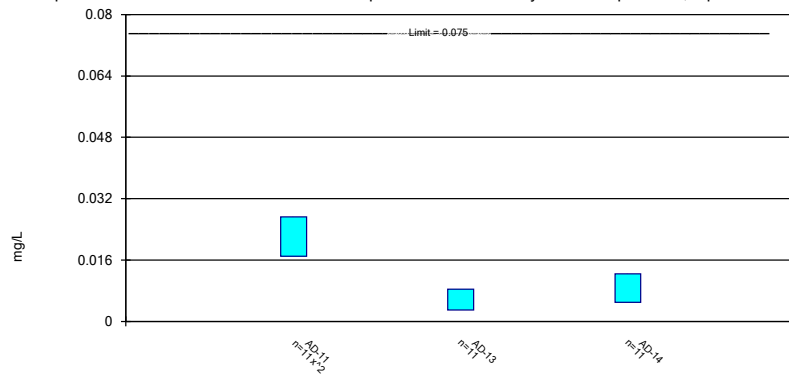
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

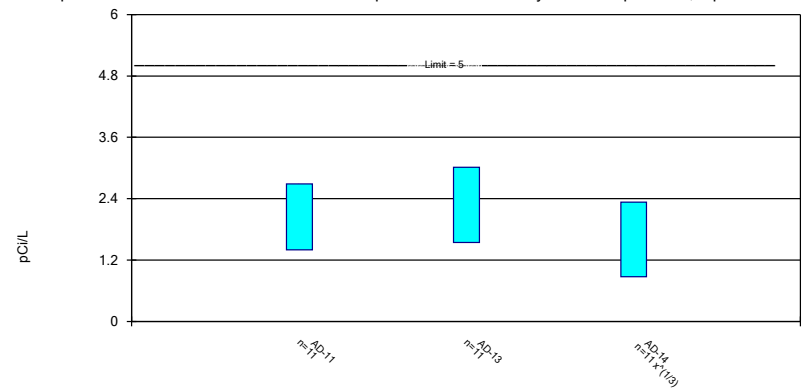
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

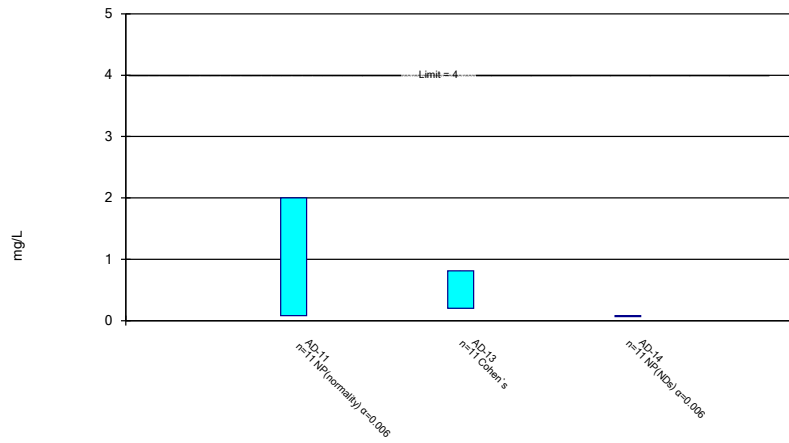
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

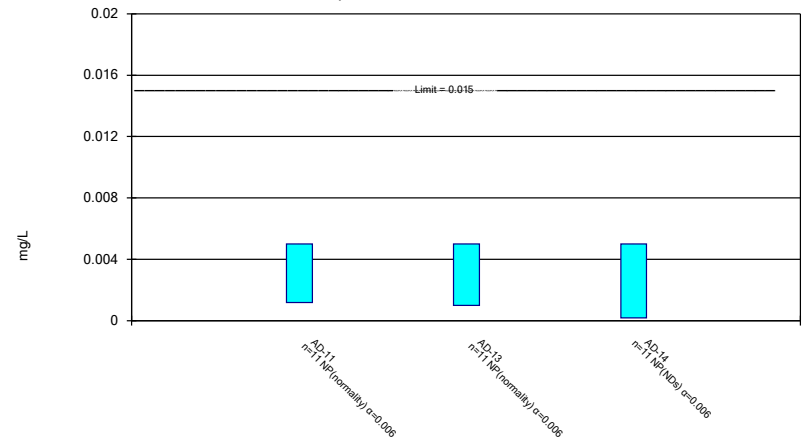
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

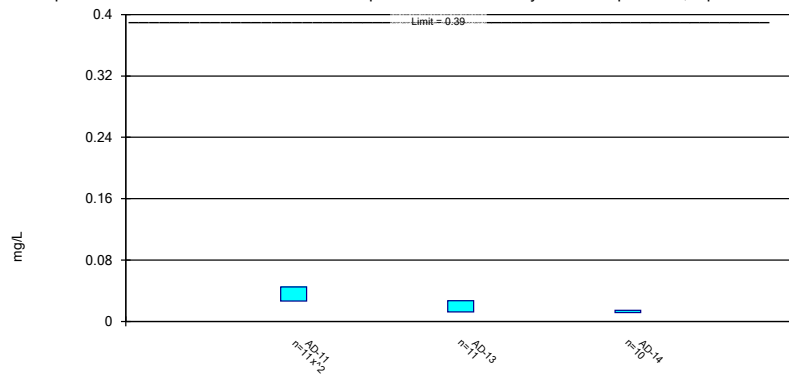
Compliance Limit is not exceeded.



Constituent: Lead, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

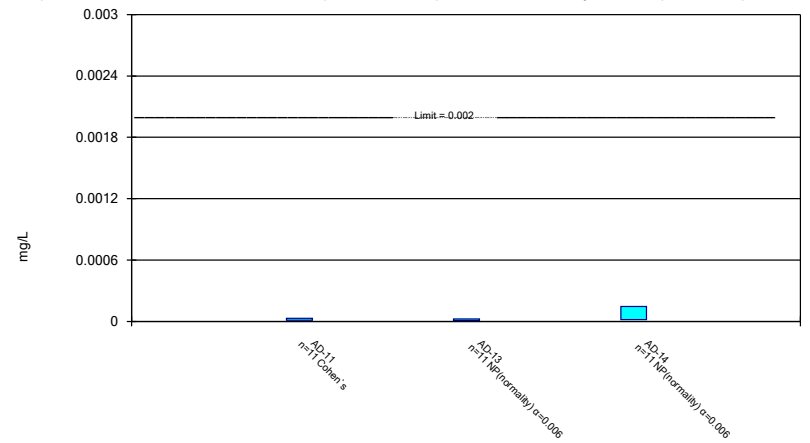
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

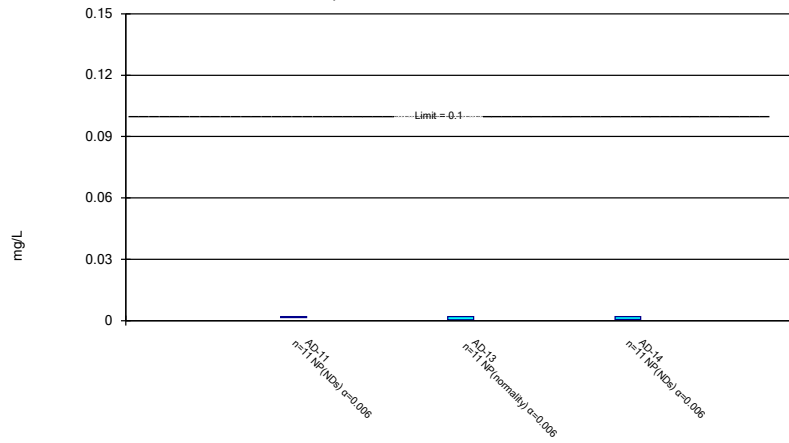
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Mercury, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

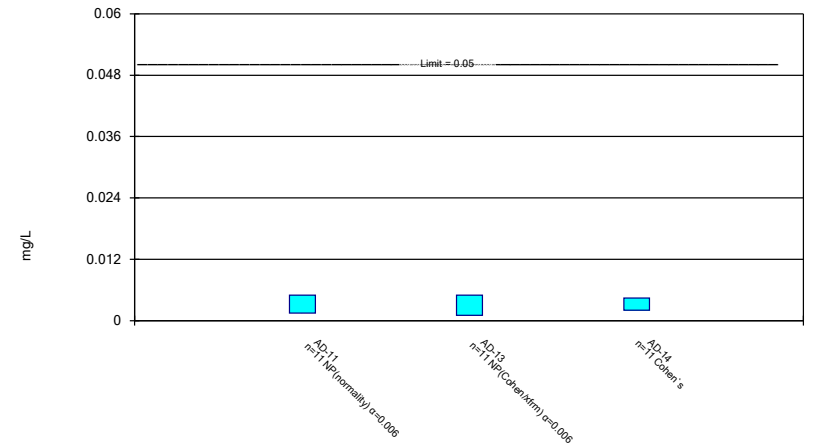
Compliance Limit is not exceeded.



Constituent: Molybdenum, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

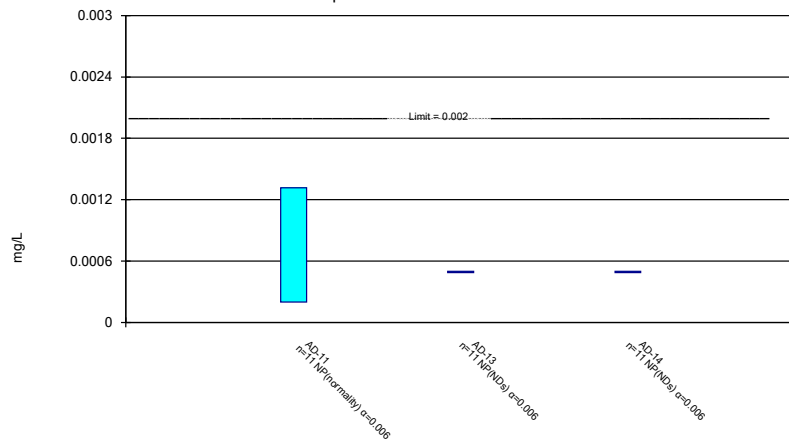
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium, total Analysis Run 6/18/2019 9:32 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Thallium, total Analysis Run 6/18/2019 9:33 AM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

STATISTICAL ANALYSIS SUMMARY LANDFILL

**J. Robert Welsh Plant
Pittsburg, Texas**

Submitted to



1 Riverside Plaza
Columbus, Ohio 43215-2372

Submitted by

Geosyntec 
consultants

engineers | scientists | innovators

941 Chatham Lane
Suite 103
Columbus, Ohio 43221

December 16, 2019

CHA8473

TABLE OF CONTENTS

SECTION 1 Executive Summary	1
SECTION 2 Landfill Evaluation	2-1
2.1 Data Validation & QA/QC	2-1
2.2 Statistical Analysis.....	2-1
2.2.1 Establishment of GWPSs.....	2-1
2.2.2 Evaluation of Potential Appendix IV SSLs	2-2
2.2.3 Establishment of Appendix III Prediction Limits.....	2-2
2.2.4 Evaluation of Potential Appendix III SSIs	2-3
2.3 Conclusions.....	2-4
SECTION 3 References	3-1

LIST OF TABLES

Table 1	Groundwater Data Summary
Table 2	Groundwater Protection Standards
Table 3	Revised Prediction Limits
Table 4	Appendix III Data Summary

LIST OF ATTACHMENTS

Attachment A	Certification by Qualified Professional Engineer
Attachment B	Statistical Analysis Output

LIST OF ACRONYMS AND ABBREVIATIONS

AEP	American Electric Power
ASD	Alternative Source Demonstration
CCR	Coal Combustion Residuals
CCV	Continuing Calibration Verification
CFR	Code of Federal Regulations
GWPS	Groundwater Protection Standard
LCL	Lower Confidence Limit
LF	Landfill
LFB	Laboratory Fortified Blanks
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
QA	Quality Assurance
QC	Quality Control
SSI	Statistically Significant Increase
SSL	Statistically Significant Level
TDS	Total Dissolved Solids
UPL	Upper Prediction Limit
USEPA	United States Environmental Protection Agency
UTL	Upper Tolerance Limit

SECTION 1

EXECUTIVE SUMMARY

In accordance with the United States Environmental Protection Agency's (USEPA's) regulations regarding the disposal of coal combustion residuals (CCR) in landfills and surface impoundments (40 CFR 257.90-257.98, "CCR rule"), groundwater monitoring has been conducted at the Landfill (LF), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas.

Based on detection monitoring conducted in 2017 and 2018, statistically significant increases (SSIs) over background were concluded for boron, total dissolved solids (TDS), and sulfate at the LF. An alternative source was not identified at the time, so the LF has been in assessment monitoring since. Groundwater protection standards (GWPS) were set in accordance with 40 CFR 257.95(d)(2) and a statistical evaluation of the assessment monitoring data was conducted. During the most recent assessment monitoring event, completed in February 2019, no SSLs were identified during these events, and the unit remained in assessment monitoring. Two assessment monitoring events were conducted at the LF in May 2019 and July 2019, in accordance with 40 CFR 257.95(b) and (d), respectively. The results of these assessment events are documented in this report.

Groundwater data underwent several validation tests, including those for completeness, sample tracking accuracy, transcription errors, and consistent use of measurement units. No data quality issues were identified which would impact the usability of the data.

The monitoring data were submitted to Groundwater Stats Consulting, LLC for statistical analysis. Groundwater protection standards (GWPSs) were re-established for the Appendix IV parameters. Confidence intervals were calculated for Appendix IV parameters at the compliance wells to assess whether Appendix IV parameters were present at a statistically significant level (SSL) above the GWPS. No SSLs were identified.

Prediction limits were calculated for Appendix III parameters. When compared to the revised prediction limits, concentrations for boron and TDS remained above background. Thus, either the unit will remain in assessment monitoring or an alternative source demonstration (ASD) will be conducted to evaluate if the unit can return to detection monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

LANDFILL EVALUATION

2.1 Data Validation & QA/QC

During the assessment monitoring program, two sets of samples were collected for analysis from each upgradient and downgradient well to meet the requirements of 40 CFR 257.95(b) (May 2019) and 257.95(d)(1) (July 2019). Samples from both sampling events were analyzed for the Appendix III and Appendix IV parameters. A summary of data collected during these assessment monitoring events may be found in Table 1.

Chemical analysis was completed by an analytical laboratory certified by the National Environmental Laboratory Accreditation Program (NELAP). Quality assurance and quality control (QA/QC) samples completed by the analytical laboratory included the use of laboratory reagent blanks (LRBs), continuing calibration verification (CCV) samples, and laboratory fortified blanks (LFBs).

The analytical data were imported into a Microsoft Access database, where checks were completed to assess the accuracy of sample location identification and analyte identification. Where necessary, unit conversions were applied to standardize reported units across all sampling events. Exported data files were created for use with the Sanitas™ v.9.6.23 statistics software. The export file was checked against the analytical data for transcription errors and completeness. No QA/QC issues were noted which would impact data usability.

2.2 Statistical Analysis

Statistical analyses for the LF were conducted in accordance with the January 2017 *Statistical Analysis Plan* (AEP, 2017), except where noted below. Time series plots and results for all completed statistical tests are provided in Attachment B.

The data obtained in May and July 2019 were screened for potential outliers. No outliers were identified.

2.2.1 Establishment of GWPSs

A GWPS was established for each Appendix IV parameter in accordance with 40 CFR 257.95(h) and the *Statistical Analysis Plan* (AEP, 2017). The established GWPS was determined to be the greater value of the background concentration and the maximum contaminant level (MCL) or risk-based level specified in 40 CFR 257.95(h)(2) for each Appendix IV parameter. To determine background concentrations, an upper tolerance limit (UTL) was calculated using pooled data from the background wells collected during the background monitoring and assessment monitoring events. Tolerance limits were calculated parametrically with 95% coverage and 95% confidence for barium, beryllium, and combined radium. Non-parametric tolerance limits were calculated for

antimony, arsenic, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, and selenium due to apparent non-normal distributions and for thallium due to a high non-detect frequency. Tolerance limits and the final GWPSs are summarized in Table 2.

2.2.2 Evaluation of Potential Appendix IV SSLs

A confidence interval was constructed for each Appendix IV parameter at each compliance well. Confidence limits were generally calculated parametrically ($\alpha = 0.01$); however, non-parametric confidence limits were calculated in some cases (e.g., when the data did not appear to be normally distributed or when the non-detect frequency was too high). An SSL was concluded if the lower confidence limit (LCL) exceeded the GWPS (i.e., if the entire confidence interval exceeded the GWPS). Calculated confidence limits are shown in Attachment B.

No SSLs were identified at the Welsh LF.

2.2.3 Establishment of Appendix III Prediction Limits

Upper prediction limits (UPL) were previously established for all Appendix III parameters following the background monitoring period (Geosyntec, 2018). Intrawell tests were used to evaluate potential SSIs for calcium, chloride, and pH, whereas interwell tests were used to evaluate potential SSIs for boron, fluoride, sulfate and TDS. While interwell prediction limits have been updated periodically during the assessment monitoring period as sufficient data became available, this represents the first update to the background dataset for parameters evaluated using intrawell tests.

Mann-Whitney (Wilcoxon rank-sum) tests were performed to determine whether the newer data are affected by a release from the LF. Because the interwell Appendix III limits and the Appendix IV GWPSs are based on data from upgradient wells which we would not expect to have been impacted by a release, these tests were used for intrawell Appendix III tests only. Mann-Whitney tests were used to compare the medians of historical data (May 2016 - June 2017) to the new compliance samples (October 2017 – February 2019) for calcium, chloride, and pH. Results were evaluated to determine if the medians of the two groups were similar at the 99% confidence level. Where no significant difference was found, the new compliance data were added to the background dataset. Where a statistically significant difference was found between the medians of the two groups, the data were reviewed to evaluate the cause of the difference and to determine if adding newer data to the background dataset, replacing the background dataset with the newer data, or continuing to use the existing background dataset was most appropriate. If the differences appeared to have been caused by a release, then the previous background dataset would have continued to be used.

The complete Mann-Whitney test results and a summary of the significant findings can be found in Appendix B. Significant differences were found between the two groups for chloride in upgradient well AD-5 at sulfate at downgradient well AD-11. However, because AD-5 is an upgradient monitoring well and more recent data are similar to background and better represent the groundwater quality upgradient of the facility, the background dataset was updated to include

the compliance data for chloride at AD-5. Because concentrations for sulfate at downgradient well AD-11 are lower in the more recent sampling events, the background dataset was updated to include all available information, which will result in a more conservative prediction limit.

After the revised background set was established, a parametric or non-parametric analysis was selected based on the distribution of the data and the frequency of non-detect data. Estimated results less than the practical quantitation limit (PQL) – i.e., “J-flagged” data – were considered detections and the estimated results were used in the statistical analyses. Non-parametric analyses were selected for datasets with at least 50% non-detect data or datasets that could not be normalized. Parametric analyses were selected for datasets (either transformed or untransformed) that passed the Shapiro-Wilk / Shapiro-Francia test for normality. The Kaplan-Meier non-detect adjustment was applied to datasets with between 15% and 50% non-detect data. For datasets with fewer than 15% non-detect data, non-detect data were replaced with one half of the PQL. The selected analysis (i.e., parametric or non-parametric) and transformation (where applicable) for each background dataset are shown in Attachment B.

UPLs were updated using all the historical data through February 2019 to represent background values. LPLs were also updated for pH. The updated prediction limits are summarized in Table 3. Intrawell tests continued to be used to evaluate potential SSIs for calcium, chloride, TDS, and sulfate, whereas interwell tests continued to be used to evaluate potential SSIs for boron, fluoride, and pH. The UPLs were calculated for a one-of-two retesting procedure; i.e., if at least one sample in a series of two does not exceed the UPL, then it can be concluded that an SSI has not occurred. In practice, where the initial result did not exceed the UPL, a second sample was not collected. The retesting procedures allowed achieving an acceptably high statistical power to detect changes at downgradient wells for constituents evaluated using intrawell prediction limits.

2.2.4 Evaluation of Potential Appendix III SSIs

The CCR rule allows CCR units to move from assessment monitoring to detection monitoring if all Appendix III and Appendix IV parameters were at or below background levels for two consecutive sampling events [40 CFR 257.95(e)]. Since no Appendix IV SSLs were identified, Appendix III results were analyzed to assess whether concentrations of Appendix III parameters at the compliance wells exceeded background concentrations.

Data collected during the May 2019 and July 2019 assessment monitoring events from each compliance well were compared to the prediction limits to evaluate results above background values. The results from these events and the prediction limits are summarized in Table 4. The following exceedances of the upper prediction limits (UPLs) were noted:

- Boron concentrations exceeded the interwell UPL of 0.700 mg/L at AD-11 (1.56 mg/L), AD-13 (0.780 mg/L), and AD-14 (1.25 mg/L)

- The TDS concentration at AD-14 exceeded the intrawell UPL of 369 mg/L at AD-14 (440 mg/L).

The results from June 2019 each represent the initial sampling for a detection monitoring event. While the prediction limits were calculated assuming one-of-two testing procedures, it was conservatively assumed that an SSI was identified if the initial sample exceeded the UPL or was below the pH LPL during each event. Based on these results, concentrations of Appendix III parameters exceeded background levels at compliance wells at the Welsh LF during assessment monitoring.

2.3 Conclusions

A semi-annual assessment monitoring event was conducted in accordance with the CCR Rule. The laboratory and field data were reviewed prior to statistical analysis, with no QA/QC issues identified that impacted data usability. A review of outliers identified no potential outliers in the May and July 2019 data. GWPSs were re-established for the Appendix IV parameters. A confidence interval was constructed at each compliance well for each Appendix IV parameter; SSLs were concluded if the entire confidence interval exceeded the GWPS. No SSLs were identified.

Revised prediction limits were calculated for Appendix III parameters. Intrawell tests were used to evaluate potential SSIs for calcium, chloride, TDS, and sulfate, whereas interwell tests were used to evaluate potential SSIs for boron, fluoride, and pH. Prediction limits were recalculated using a one-of-two retesting procedure. The Appendix III results were evaluated to assess whether concentrations of Appendix III parameters exceeded background levels. Boron and TDS results exceeded background levels.

Based on this evaluation, either the Welsh LF CCR unit will remain in assessment monitoring or an ASD will be conducted to evaluate if the unit can return to detection monitoring.

SECTION 3

REFERENCES

American Electric Power (AEP). 2017. Statistical Analysis Plan – Welsh Plant. January 2017.

Geosyntec Consultants (Geosyntec). 2018. Statistical Analysis Summary – Landfill, J. Robert Welsh Plant, Pittsburg, Texas. January 15, 2018.

TABLES

**Table 1 - Groundwater Data Summary
Welsh - Landfill**

Component	Unit	AD-1		AD-5		AD-11		AD-13		AD-14		AD-17	
		5/30/2019	7/24/2019	5/30/2019	7/24/2019	5/29/2019	7/23/2019	5/30/2019	7/23/2019	5/29/2019	7/23/2019	5/30/2019	7/24/2019
Antimony	µg/L	0.160	0.080 J	0.100 U	0.100 U	0.100 U	0.100 U	0.030 J	0.020 J	0.030 J	0.100 U	0.100 U	0.100 U
Arsenic	µg/L	0.600	0.390	3.05	2.48	0.780	0.590	0.320	0.370	0.400	0.430	0.410	1.07
Barium	µg/L	512	245	60.5	77.4	19.1	16.4	60.9	23.6	44.8	36.2	19.6	14.3
Beryllium	µg/L	0.244	0.540	0.080 J	0.050 J	1.05	0.987	0.385	0.443	0.556	0.934	0.020 J	0.130
Boron	mg/L	0.689	0.644	0.030 J	0.040 J	1.40	1.56	0.477	0.780	1.21	1.25	0.158	0.113
Cadmium	µg/L	0.010 J	0.020 J	0.050 U	0.050 U	0.200	0.240	0.07	0.09	0.810	2.49	0.030 J	0.030 J
Calcium	mg/L	138	62.7	30.0	41.1	5.78	7.19	9.88	6.16	9.80	9.93	202	216
Chloride	mg/L	1.59	2.00	22.3	18.0	6.96	6.00	3.60	5.00	3.65	8.00	41.7	37.0
Chromium	µg/L	0.100 J	0.100 J	0.060 J	0.050 J	0.369	0.413	0.310	0.283	0.200 J	0.286	0.246	0.228
Cobalt	µg/L	0.756	0.789	11.8	8.38	9.82	10.5	3.15	3.82	7.82	18.5	51.1	57.7
Combined Radium	pCi/L	2.72	1.82	1.43	2.53	1.47	2.25	3.15	1.75	1.95	2.73	2.51	3.45
Fluoride	mg/L	0.290	0.106 J	0.290	0.112 J	0.470	0.338 J	0.530	0.169 J	0.190	0.162 J	0.200 U	0.085 J
Lead	µg/L	0.197	0.100 J	0.0500 J	0.200 U	0.847	0.976	0.050 J	0.204	0.137	0.200	0.030 J	0.263
Lithium	mg/L	0.030 U	0.006	0.104	0.108	0.020 J	0.015	0.009 J	0.018	0.020 J	0.016	0.341	0.283
Mercury	mg/L	0.0000250 U	0.0000250 U	0.00000600 J	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.0000250 U	0.000181	0.000123	0.0000250 U	0.0000250 U
Molybdenum	µg/L	2.43	2.00 J	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U	2.00 U
Selenium	µg/L	1.40	3.40	0.050 J	0.060 J	2.20	1.00	0.400	0.300	2.00	2.70	0.060 J	0.100 J
Total Dissolved Solids	mg/L	588	180	238	354	680	700	196	334	274	440	1550	1860
Sulfate	mg/L	43.3	58.0	51.3	90.0	367	342	94.0	146	122	171	1120	1130
Thallium	µg/L	0.500 U	0.500 U	0.500 U	0.500 U	0.100 J	0.200 J	0.500 U	0.100 J	0.500 U	0.200 J	0.500 U	0.500 U
pH	SU	6.7	6.0	6.3	6.3	4.2	4.5	5.2	4.8	4.5	5.5	6.1	6.0

Notes:

µg/L: micrograms per liter

mg/L: milligrams per liter

pCi/L: picocuries per liter

SU: standard unit

U: Parameter was not present in concentrations above the method detection limit and is reported as the reporting limit

J: Estimated value. Parameter was detected in concentrations below the reporting limit

**Table 2: Groundwater Protection Standards
Welsh Plant - Landfill**

Constituent Name	MCL	CCR Rule-Specified	Calculated UTL
Antimony, Total (mg/L)	0.006		0.003
Arsenic, Total (mg/L)	0.01		0.005
Barium, Total (mg/L)	2		0.62
Beryllium, Total (mg/L)	0.004		0.00079
Cadmium, Total (mg/L)	0.005		0.0065
Chromium, Total (mg/L)	0.1		0.004
Cobalt, Total (mg/L)	n/a	0.006	0.075
Combined Radium, Total (pCi/L)	5		4.11
Fluoride, Total (mg/L)	4		0.583
Lead, Total (mg/L)	n/a	0.015	0.003
Lithium, Total (mg/L)	n/a	0.04	0.39
Mercury, Total (mg/L)	0.002		0.000033
Molybdenum, Total (mg/L)	n/a	0.1	0.002
Selenium, Total (mg/L)	0.05		0.005
Thallium, Total (mg/L)	0.002		0.001

Notes:

Grey cell indicates calculated UTL is higher than MCL or CCR Rule-specified value.

MCL = Maximum Contaminant Level

Calculated UTL (Upper Tolerance Limit) represents site-specific background values.

The higher of the calculated UTL or MCL/Rule-Specified Level is used as the GWPS.

**Table 3: Revised Prediction Limits
Welsh Plant - Landfill**

Parameter	Unit	Description	AD-11	AD-13	AD-14
Boron	mg/L	Interwell Background Value (UPL)	0.700		
Calcium	mg/L	Intrawell Background Value (UPL)	17.1	28.4	12.2
Chloride	mg/L	Intrawell Background Value (UPL)	14.3	24.0	11.5
Fluoride	mg/L	Interwell Background Value (UPL)	0.583		
pH	SU	Interwell Background Value (UPL)	7.1		
		Interwell Background Value (LPL)	4.3		
Sulfate	mg/L	Intrawell Background Value (UPL)	829	422	189
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1330	881	369

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

**Table 4: Appendix III Data Summary
Welsh - Landfill**

Parameter	Unit	Description	AD-11		AD-13		AD-14	
			5/29/2019*	7/23/2019	5/30/2019*	7/23/2019	5/29/2019*	7/23/2019
Boron	mg/L	Interwell Background Value (UPL)	0.700					
		Detection Monitoring Result	1.40	1.56	0.477	0.780	1.21	1.25
Calcium	mg/L	Intrawell Background Value (UPL)	17.1		28.4		12.2	
		Detection Monitoring Result	5.78	7.19	9.88	6.16	9.80	9.93
Chloride	mg/L	Intrawell Background Value (UPL)	14.3		24.0		11.5	
		Detection Monitoring Result	6.96	6.00	3.60	5.00	3.65	8.00
Fluoride	mg/L	Interwell Background Value (UPL)	0.583					
		Detection Monitoring Result	0.470	0.338	0.530	0.169	0.190	0.162
pH	SU	Interwell Background Value (UPL)	7.1					
		Interwell Background Value (LPL)	4.3					
		Detection Monitoring Result	4.2	4.5	5.2	4.8	4.5	5.5
Sulfate	mg/L	Intrawell Background Value (UPL)	829		422		189	
		Detection Monitoring Result	367	342	94.0	146	122	171
Total Dissolved Solids	mg/L	Intrawell Background Value (UPL)	1330		881		369	
		Detection Monitoring Result	680	700	196	334	274	440

Notes:

UPL: Upper prediction limit

LPL: Lower prediction limit

Background values are shaded gray.

Bold values exceed the background value.

*257.95(b) results not used to determine SSI

ATTACHMENT A

Certification by Qualified Professional Engineer

Certification by Qualified Professional Engineer

I certify that the selected and above described statistical method is appropriate for evaluating the groundwater monitoring data for the Welsh Landfill CCR management area and that the requirements of 40 CFR 257.93(f) have been met.

DAVID ANTHONY MILLER

Printed Name of Licensed Professional Engineer

David Anthony Miller

Signature



112498

License Number

TEXAS

Licensing State

12.17.19

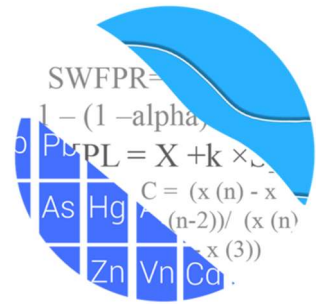
Date

ATTACHMENT B
Statistical Analysis Output

GROUNDWATER STATS CONSULTING

December 8, 2019

Geosyntec Consultants
Attn: Ms. Allison Kreinberg
941 Chatham Lane, #103
Columbus, OH 43221



Re: Welsh Landfill - Assessment Monitoring Event & Background Update 2019

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis and background update of groundwater data for American Electric Power Inc.'s Welsh Landfill. The analysis complies with the federal rule for the Disposal of Coal Combustion Residuals from Electric Utilities (CCR Rule, 2015) as well as with the USEPA Unified Guidance (2009).

Sampling began at the site for the CCR program in 2016. Below is a list of the monitoring well network, as provided by Geosyntec Consultants. Note that originally the network included upgradient well AD-18; however, further research, reportedly, identified that this well was not providing adequate representation of the groundwater quality upgradient of this site and exhibited different chemical properties from the neighboring upgradient wells. Therefore, data from this well is no longer included in the statistical analysis.

- **Upgradient wells:** AD-1, AD-5, and AD-17
- **Downgradient wells:** AD-11, AD-13 and AD-14

Data were sent electronically, and the statistical analysis was reviewed by Dr. Kirk Cameron, PhD Statistician with MacStat Consulting, primary author of the USEPA Unified Guidance, and Senior Advisor to GSC. The analysis was conducted according to the Statistical Analysis Plan prepared by GSC and approved by Dr. Cameron.

The CCR program consists of the following constituents:

- **Appendix III** (Detection Monitoring) - boron, calcium, chloride, fluoride, pH, sulfate, and TDS;
- **Appendix IV** (Assessment Monitoring) – antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, combined radium 226 + 228, fluoride, lead, lithium, mercury, molybdenum, selenium, and thallium.

Time series plots for Appendix III and IV parameters are provided for all wells and constituents; and are used to evaluate concentrations over the entire record (Figure A). Additionally, box plots are included for all constituents at upgradient and downgradient wells (Figure B). The time series plots are used to initially screen for suspected outliers and trends, while the box plots provide visual representation of variation within individual wells and between all wells. Values flagged as outliers may be seen in the Outlier Summary following this letter (Figure C). These values are plotted in a lighter font and disconnected symbol on the time series graphs.

Summary of Statistical Method:

- 1) Intrawell prediction limits, combined with a 1-of-2 resample plan for calcium, chloride, sulfate and TDS; and
- 2) Interwell prediction limits combined with a 1-of-2 resample plan for boron, fluoride and pH.

Parametric prediction limits are utilized when the screened historical data follow a normal or transformed-normal distribution. When data cannot be normalized or the majority of data are nondetects, a nonparametric test is utilized. The distribution of data is tested using the Shapiro-Wilk/Shapiro-Francia test for normality. After testing for normality and performing any adjustments as discussed below (US EPA, 2009), data are analyzed using either parametric or non-parametric prediction limits.

- No statistical analyses are required on wells and analytes containing 100% nondetects (USEPA Unified Guidance, 2009, Chapter 6).
- When data contain <15% nondetects in background, simple substitution of one-half the reporting limit is utilized in the statistical analysis. The reporting limit utilized for nondetects is the practical quantification limit (PQL) as reported by the laboratory.
- When data contain between 15-50% nondetects, the Kaplan-Meier nondetect adjustment is applied to the background data. This technique adjusts the mean

and standard deviation of the historical concentrations to account for concentrations below the reporting limit.

- Nonparametric prediction limits are used on data containing greater than 50% nondetects.

Summary of Background Screening Conducted December 2017

Appendix III – Determination of Spatial Variation

The Analysis of Variance (ANOVA) was used to statistically evaluate differences in average concentrations among upgradient wells, which assists in identifying the most appropriate statistical approach. Interwell tests, which compare downgradient well data to statistical limits constructed from pooled upgradient well data, are appropriate when average concentrations are similar across upgradient wells. Intrawell tests, which compare compliance data from a single well to screened historical data within the same well, are appropriate when upgradient wells exhibit spatial variation; when statistical limits constructed from upgradient wells would not be conservative from a regulatory perspective; and when downgradient water quality is unimpacted compared to upgradient water quality for the same parameter.

The ANOVA identified variation for the following Appendix III parameters: boron, calcium, chloride, sulfate and TDS suggesting intrawell methods should be considered. No differences were noted for fluoride and pH; therefore, these parameters are eligible for interwell prediction limits. Boron, calcium, chloride, sulfate and TDS data were further evaluated as described below for the appropriateness of intrawell testing to accommodate the groundwater quality. A summary table of the ANOVA results was included with the reports.

Appendix III - Statistical Limits

Intrawell limits constructed from carefully screened background data from within each well serve to provide statistical limits that are conservative (i.e. lower) from a regulatory perspective, and will rapidly identify a change in more recent compliance data from within a given well. This statistical method removes the element of variation from across wells and eliminates the chance of mistaking natural spatial variation for a release from the facility. Prior to performing intrawell prediction limits, several steps are required to reasonably demonstrate downgradient water quality does not have existing impacts from the practices of the facility.

Exploratory data analysis was used as a general comparison of concentrations in downgradient wells for all Appendix III parameters recommended for intrawell analyses to concentrations reported in the upgradient well. Upper tolerance limits are used in conjunction with confidence intervals to determine whether the estimated averages in downgradient wells are higher than observed levels upgradient of the facility. The upper tolerance limits were constructed to represent the extreme upper range of possible background levels at the site.

In cases where downgradient average concentrations are higher than observed concentrations upgradient for a given constituent, an independent study and hydrogeological investigation would be required to identify local geochemical conditions and expected groundwater quality for the region to justify an intrawell approach. Such an assessment is beyond the scope of services provided by Groundwater Stats Consulting. When there is not an obvious explanation for observed concentration differences in downgradient wells relative to reported concentrations in the upgradient well, interwell prediction limits will initially be selected for the statistical method until further evidence shows that concentrations are due to natural variation rather than a result of the facility.

Parametric tolerance limits were constructed with a target of 99% confidence and 95% coverage using upgradient well data for each of the Appendix III parameters. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. As more data are collected, the background population is better represented and the confidence and coverage levels increase.

Confidence intervals were constructed on downgradient wells for each of the Appendix III parameters, using the tolerance limits discussed above, to determine intrawell eligibility. When the entire confidence interval is above a background standard for a given parameter, interwell methods are initially recommended as the statistical method. Therefore, only parameters with confidence intervals which did not exceed background standards are eligible for intrawell prediction limits.

Confidence intervals for the above parameters were found to be within their respective background limit for all parameters except boron. Therefore, intrawell methods are recommended for calcium, chloride, sulfate and TDS; and interwell methods are initially recommended for boron, fluoride and pH. As mentioned earlier, if a demonstration supports natural variation in groundwater, intrawell methods will be considered for all parameters.

All available data through June 2017 at each well were used to establish intrawell background limits for the parameters identified above based on a 1-of-2 resample plan

that will be used for future comparisons. Interwell prediction limits, combined with a 1-of-2 resample plan, were constructed from upgradient wells AD-1, AD-5 and AD-17.

Natural systems continuously evolve due to physical changes made to the environment. Examples include capping a landfill, paving areas near a well, or lining a drainage channel to prevent erosion. Periodic updating of background statistical limits will be necessary to accommodate these types of changes. In the interwell case, newer data will be included in background during each subsequent event after careful screening for new outliers. In the intrawell case, data for all wells and constituents are re-evaluated when a minimum of 4 new data points are available to determine whether earlier concentrations are representative of present-day groundwater quality. In some cases, the earlier portion of data are deselected prior to construction of limits in order to provide sensitive limits that will rapidly detect changes in groundwater quality. Even though the data are excluded from the calculation, the values will continue to be reported and shown in tables and graphs.

November 2019 - Background Update

Data were re-evaluated using Tukey's outlier test and visual screening with the February 2019 samples. Boron, fluoride and pH are tested using interwell prediction limits and, therefore, pooled upgradient wells were tested for outliers for these constituents (Figure C). All other Appendix III parameters, which use intrawell prediction limits, were tested for outliers at each well (Figure C). Tukey's test did not identify any outliers except for Chromium AD-13. The following values were not identified as outliers by Tukey's test; However, these values were flagged as outliers in the database because they do not appear to represent the population at these wells: chromium, fluoride, and thallium in well AD-11.

For constituents requiring intrawell prediction limits, the Mann-Whitney (Wilcoxon Rank Sum) test was used to compare the medians of historical data through June 2017 to the new compliance samples at each well through February 2019 to evaluate whether the groups are statistically different at the 99% confidence level, in which case background data may not be updated with more recent compliance data (Figure D). Statistically significant differences were found for chloride in upgradient well AD-5, with the median of the more recent group of data slightly higher than the background median. Additionally, a significant difference was noted for sulfate in downgradient well AD-11, with the median of the more recent group of data slightly lower than the background median.

Typically, when the test concludes that the medians of the two groups are significantly different, particularly in the downgradient wells, the background are not updated to include the newer data but will be reconsidered in the future. Chloride, however, was updated to include more recent data in upgradient well AD-5 as those data represent groundwater quality upgradient of the facility. In the case of sulfate, while concentrations have decreased over the entire record, background was updated to include all data through February 2019. In both cases, limited data are currently available but all data will be reevaluated during the next background update, and earlier measurements will be deselected if they no longer represent present-day groundwater quality. A summary of these results follows this letter and the test results are included with the Mann Whitney test section at the end of this report.

Intrawell prediction limits using all historical data reported through February 2019, combined with a 1-of-2 resample plan, were constructed and a summary of the updated limits follows this letter (Figure E).

The Sen's Slope/Mann Kendall trend test was used to evaluate data at upgradient wells for fluoride to identify statistically significant increasing or decreasing trends. The results of the trend analyses showed all data are consistent over time with no statistically significant increasing or decreasing trends (Figure F).

Interwell prediction limits, combined with a 1-of-2 resample plan, were updated using all available data from upgradient wells for the same time period for fluoride (Figure G). Interwell prediction limits pool upgradient well data to establish a background limit for an individual constituent. A summary table of the updated limits may be found following this letter in the Prediction Limit Summary Tables.

Evaluation of Appendix IV Parameters

Interwell Tolerance limits were used to calculate background limits from all available pooled upgradient well data for Appendix IV parameters to determine the Alternate Contaminant Level (ACL) for each constituent (Figure H). Background data are screened for outliers and extreme trending patterns that would lead to artificially elevated statistical limits. Any flagged values may be seen on the Outlier Summary following this letter.

Parametric limits use a target of 95% confidence and 95% coverage. The confidence and coverage levels for nonparametric tolerance limits are dependent upon the number of background samples. These limits were compared to the Maximum Contaminant Levels (MCLs) and CCR-Rule specified levels in the Groundwater Protection Standard (GWPS)

table following this letter to determine the highest limit for use as the GWPS in the Confidence Interval comparisons (Figure I).

Confidence intervals were then constructed on downgradient wells for each of the Appendix IV parameters using the highest limit of either the MCL, CCR-rule specified, or ACL as discussed above (Figure J). Only when the entire confidence interval is above a GWPS is the well/constituent pair considered to exceed its respective standard. No confidence intervals exceedances were found for any of the downgradient wells. A summary of the confidence interval results follows this letter.

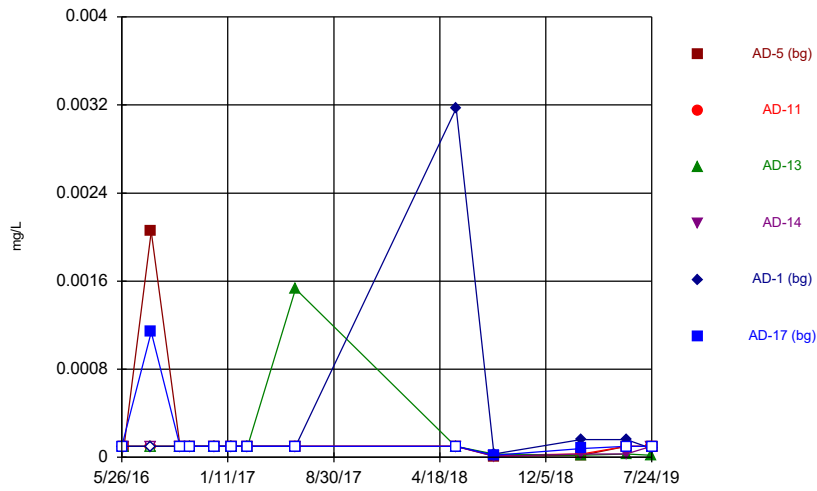
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Welsh Landfill. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

A handwritten signature in cursive script that reads "Kristina Rayner". The signature is written in black ink and is positioned below the typed name.

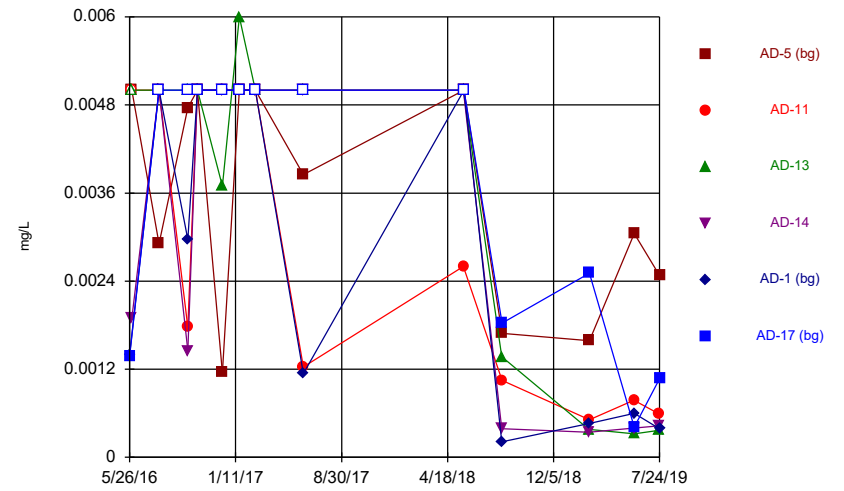
Kristina L. Rayner
Groundwater Statistician

Time Series



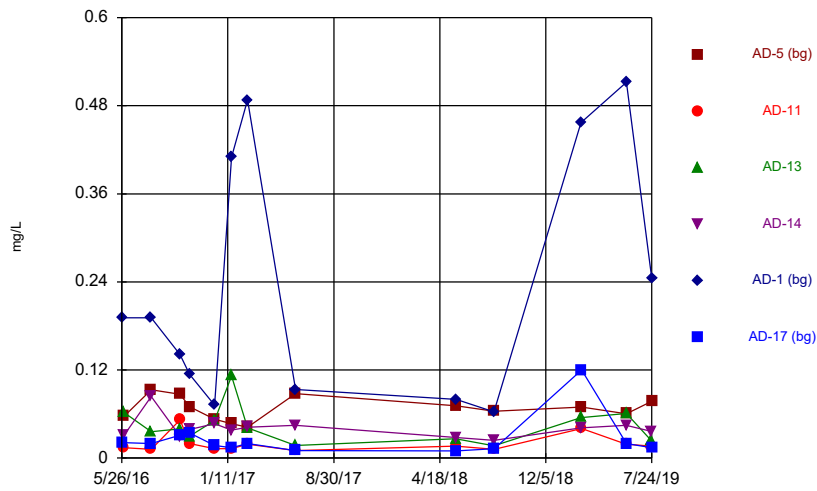
Constituent: Antimony, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



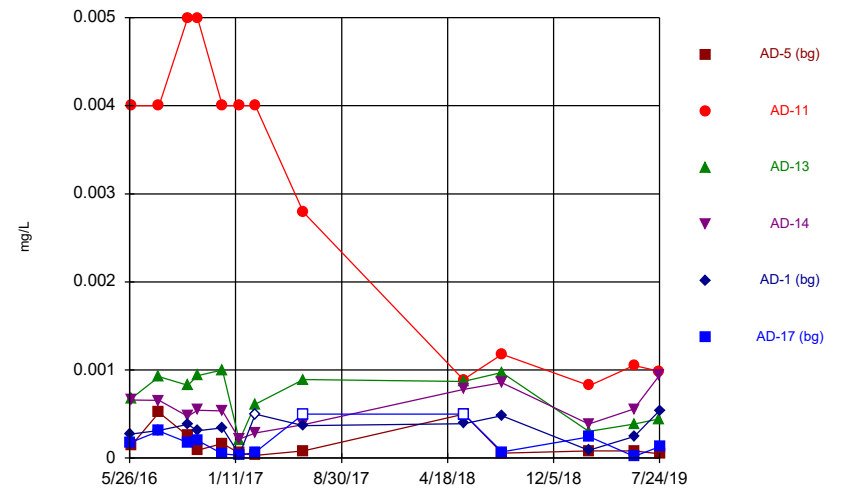
Constituent: Arsenic, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



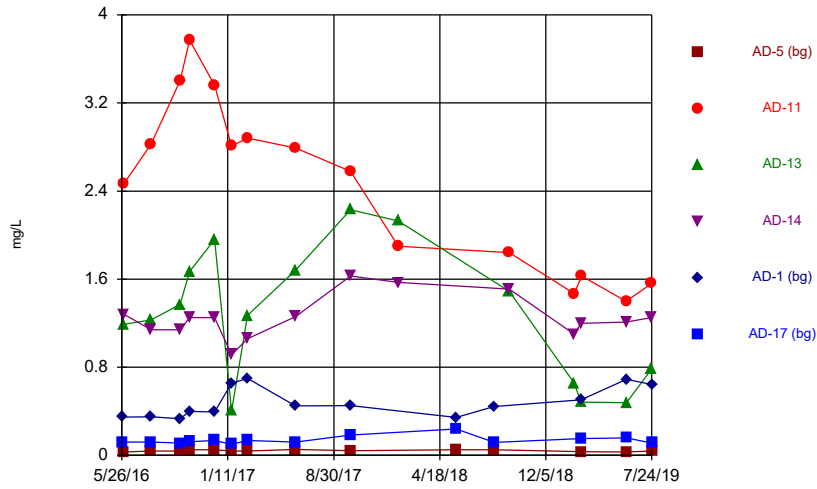
Constituent: Barium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



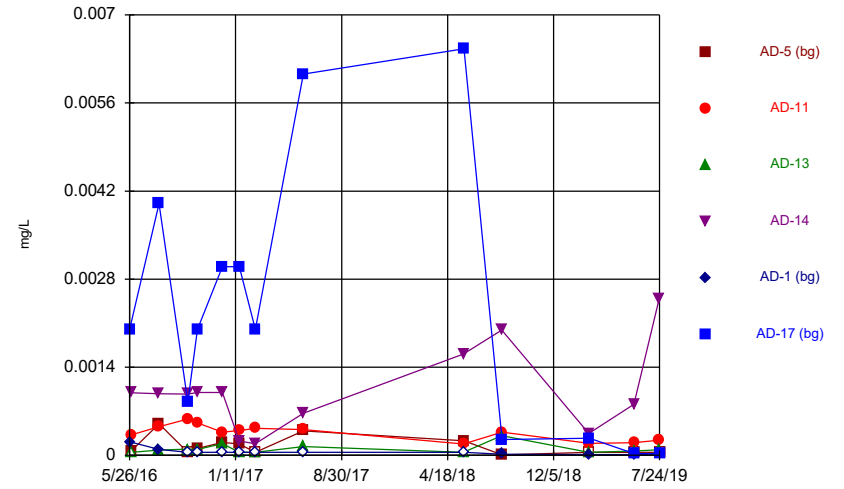
Constituent: Beryllium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



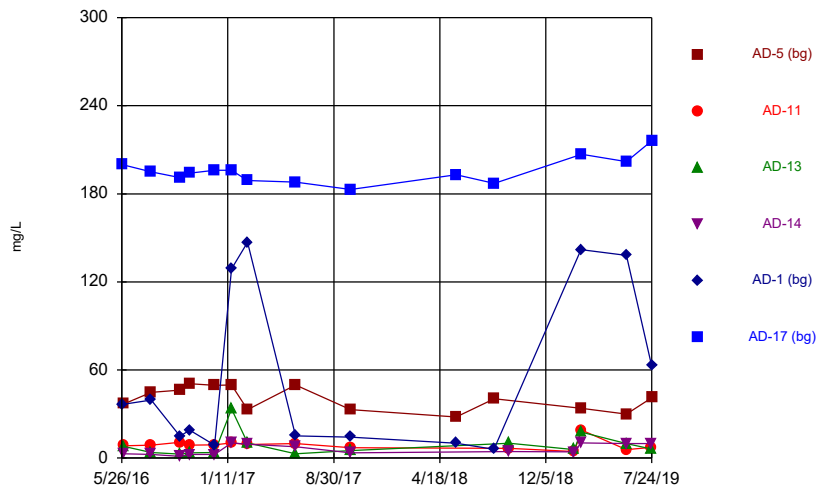
Constituent: Boron, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



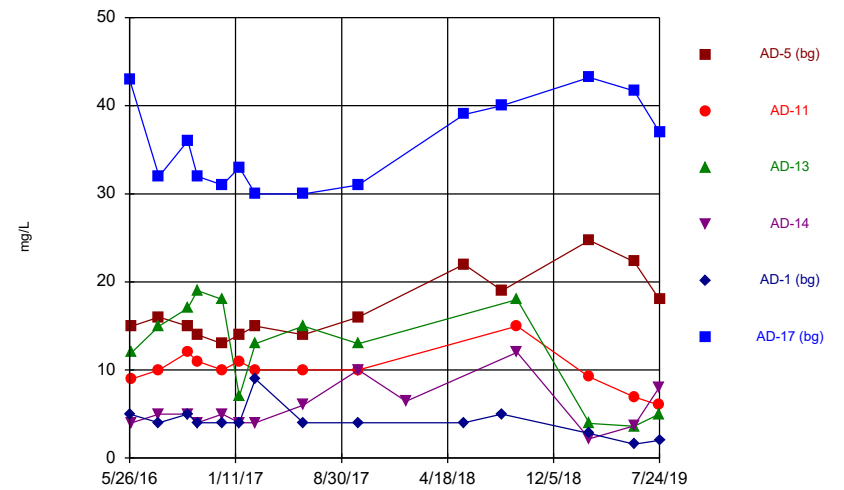
Constituent: Cadmium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



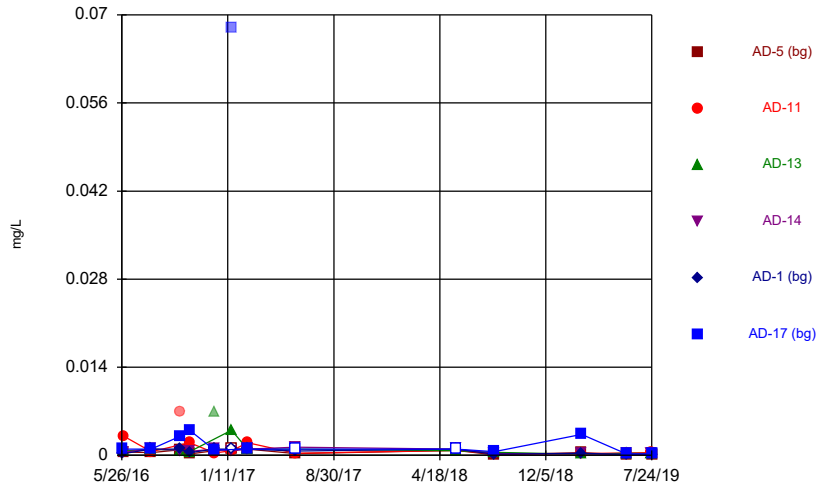
Constituent: Calcium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



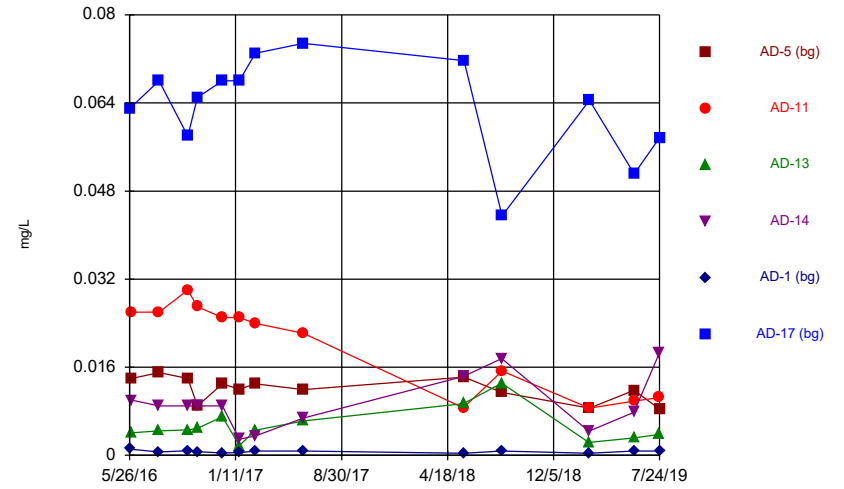
Constituent: Chloride, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



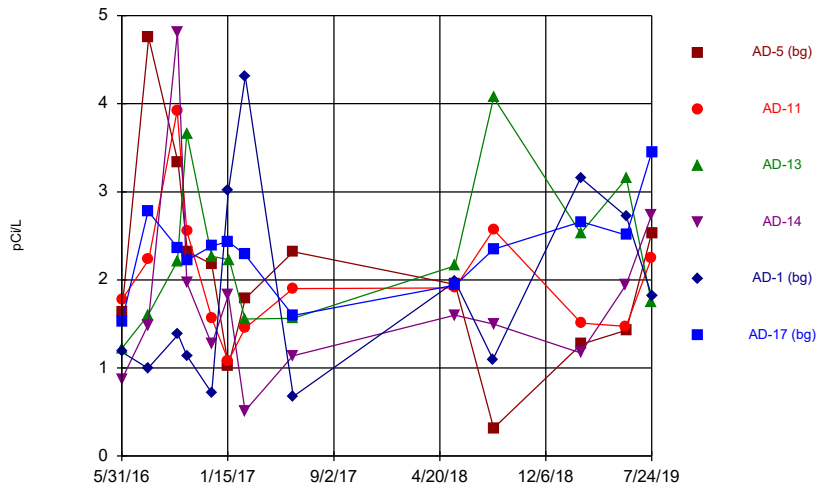
Constituent: Chromium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



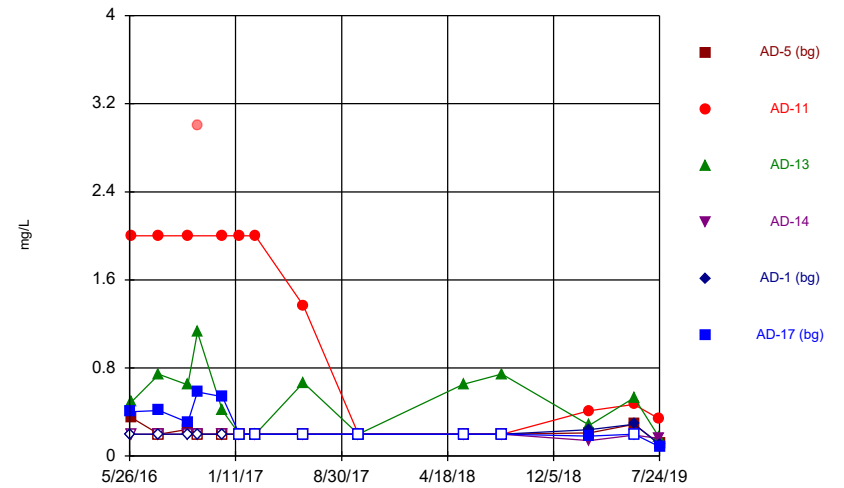
Constituent: Cobalt, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



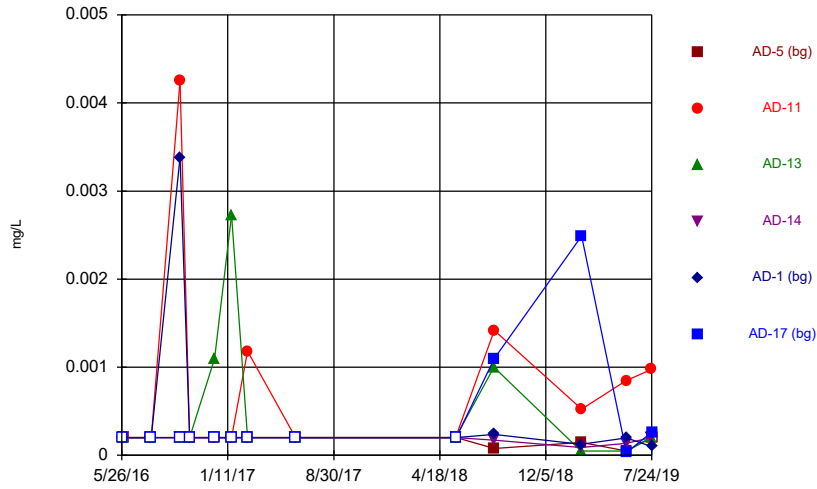
Constituent: Combined Radium 226 + 228 Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



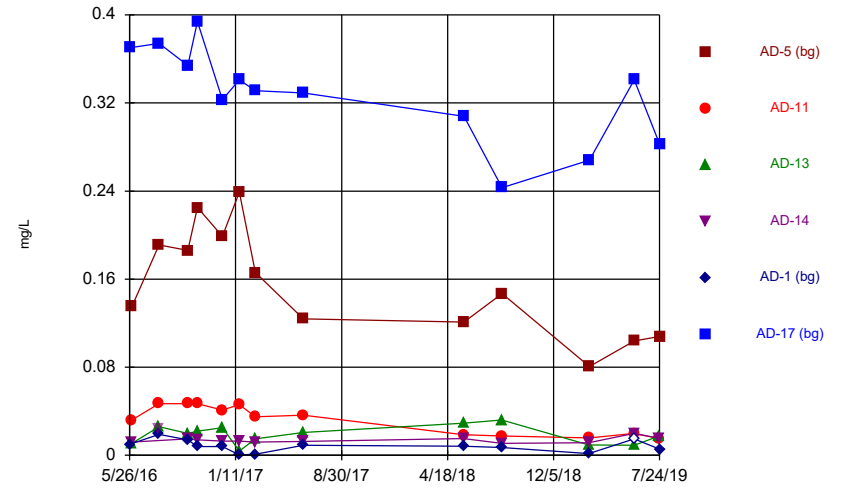
Constituent: Fluoride, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
 Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



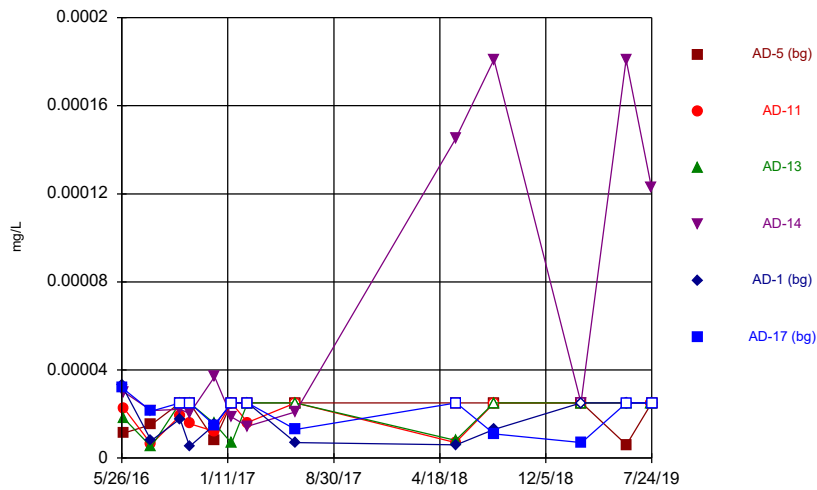
Constituent: Lead, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



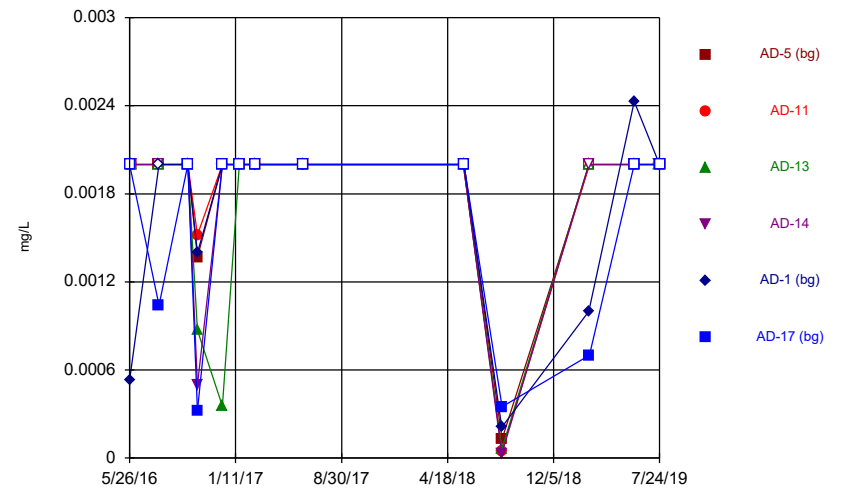
Constituent: Lithium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



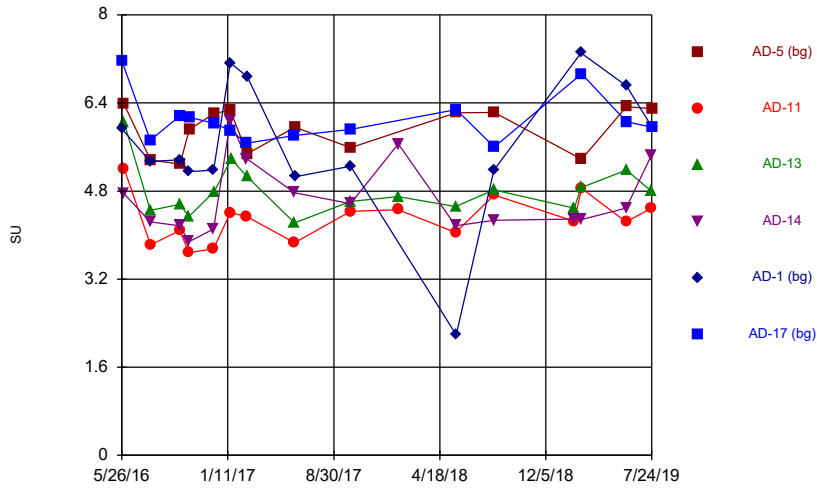
Constituent: Mercury, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



Constituent: Molybdenum, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

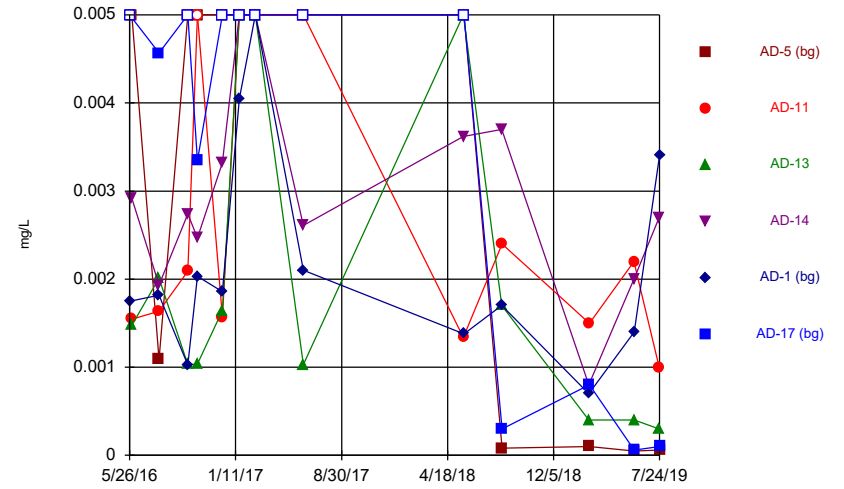
Time Series



Constituent: pH, field Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

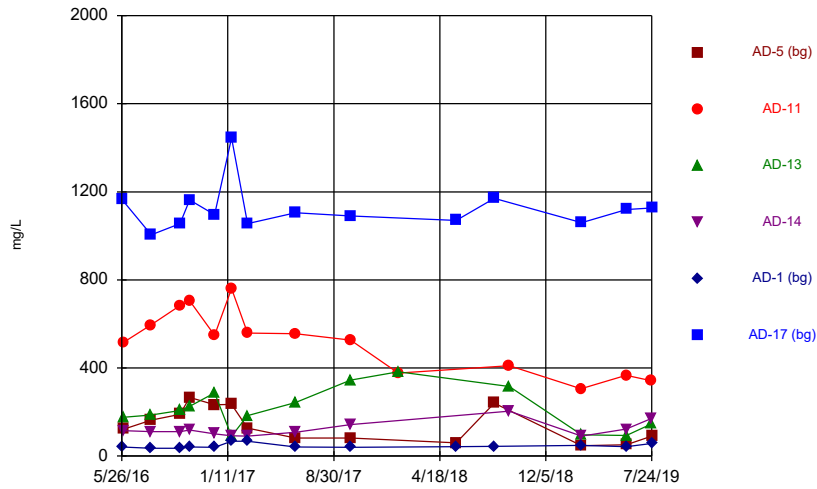
Hollow symbols indicate censored values.

Time Series



Constituent: Selenium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

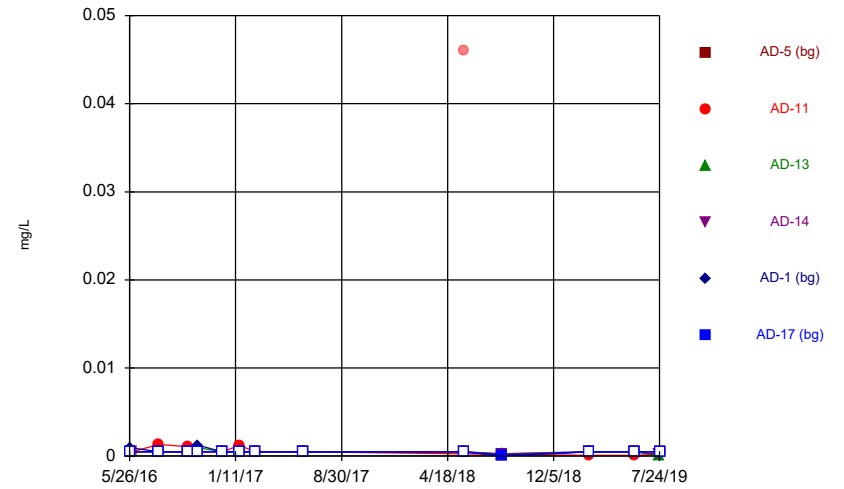
Time Series



Constituent: Sulfate, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

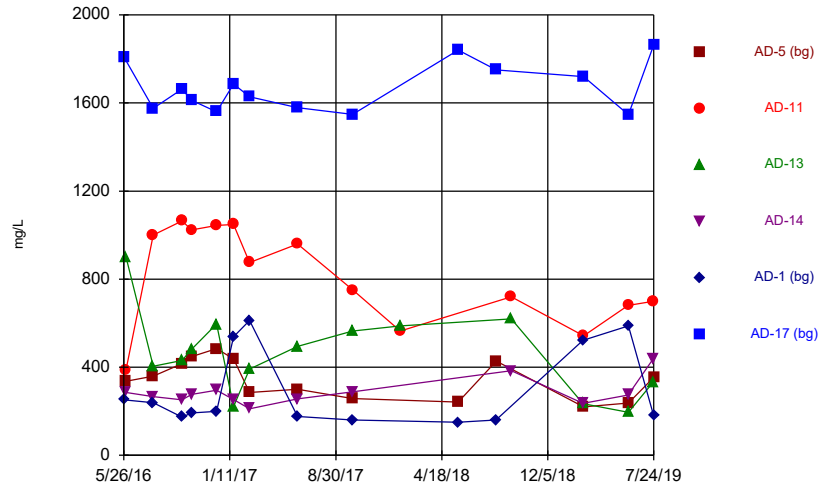
Hollow symbols indicate censored values.

Time Series



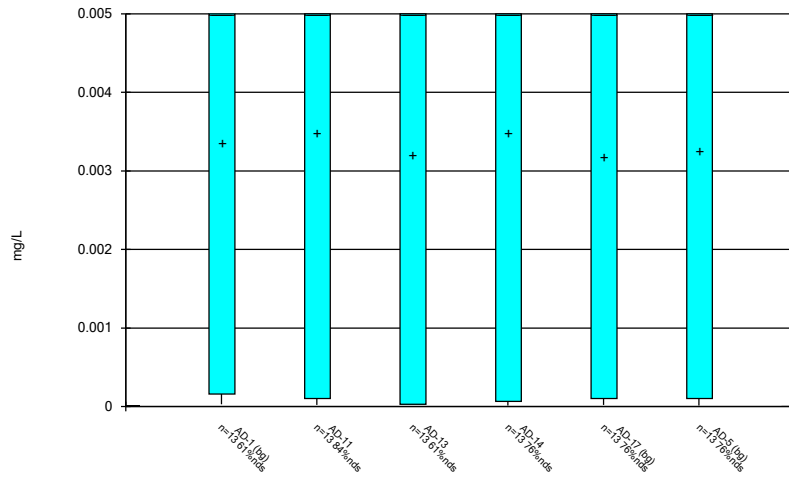
Constituent: Thallium, total Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Time Series



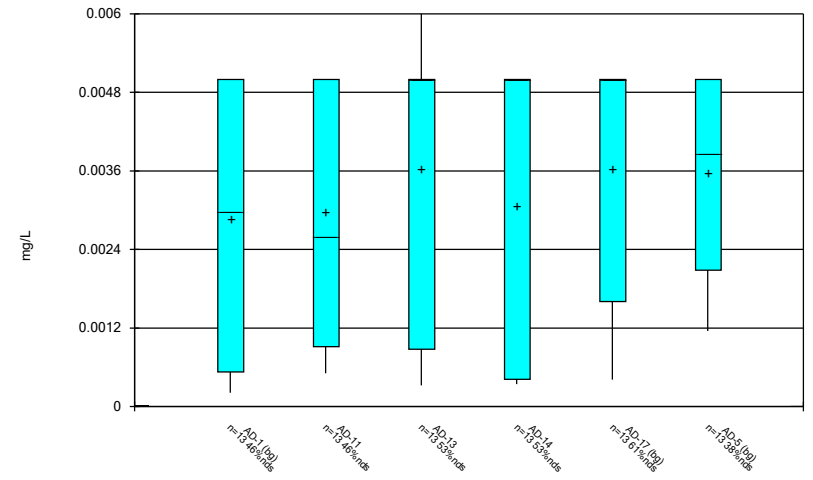
Constituent: Total Dissolved Solids Analysis Run 12/5/2019 12:32 PM View: Descriptive
Welsh LF Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



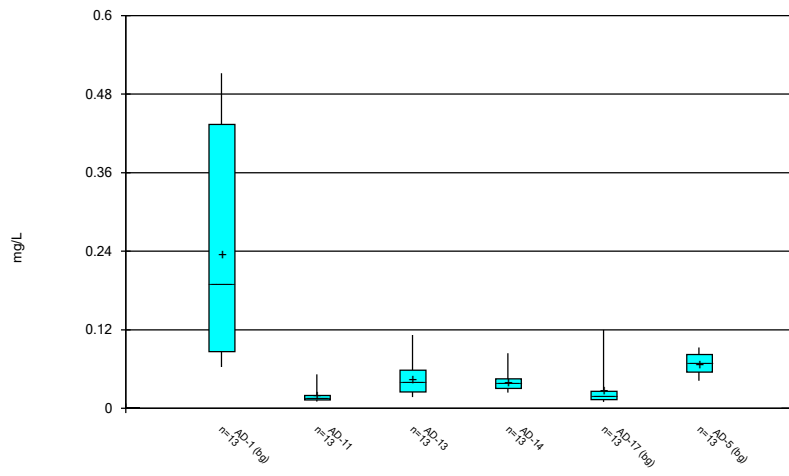
Constituent: Antimony, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



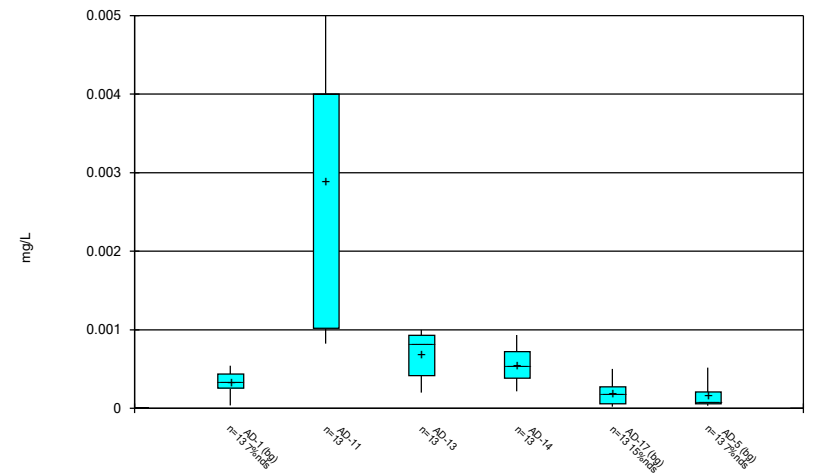
Constituent: Arsenic, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



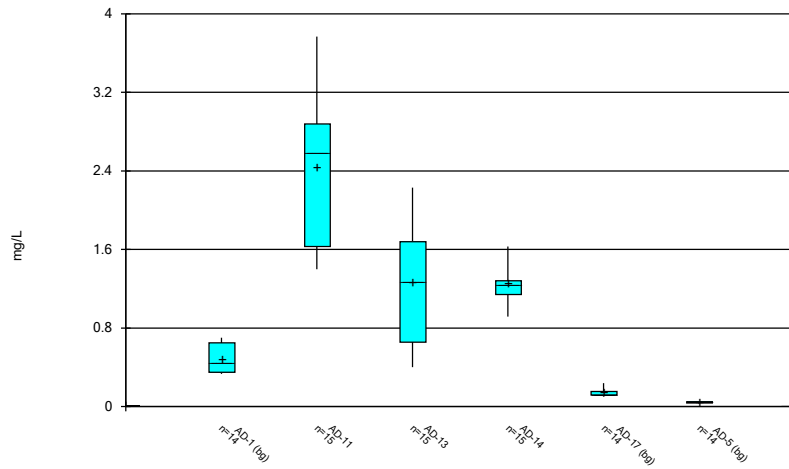
Constituent: Barium, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



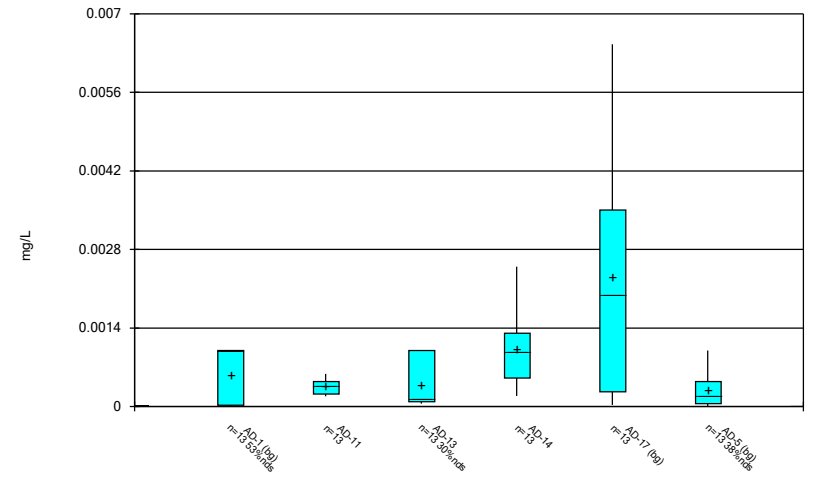
Constituent: Beryllium, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



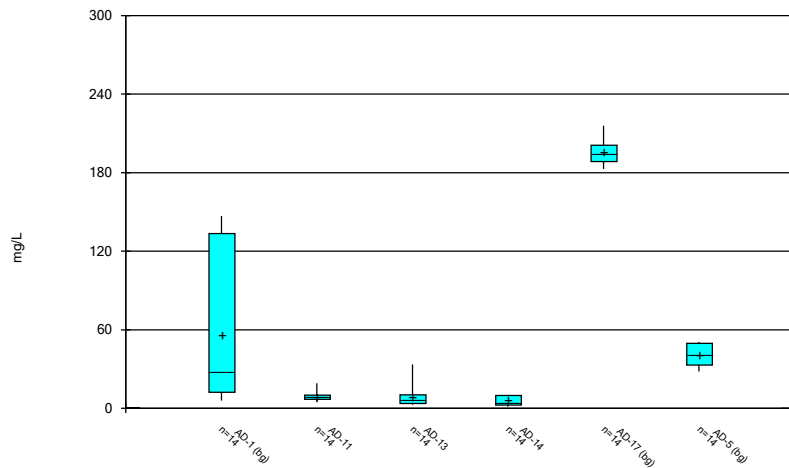
Constituent: Boron, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



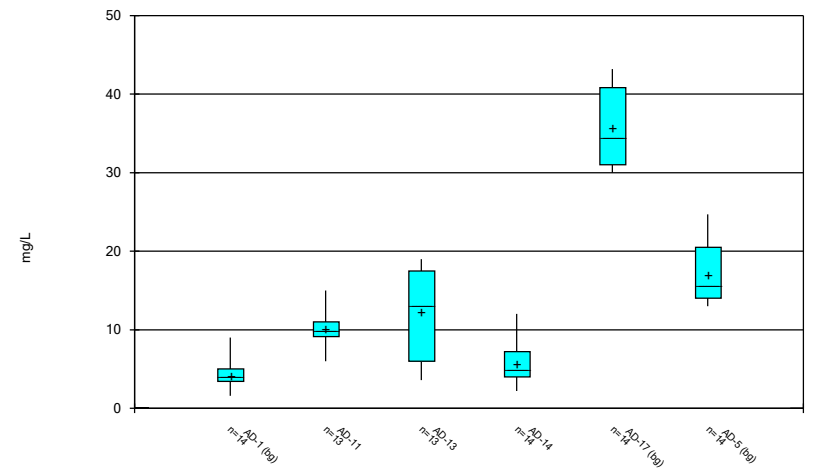
Constituent: Cadmium, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



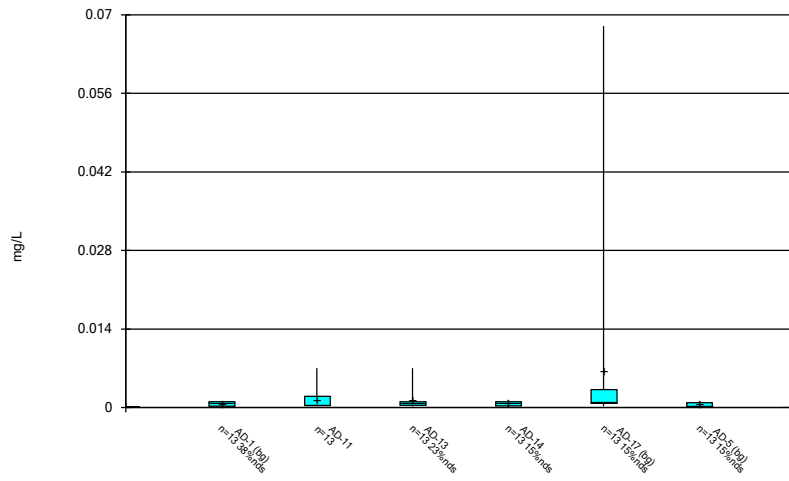
Constituent: Calcium, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



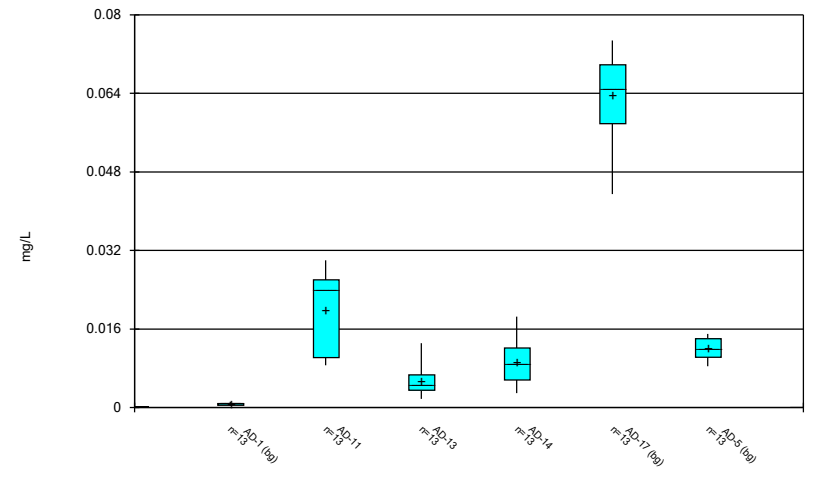
Constituent: Chloride, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



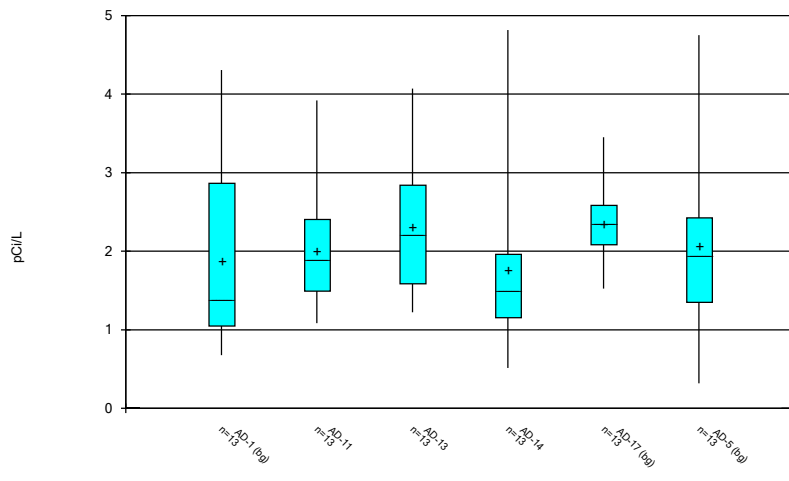
Constituent: Chromium, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



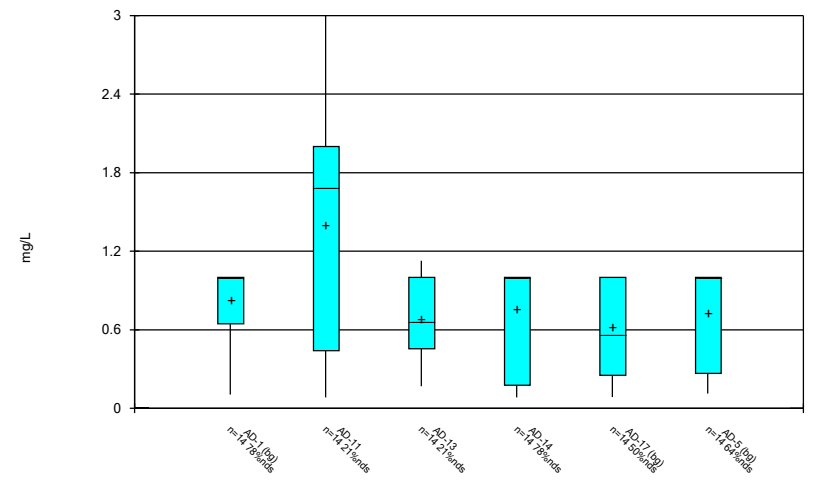
Constituent: Cobalt, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



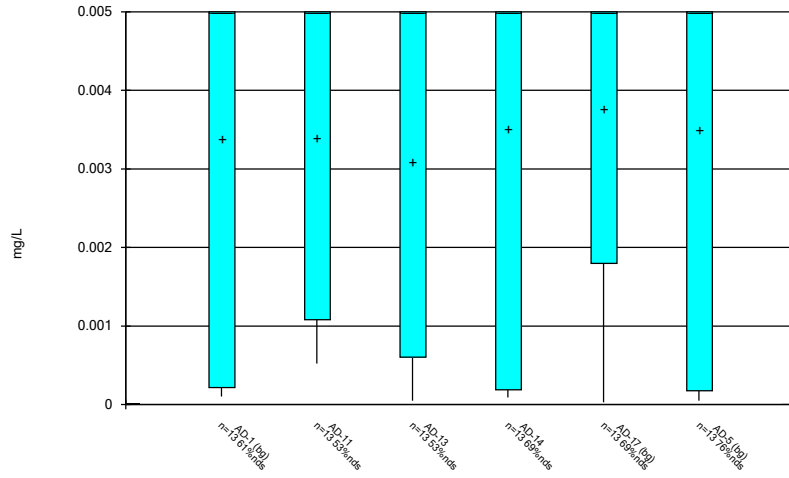
Constituent: Combined Radium 226 + 228 Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



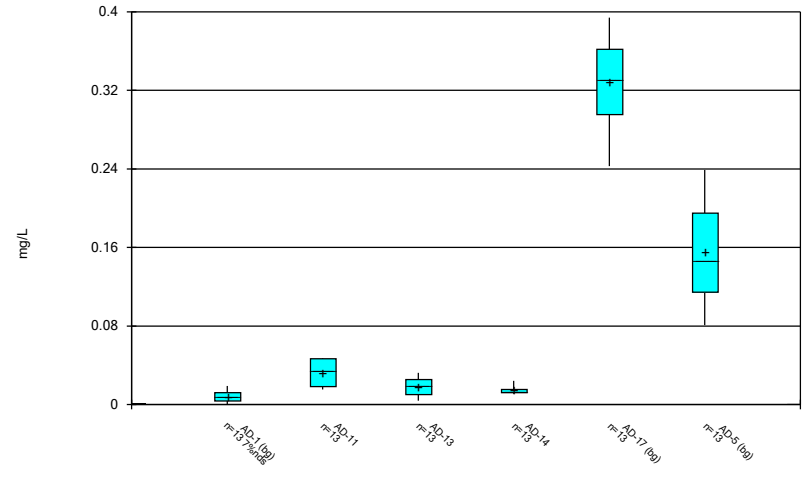
Constituent: Fluoride, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



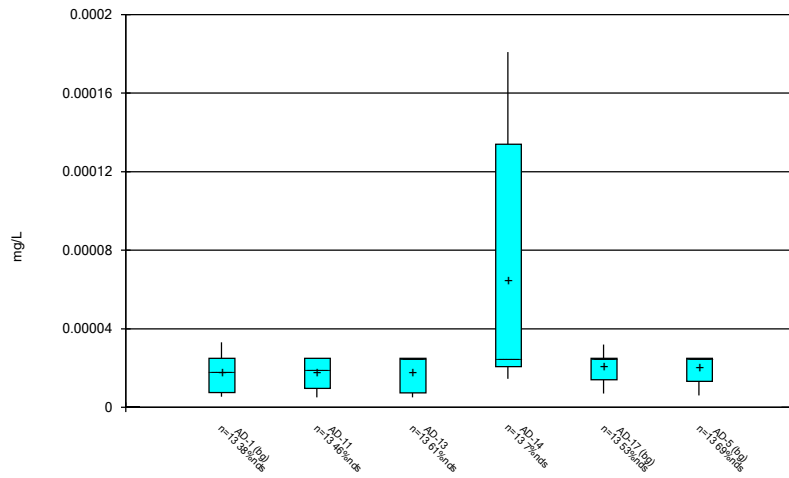
Constituent: Lead, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



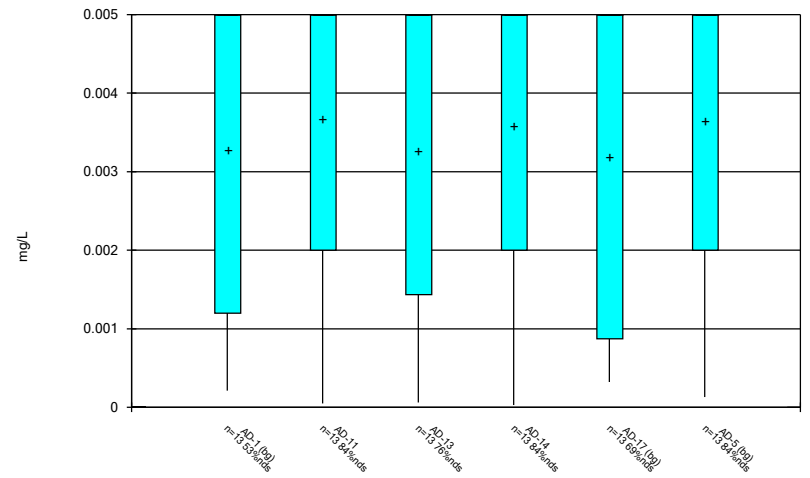
Constituent: Lithium, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



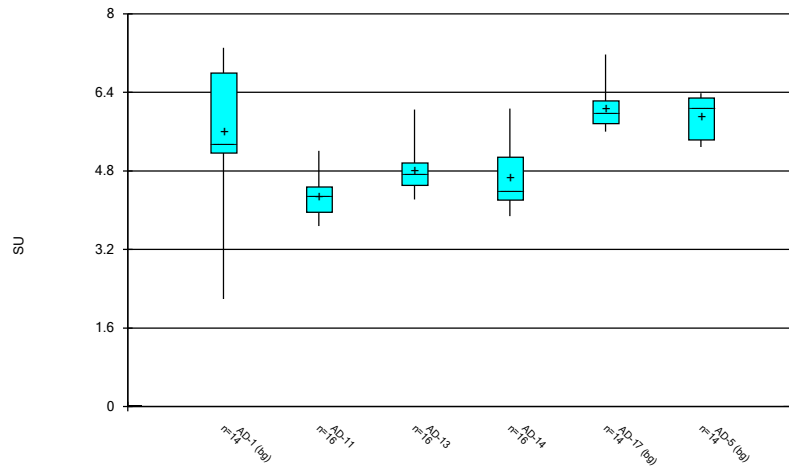
Constituent: Mercury, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



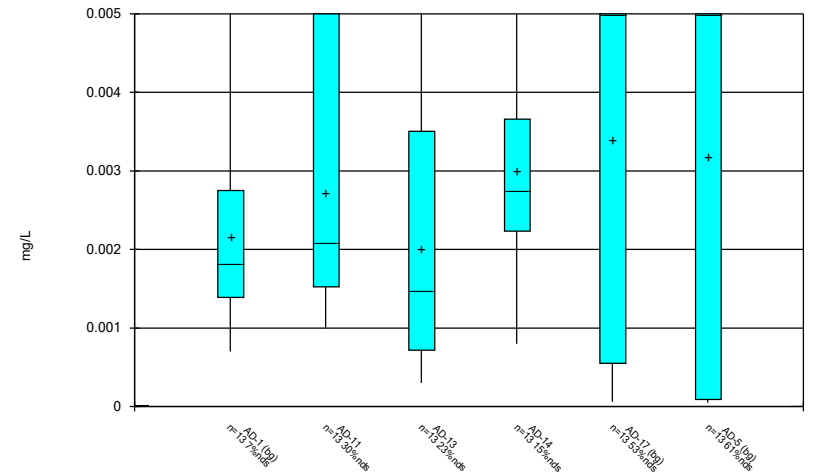
Constituent: Molybdenum, total Analysis Run 11/22/2019 5:25 PM
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



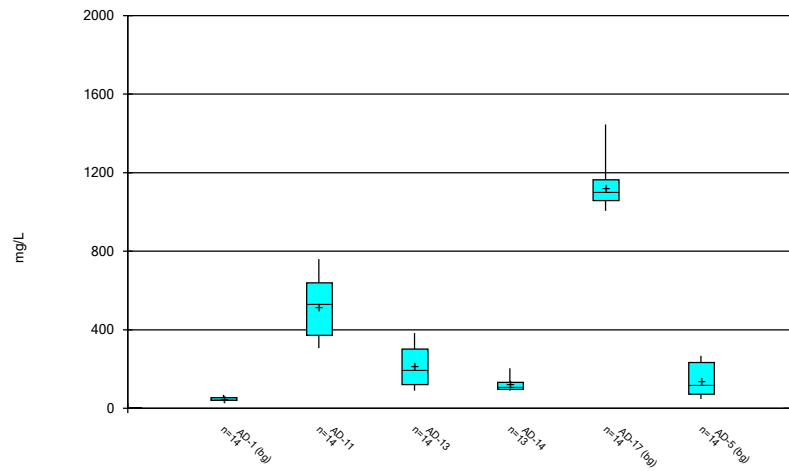
Constituent: pH, field Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



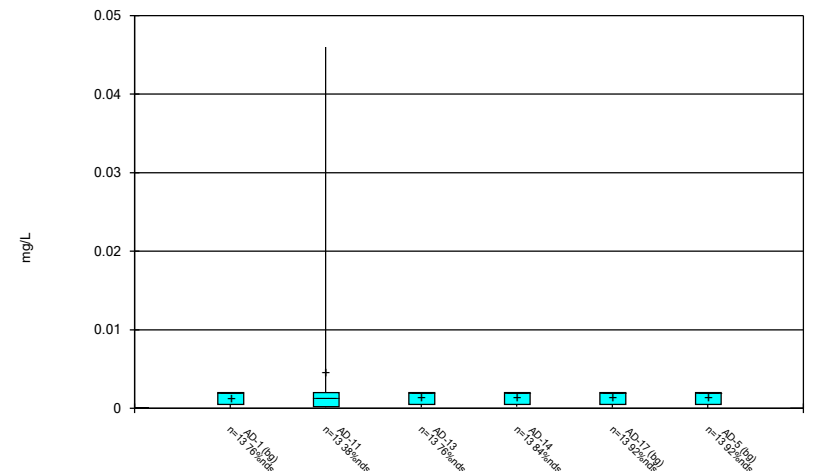
Constituent: Selenium, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



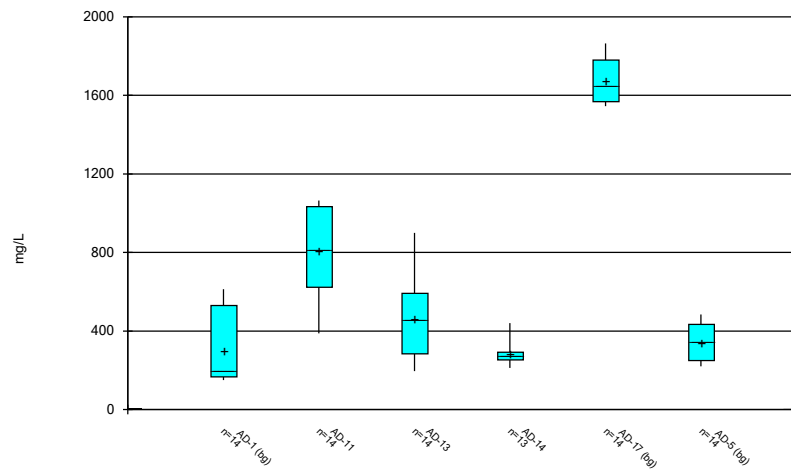
Constituent: Sulfate, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



Constituent: Thallium, total Analysis Run 11/22/2019 5:25 PM
Welsh Landfill Client: Geosyntec Data: Welsh LF

Box & Whiskers Plot



Constituent: Total Dissolved Solids Analysis Run 11/22/2019 5:25 PM

Welsh Landfill Client: Geosyntec Data: Welsh LF

Outlier Summary

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/25/2019, 3:39 PM

AD-11 Chromium, total (mg/L)
AD-13 Chromium, total (mg/L)
AD-17 Chromium, total (mg/L)
AD-11 Fluoride, total (mg/L)
AD-14 Lithium, total (mg/L)
AD-11 Thallium, total (mg/L)

7/29/2016				0.024 (o)		
9/30/2016	0.007 (o)					
10/21/2016			3 (o)			
12/14/2016	0.007 (o)					
1/20/2017		0.068 (O)				
5/23/2018				0.046 (o)		

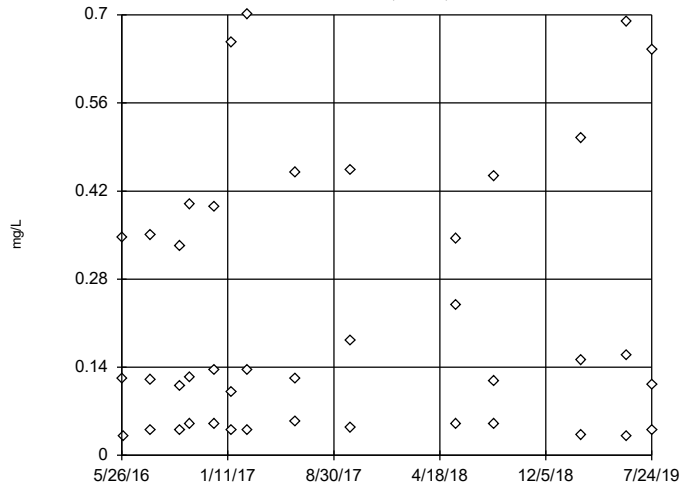
Interwell Appendix III Outlier Analysis - All Results (No Significant)

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/20/2019, 1:15 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Boron, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	42	0.2196	0.2058	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	42	0.7273	0.3627	ln(x)	ShapiroWilk
pH, field (SU)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	42	5.879	0.8205	x^3	ShapiroWilk

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

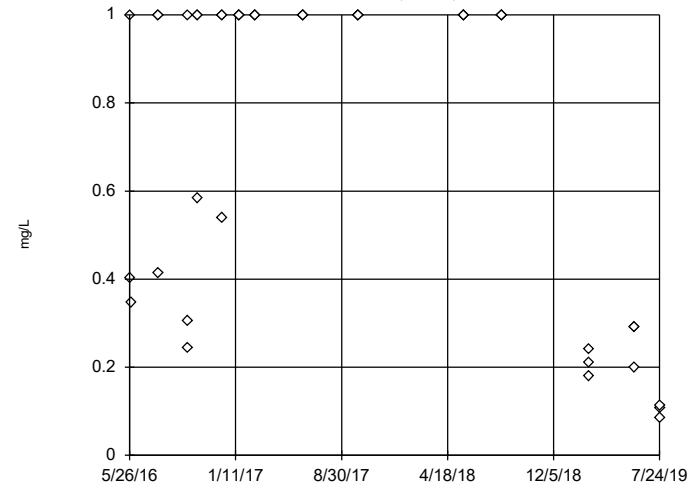


n = 42
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 152.1, low cutoff = 0.000122, based on IQR multiplier of 3.

Constituent: Boron, total Analysis Run 11/20/2019 1:14 PM View: Interwell All
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

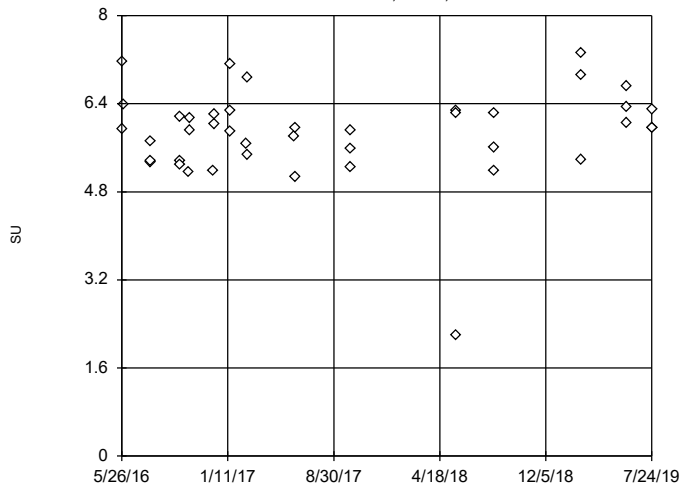


n = 42
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 37.92, low cutoff = 0.007849, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 11/20/2019 1:14 PM View: Interwell All
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 42
 No outliers found.
 Tukey's method selected by user.
 Data were cube transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 8.054, low cutoff = -4.934, based on IQR multiplier of 3.

Constituent: pH, field Analysis Run 11/20/2019 1:14 PM View: Interwell All
 Welsh Landfill Client: Geosyntec Data: Welsh LF

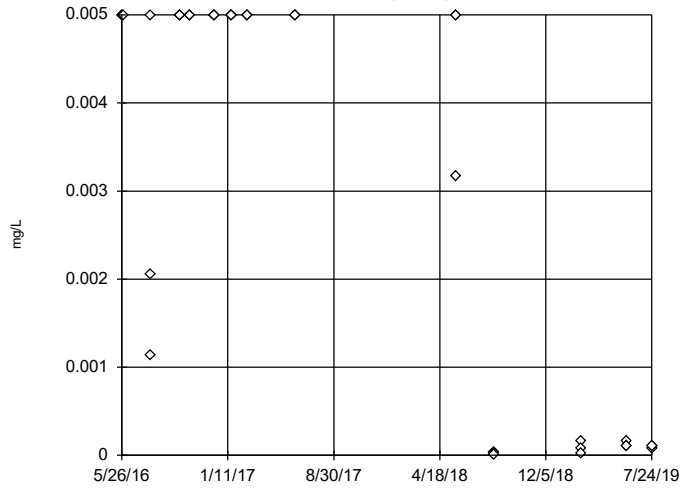
Upgradient Appendix IV Outlier Analysis - All Results

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/20/2019, 1:29 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, total (mg/L)	AD-1,AD-1...	n/a	n/a	n/a w/com...	NP	NaN	39	0.003265	0.002294	unknown	ShapiroWilk
Arsenic, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.003355	0.001848	sqrt(x)	ShapiroWilk
Barium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.1097	0.1337	ln(x)	ShapiroWilk
Beryllium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.000...	0.000171	$x^{1/3}$	ShapiroWilk
Cadmium, total (mg/L)	AD-1,AD-1...	n/a	n/a	n/a w/com...	NP	NaN	39	0.001055	0.001552	unknown	ShapiroWilk
Chromium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	38	0.000...	0.00086	ln(x)	ShapiroWilk
Cobalt, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.02542	0.02821	$x^{1/3}$	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	2.091	0.9476	sqrt(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	42	0.7273	0.3627	ln(x)	ShapiroWilk
Lead, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.003549	0.002164	ln(x)	ShapiroWilk
Lithium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.1639	0.1373	normal	ShapiroWilk
Mercury, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.000...	0.0000...	x^2	ShapiroWilk
Molybdenum, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.003371	0.001944	$x^{1/3}$	ShapiroWilk
Selenium, total (mg/L)	AD-1,AD-1...	No	n/a	n/a w/com...	NP	NaN	39	0.002917	0.002031	sqrt(x)	ShapiroWilk
Thallium, total (mg/L)	AD-1,AD-1...	n/a	n/a	n/a w/com...	NP	NaN	39	0.001457	0.00076	unknown	ShapiroWilk

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

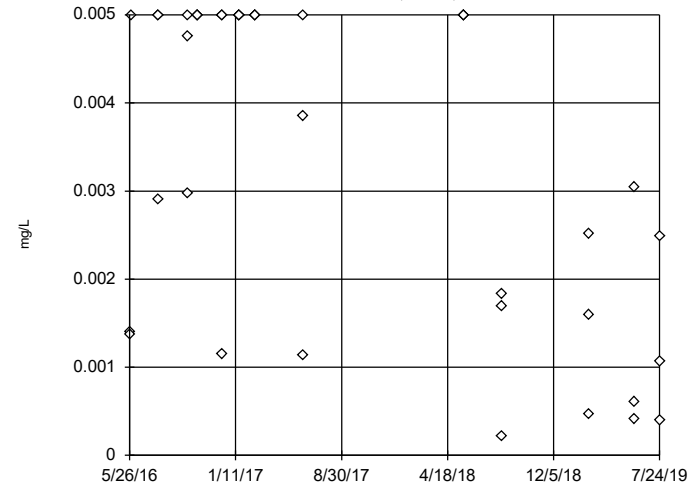


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Antimony, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

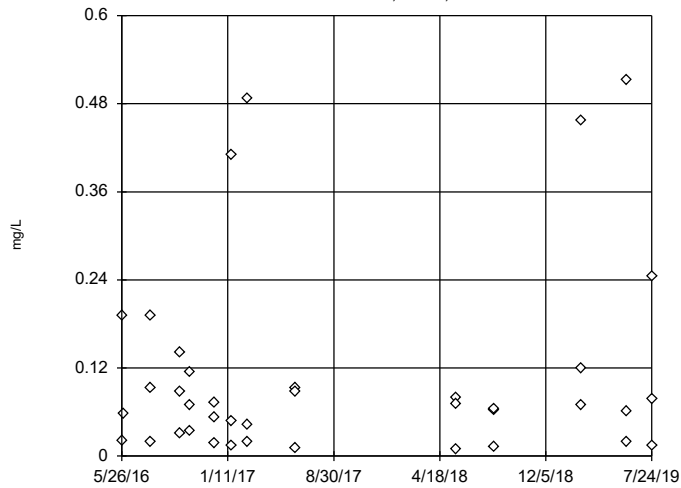


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.02919, low cutoff = -0.003945, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

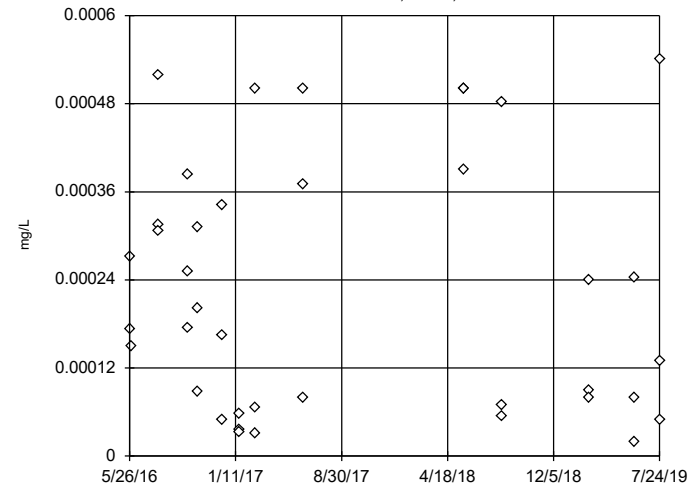


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 18.24, low cutoff = 0.0001313, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

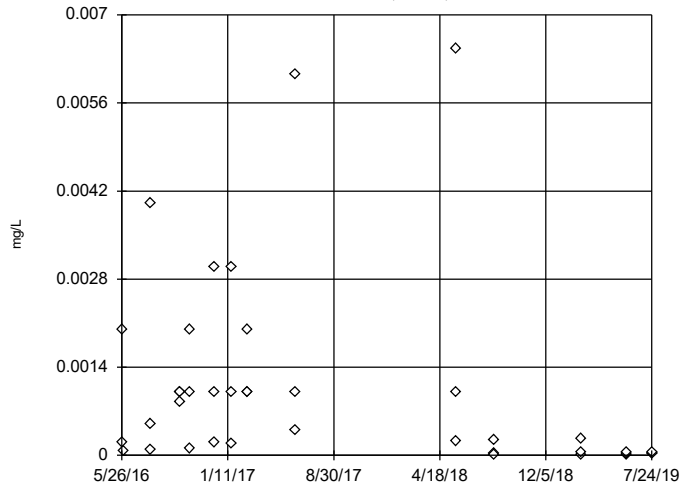


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were cube root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.00442, low cutoff = -0.0001351, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

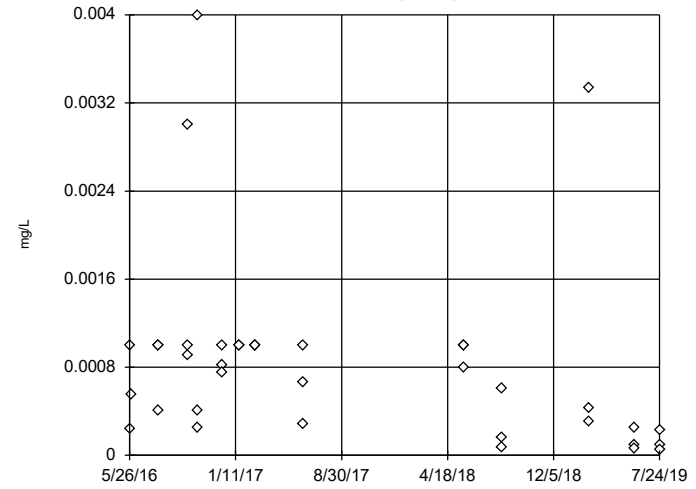


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Cadmium, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

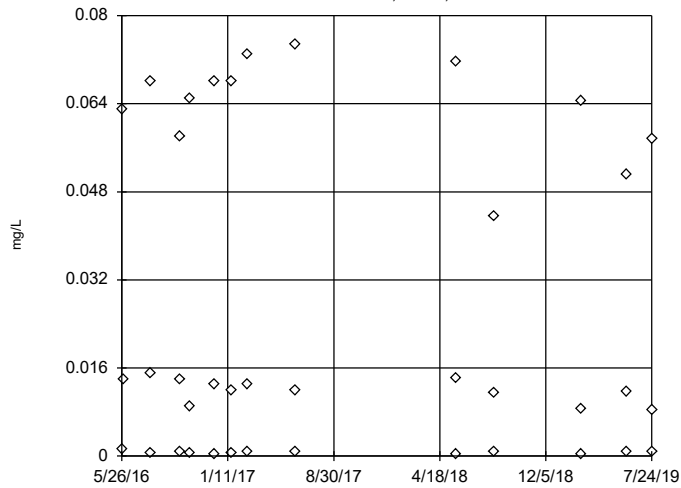


n = 38
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.06633, low cutoff = 0.000003725, based on IQR multiplier of 3.

Constituent: Chromium, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

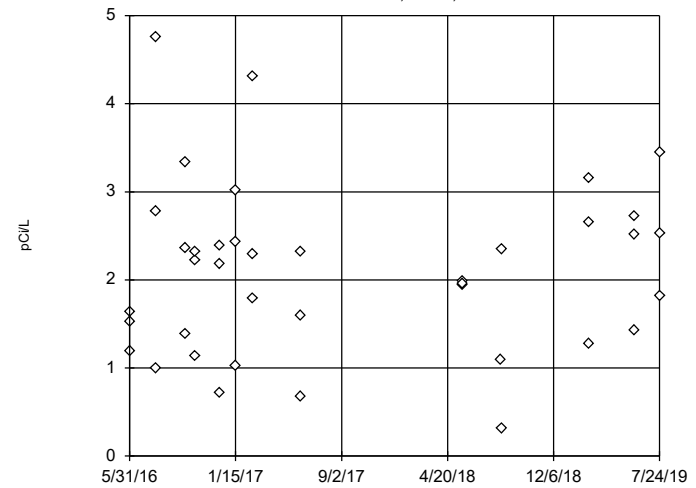


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were cube root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 2.054, low cutoff = -0.4961, based on IQR multiplier of 3.

Constituent: Cobalt, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

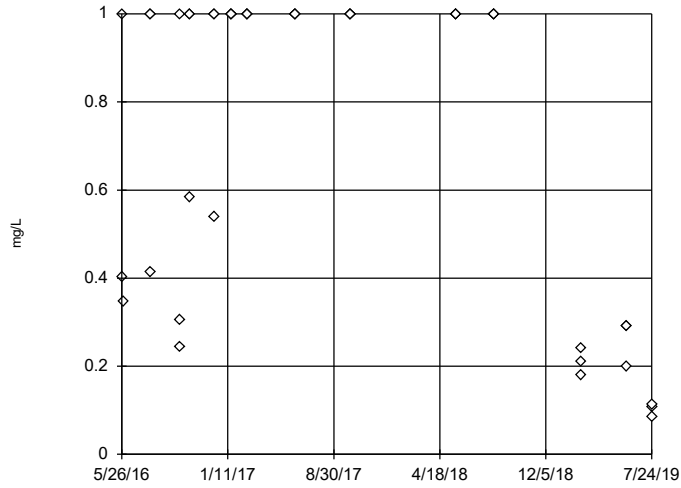


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 8.077, low cutoff = -0.005728, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

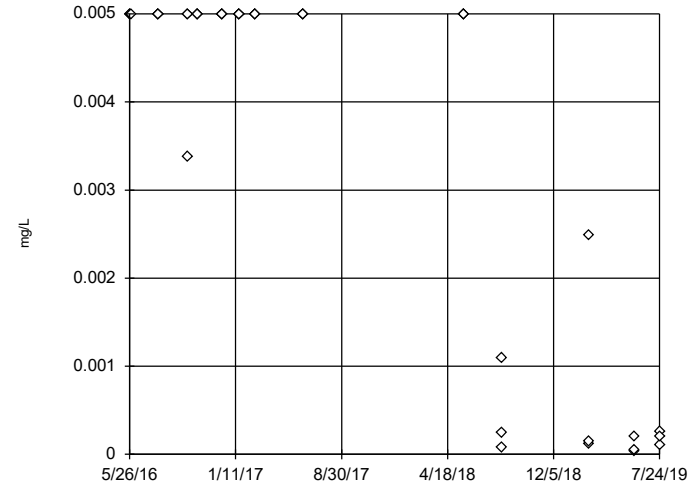


n = 42
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 37.92, low cutoff = 0.007849, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

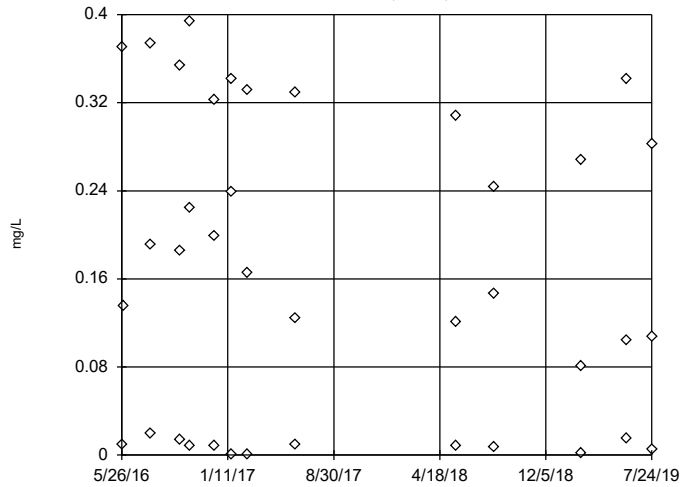


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 34.36, low cutoff = 3.8e-8, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

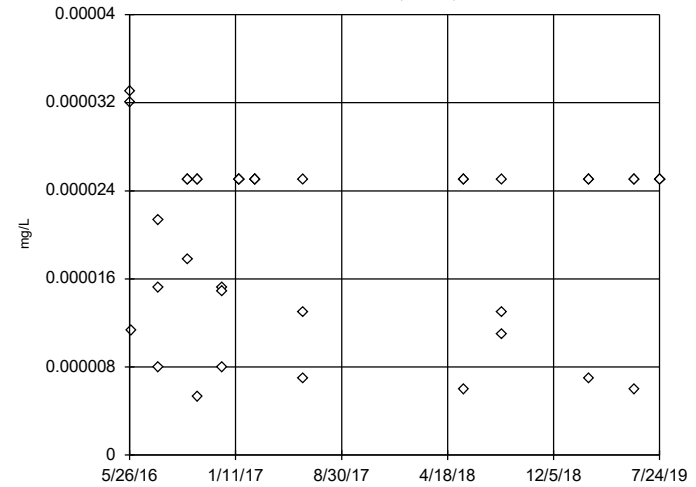


n = 39
 No outliers found.
 Tukey's method selected by user.
 Ladder of Powers transformations did not improve normality; analysis run on raw data.
 High cutoff = 1.202, low cutoff = -0.884, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

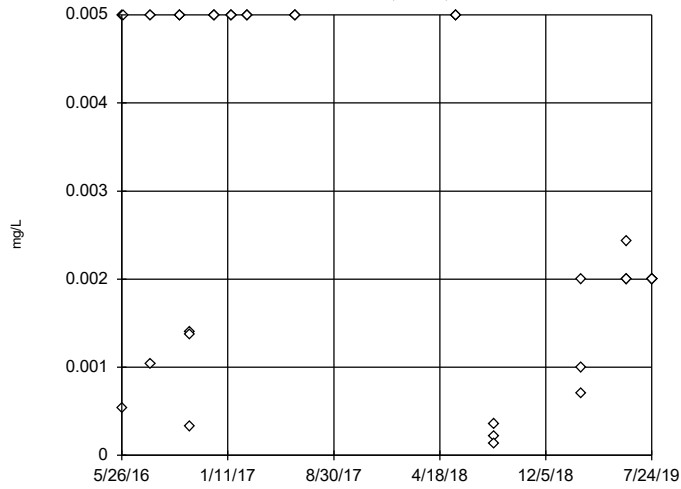


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were square transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.00004464, low cutoff = -0.00003463, based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

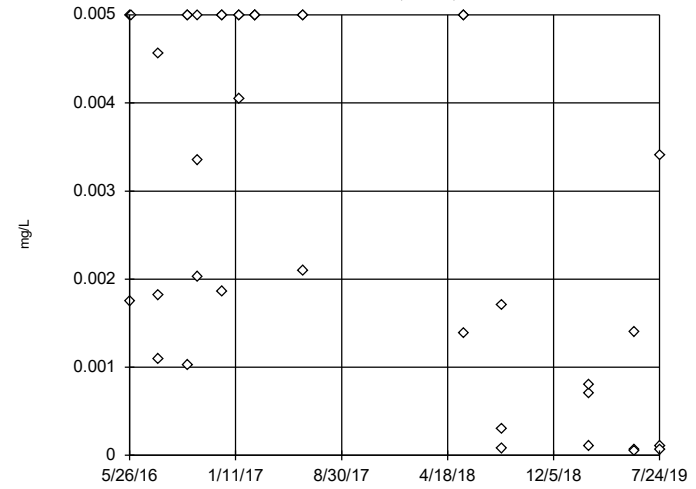


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were cube root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.04232,
 low cutoff = -0.000283,
 based on IQR multiplier of 3.

Constituent: Molybdenum, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5

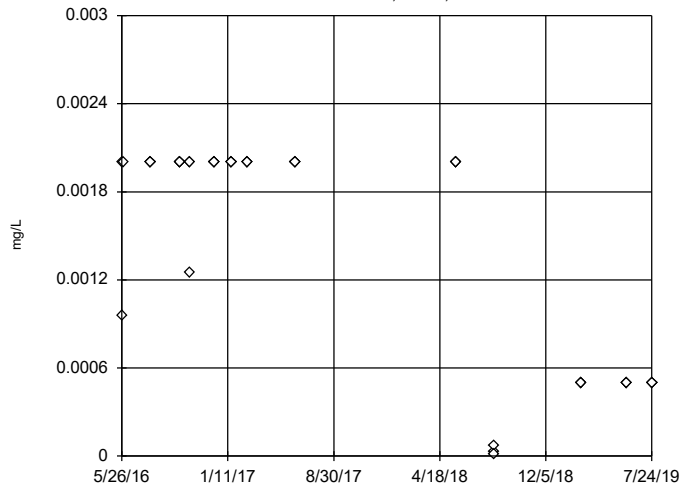


n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.03487,
 low cutoff = -0.007054,
 based on IQR multiplier of 3.

Constituent: Selenium, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening, Pooled Background

AD-1,AD-17,AD-5



n = 39
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 The results were invalidated, because both the lower and upper quartiles represent reporting limits.

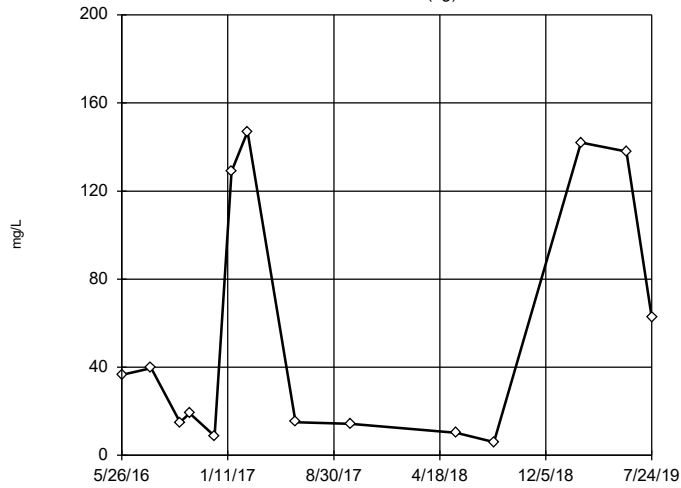
Constituent: Thallium, total Analysis Run 11/20/2019 1:28 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Intrawell Appendix III Outlier Analysis - All Results

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/20/2019, 1:27 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Calcium, total (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	55.94	56.65	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	14	8.97	3.408	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	14	8.82	8.193	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	14	5.797	3.544	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	195.5	8.645	ln(x)	ShapiroWilk
Calcium, total (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	40.53	8.044	$x^{(1/3)}$	ShapiroWilk
Chloride, total (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	4.172	1.727	$x^{(1/3)}$	ShapiroWilk
Chloride, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	10.01	2.195	sqrt(x)	ShapiroWilk
Chloride, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	12.27	5.586	x^2	ShapiroWilk
Chloride, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	14	5.663	2.683	ln(x)	ShapiroWilk
Chloride, total (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	35.64	4.965	ln(x)	ShapiroWilk
Chloride, total (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	17	3.662	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	46.46	10.67	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	14	518.1	141.8	normal	ShapiroWilk
Sulfate, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	14	213	93.58	sqrt(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	121.3	33.45	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	1123	104.3	ln(x)	ShapiroWilk
Sulfate, total (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	142.1	78.09	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-1 (bg)	No	n/a	n/a	NP	NaN	14	295.9	180	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-11	No	n/a	n/a	NP	NaN	14	811.6	221.2	normal	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-13	No	n/a	n/a	NP	NaN	14	461.2	189.8	sqrt(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	286.2	61.3	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-17 (bg)	No	n/a	n/a	NP	NaN	14	1670	111	ln(x)	ShapiroWilk
Total Dissolved Solids (mg/L)	AD-5 (bg)	No	n/a	n/a	NP	NaN	14	343.5	88.41	sqrt(x)	ShapiroWilk

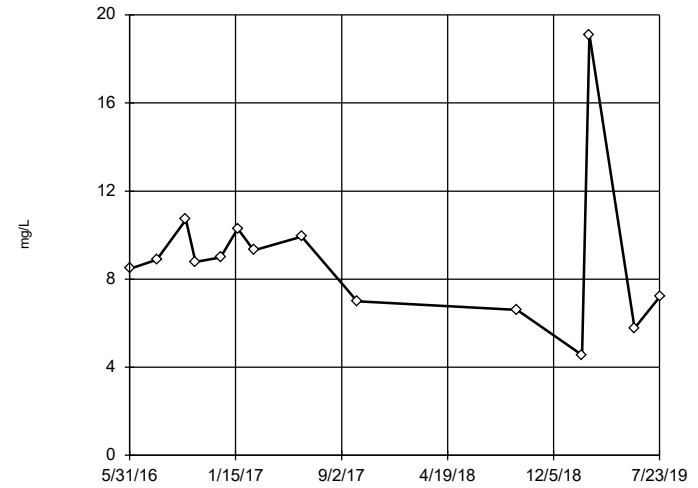
Tukey's Outlier Screening
AD-1 (bg)



n = 14
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 179901, low cutoff = 0.008957, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

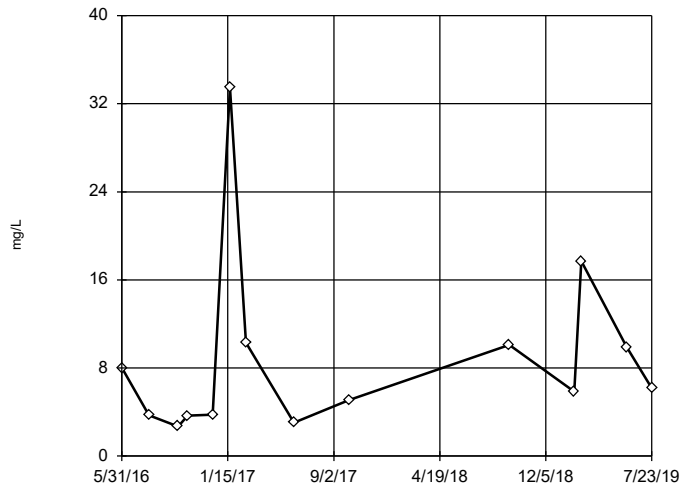
Tukey's Outlier Screening
AD-11



n = 14
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 33.31, low cutoff = 2.064, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

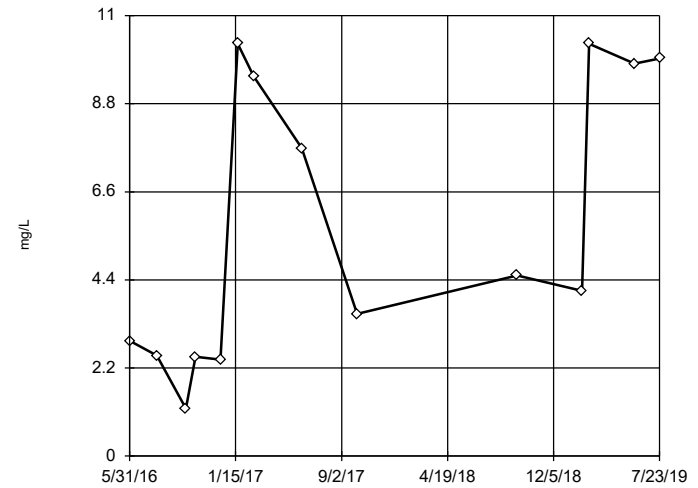
Tukey's Outlier Screening
AD-13



n = 14
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 217.2, low cutoff = 0.1728, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

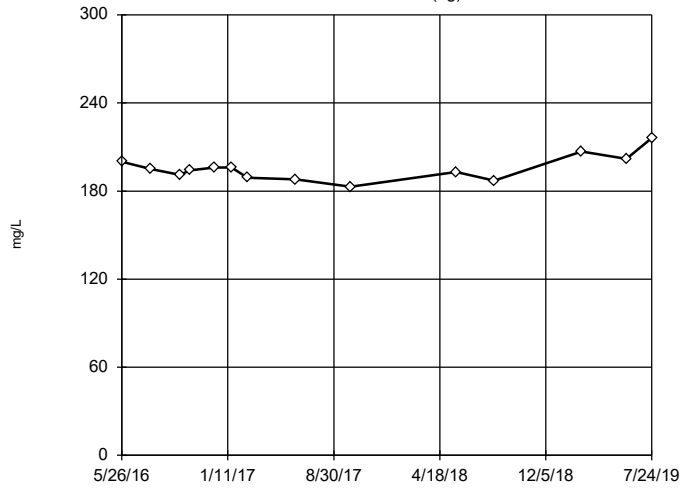
Tukey's Outlier Screening
AD-14



n = 14
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 609.8, low cutoff = 0.04036, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

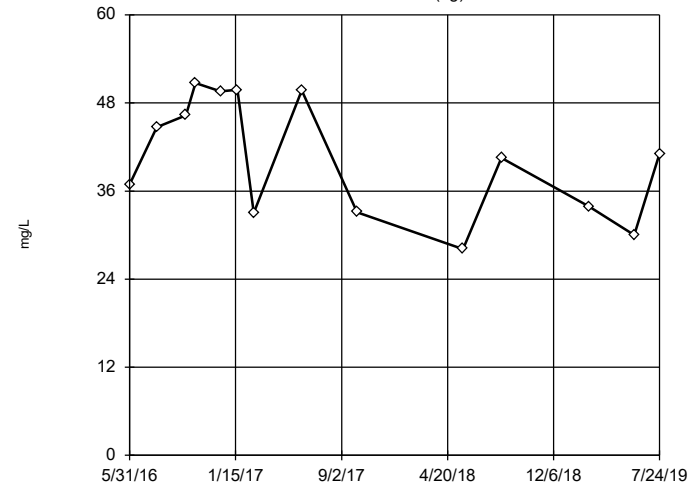
Tukey's Outlier Screening
AD-17 (bg)



n = 14
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 243.7, low cutoff = 155.5, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

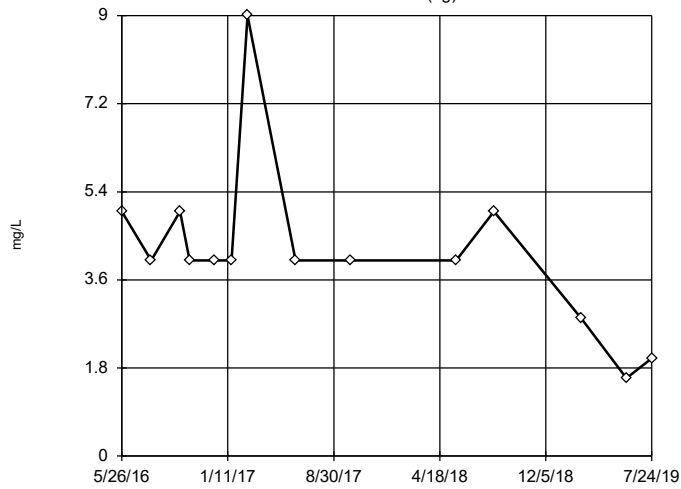
Tukey's Outlier Screening
AD-5 (bg)



n = 14
No outliers found.
Tukey's method selected by user.
Data were cube root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 130.6, low cutoff = 5.933, based on IQR multiplier of 3.

Constituent: Calcium, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

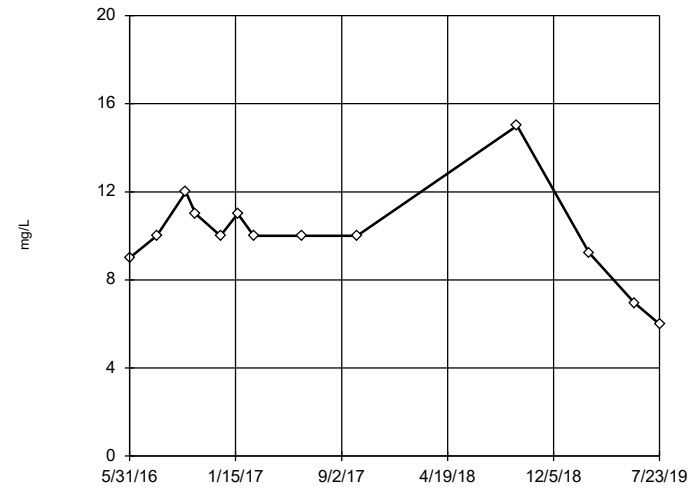
Tukey's Outlier Screening
AD-1 (bg)



n = 14
No outliers found.
Tukey's method selected by user.
Data were cube root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 12.81, low cutoff = 0.6596, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

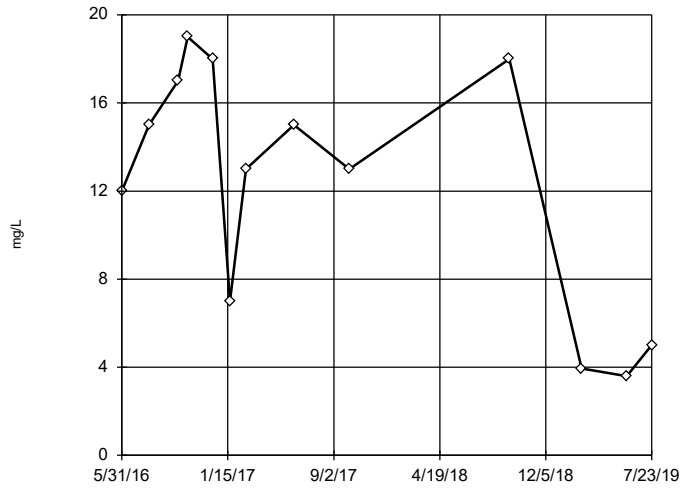
Tukey's Outlier Screening
AD-11



n = 13
No outliers found.
Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 17.72, low cutoff = 4.521, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

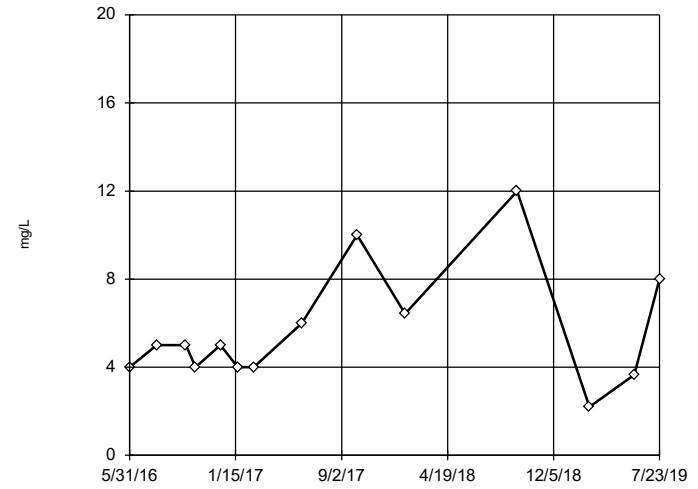
Tukey's Outlier Screening
AD-13



n = 13
No outliers found. Tukey's method selected by user.
Data were square transformed to achieve best W statistic (graph shown in original units).
High cutoff = 33.39, low cutoff = -27.78, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

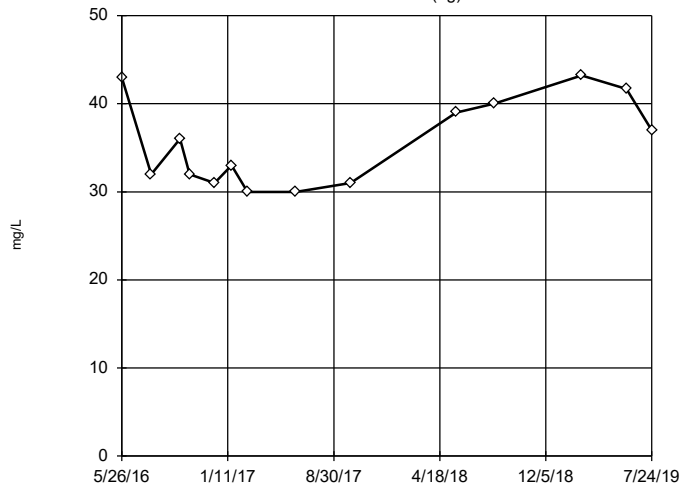
Tukey's Outlier Screening
AD-14



n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 41.34, low cutoff = 0.6939, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

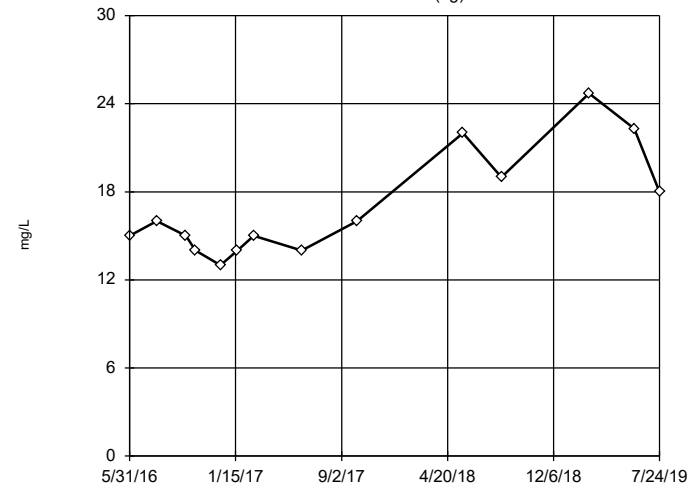
Tukey's Outlier Screening
AD-17 (bg)



n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 93.39, low cutoff = 13.56, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

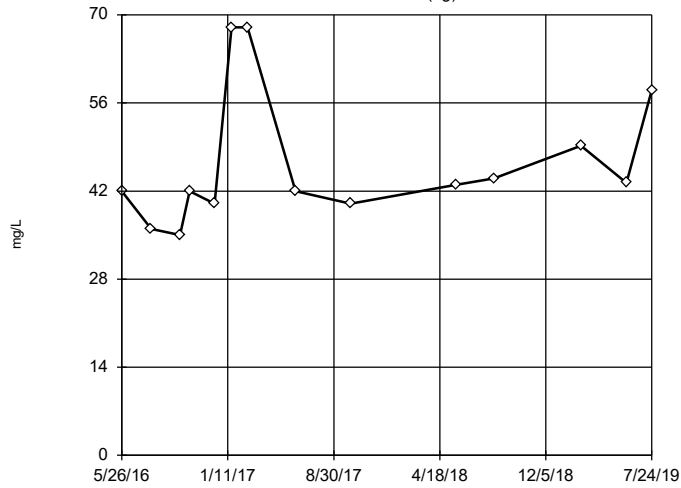
Tukey's Outlier Screening
AD-5 (bg)



n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 63.67, low cutoff = 4.495, based on IQR multiplier of 3.

Constituent: Chloride, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

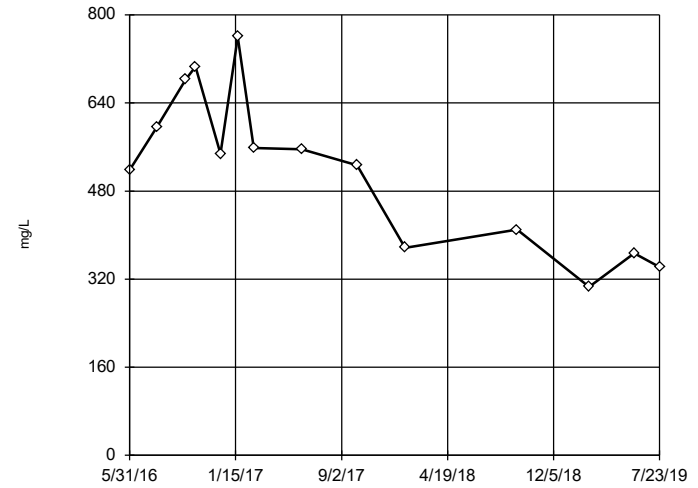
Tukey's Outlier Screening
AD-1 (bg)



n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 127.2, low cutoff = 16.79, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

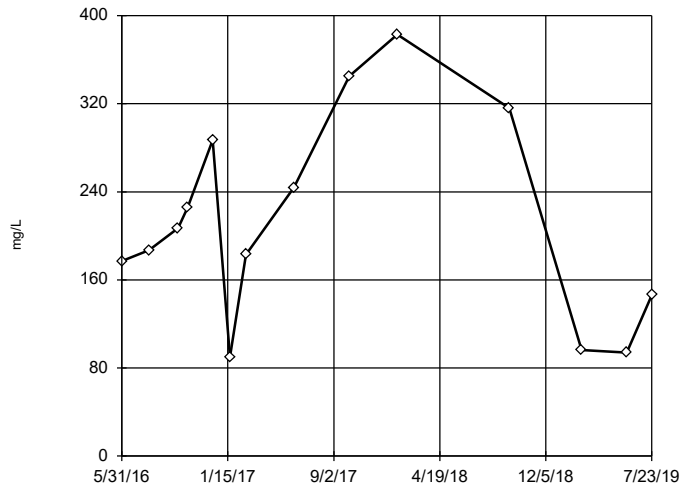
Tukey's Outlier Screening
AD-11



n = 14
No outliers found. Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
High cutoff = 1442, low cutoff = -430.5, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

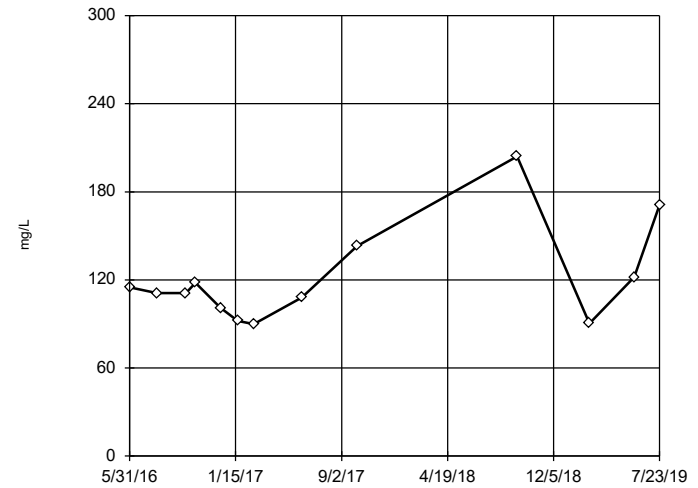
Tukey's Outlier Screening
AD-13



n = 14
No outliers found. Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 1339, low cutoff = -68.62, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

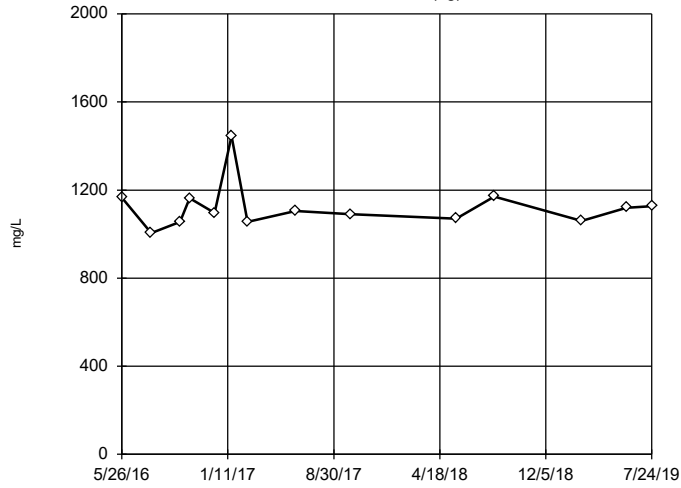
Tukey's Outlier Screening
AD-14



n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 339.8, low cutoff = 37.47, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:26 PM View: Intrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

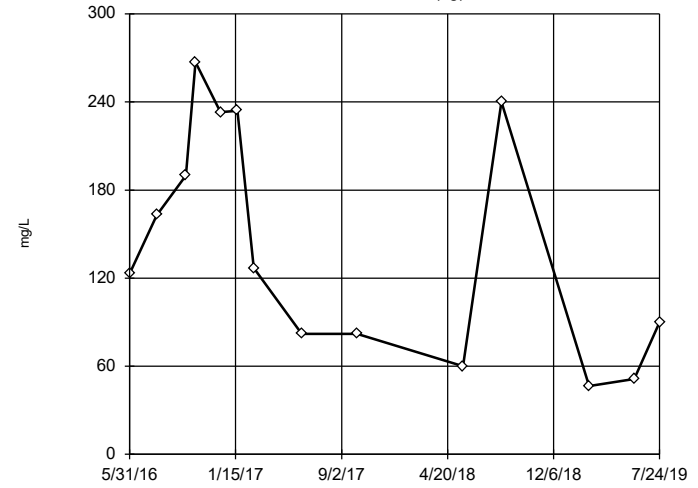
Tukey's Outlier Screening
AD-17 (bg)



n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 1555, low cutoff = 792, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:26 PM View: Inrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

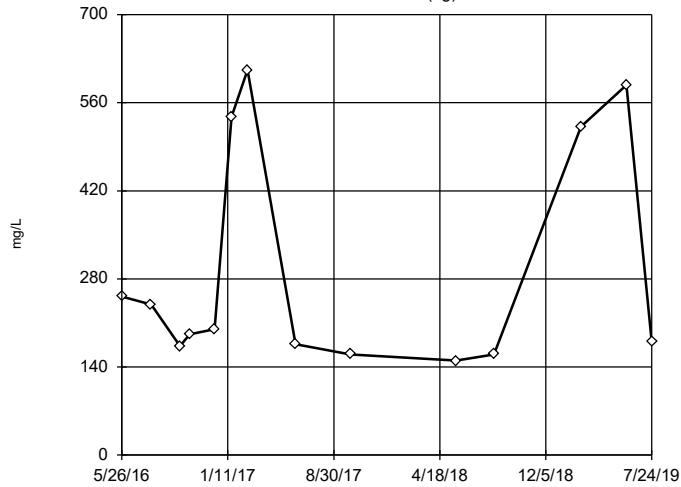
Tukey's Outlier Screening
AD-5 (bg)



n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 8614, low cutoff = 1.901, based on IQR multiplier of 3.

Constituent: Sulfate, total Analysis Run 11/20/2019 1:26 PM View: Inrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

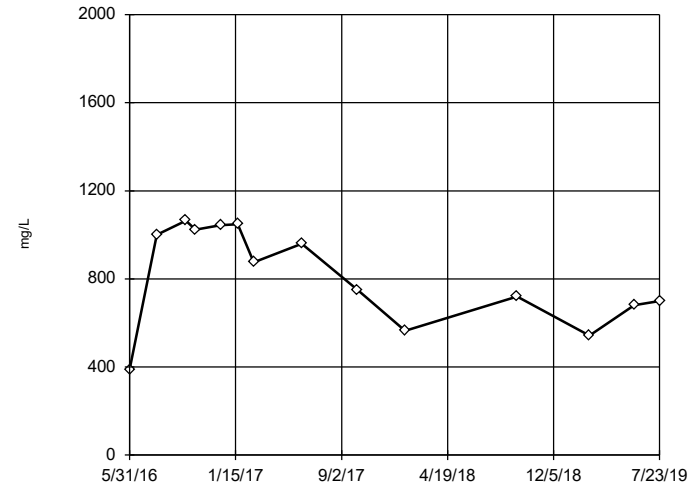
Tukey's Outlier Screening
AD-1 (bg)



n = 14
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 17126, low cutoff = 5.148, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:26 PM View: Inrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

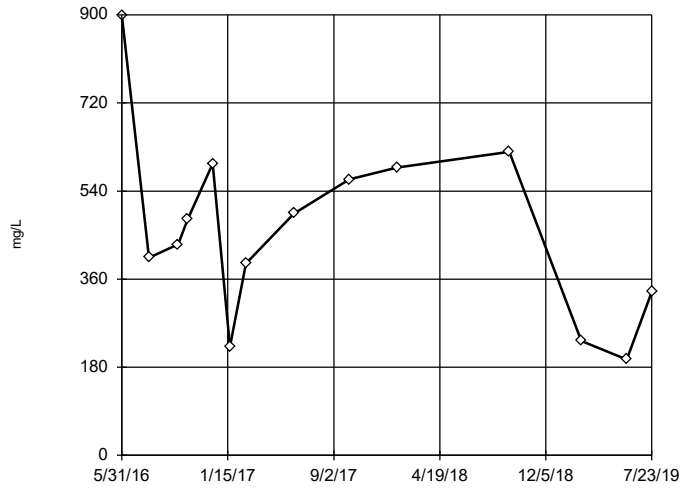
Tukey's Outlier Screening
AD-11



n = 14
No outliers found. Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
High cutoff = 2270, low cutoff = -614, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:26 PM View: Inrawell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

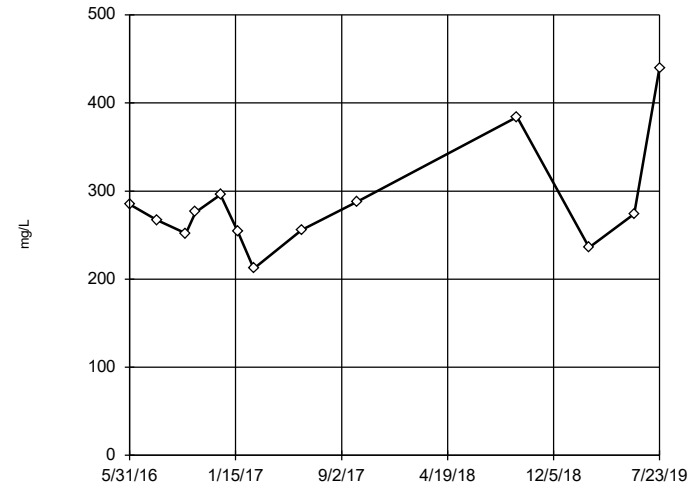
Tukey's Outlier Screening
AD-13



n = 14
No outliers found.
Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 2206, low cutoff = -34.19, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:26 PM View: IntraWell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

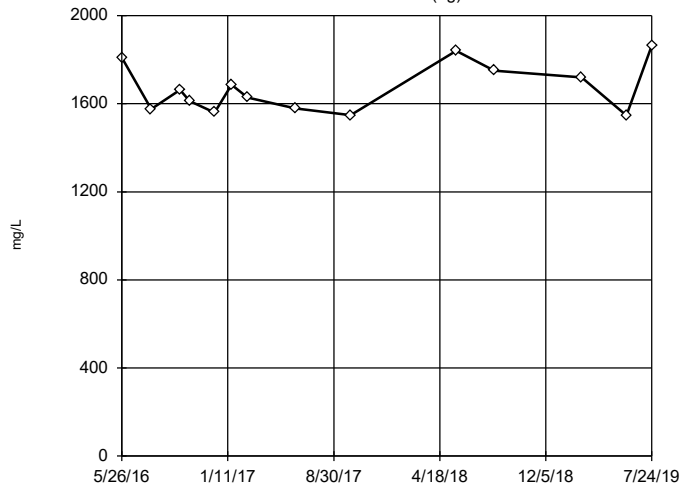
Tukey's Outlier Screening
AD-14



n = 13
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 448.8, low cutoff = 164.6, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:26 PM View: IntraWell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

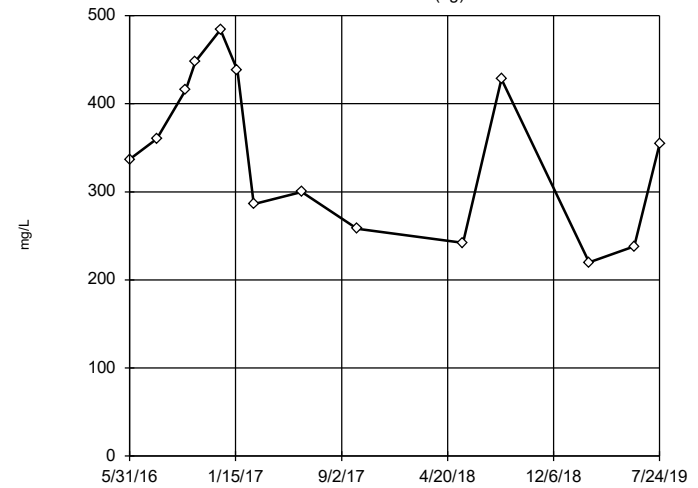
Tukey's Outlier Screening
AD-17 (bg)



n = 14
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 2603, low cutoff = 1072, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:26 PM View: IntraWell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening
AD-5 (bg)



n = 14
No outliers found.
Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 1282, low cutoff = 0.6602, based on IQR multiplier of 3.

Constituent: Total Dissolved Solids Analysis Run 11/20/2019 1:26 PM View: IntraWell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

Downgradient Appendix IV Outlier Analysis - Significant Results

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/20/2019, 1:21 PM

<u>Constituent</u>	<u>Well</u>	<u>Outlier</u>	<u>Value(s)</u>	<u>Date(s)</u>	<u>Method</u>	<u>Alpha</u>	<u>N</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Distribution</u>	<u>Normality Test</u>
Chromium, total (mg/L)	AD-13	Yes	0.007	12/14/2016	NP	NaN	13	0.001275	0.00198	ln(x)	ShapiroWilk

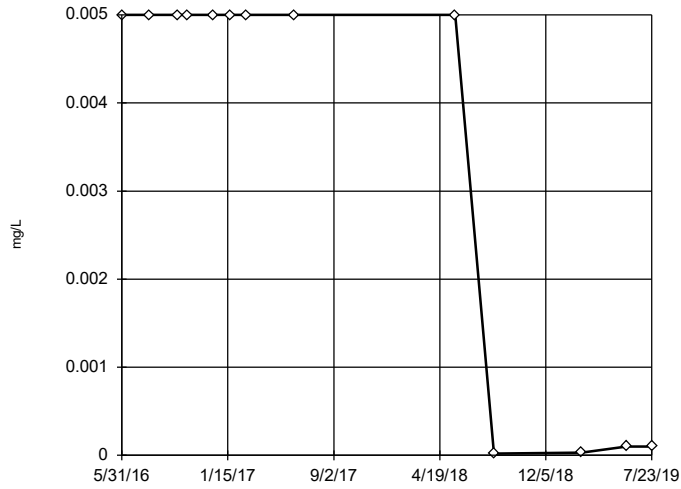
Downgradient Appendix IV Outlier Analysis - All Results

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/20/2019, 1:21 PM

Constituent	Well	Outlier	Value(s)	Date(s)	Method	Alpha	N	Mean	Std. Dev.	Distribution	Normality Test
Antimony, total (mg/L)	AD-11	n/a	n/a	n/a	NP	NaN	13	0.003481	0.002372	unknown	ShapiroWilk
Antimony, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.003202	0.002398	sqrt(x)	ShapiroWilk
Antimony, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.003475	0.002382	ln(x)	ShapiroWilk
Arsenic, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.002964	0.002031	ln(x)	ShapiroWilk
Arsenic, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.003626	0.00216	x^3	ShapiroWilk
Arsenic, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.00307	0.002214	ln(x)	ShapiroWilk
Barium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.01978	0.01233	ln(x)	ShapiroWilk
Barium, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.04402	0.02561	ln(x)	ShapiroWilk
Barium, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.04079	0.01479	ln(x)	ShapiroWilk
Beryllium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.002902	0.001665	x^2	ShapiroWilk
Beryllium, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.000...	0.0002788	x^3	ShapiroWilk
Beryllium, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.000...	0.0002155	sqrt(x)	ShapiroWilk
Cadmium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.000...	0.0001266	normal	ShapiroWilk
Cadmium, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.000...	0.000192	ln(x)	ShapiroWilk
Cadmium, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.001022	0.0006704	sqrt(x)	ShapiroWilk
Chromium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.001393	0.001892	ln(x)	ShapiroWilk
Chromium, total (mg/L)	AD-13	Yes	0.007	12/14/2016	NP	NaN	13	0.001275	0.00198	ln(x)	ShapiroWilk
Chromium, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.000...	0.0003319	x^(1/3)	ShapiroWilk
Cobalt, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.01985	0.007995	x^4	ShapiroWilk
Cobalt, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.005342	0.003061	ln(x)	ShapiroWilk
Cobalt, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.009368	0.004887	x^(1/3)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-11	No	n/a	n/a	NP	NaN	13	2.015	0.7276	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-13	No	n/a	n/a	NP	NaN	13	2.306	0.8584	ln(x)	ShapiroWilk
Combined Radium 226 + 228 (pCi/L)	AD-14	No	n/a	n/a	NP	NaN	13	1.757	1.075	ln(x)	ShapiroWilk
Fluoride, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	14	1.405	0.8659	normal	ShapiroWilk
Fluoride, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	14	0.6763	0.2861	normal	ShapiroWilk
Fluoride, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	14	0.7554	0.402	ln(x)	ShapiroWilk
Lead, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.0034	0.002003	ln(x)	ShapiroWilk
Lead, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.003087	0.002251	sqrt(x)	ShapiroWilk
Lead, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.003508	0.00233	ln(x)	ShapiroWilk
Lithium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.03222	0.01308	normal	ShapiroWilk
Lithium, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.01853	0.008507	normal	ShapiroWilk
Lithium, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	12	0.01373	0.002473	ln(x)	ShapiroWilk
Mercury, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.000...	0.0000...	normal	ShapiroWilk
Mercury, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.000...	0.0000...	normal	ShapiroWilk
Mercury, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.000...	0.0000...	ln(x)	ShapiroWilk
Molybdenum, total (mg/L)	AD-11	n/a	n/a	n/a	NP	NaN	13	0.003659	0.001831	unknown	ShapiroWilk
Molybdenum, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.003253	0.002048	sqrt(x)	ShapiroWilk
Molybdenum, total (mg/L)	AD-14	n/a	n/a	n/a	NP	NaN	13	0.003579	0.001952	unknown	ShapiroWilk
Selenium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.002714	0.001628	ln(x)	ShapiroWilk
Selenium, total (mg/L)	AD-13	No	n/a	n/a	NP	NaN	13	0.002002	0.001787	ln(x)	ShapiroWilk
Selenium, total (mg/L)	AD-14	No	n/a	n/a	NP	NaN	13	0.002985	0.001174	normal	ShapiroWilk
Thallium, total (mg/L)	AD-11	No	n/a	n/a	NP	NaN	13	0.004632	0.01246	ln(x)	ShapiroWilk
Thallium, total (mg/L)	AD-13	n/a	n/a	n/a	NP	NaN	13	0.001412	0.0007975	unknown	ShapiroWilk
Thallium, total (mg/L)	AD-14	n/a	n/a	n/a	NP	NaN	13	0.001496	0.0007917	unknown	ShapiroWilk

Tukey's Outlier Screening

AD-11

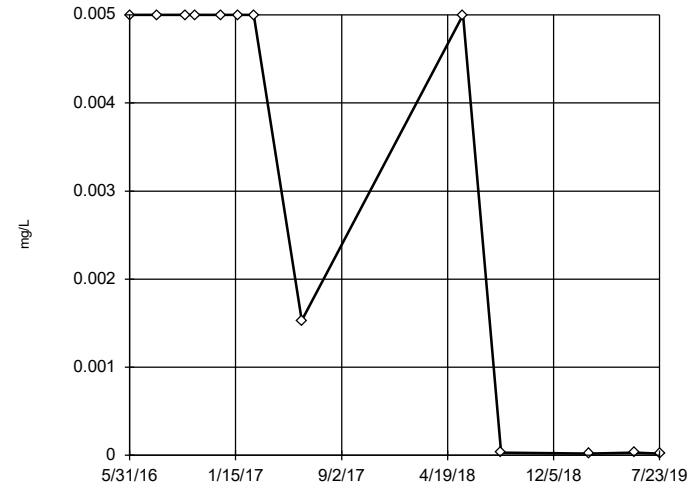


n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Antimony, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-13

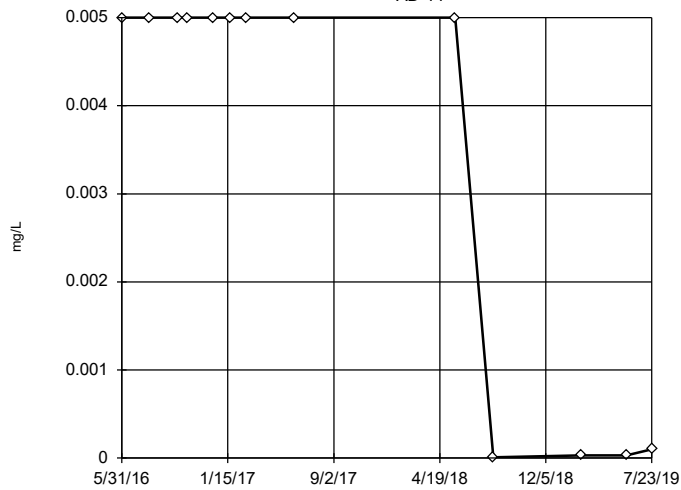


n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.07097, low cutoff = -0.03618, based on IQR multiplier of 3.

Constituent: Antimony, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-14

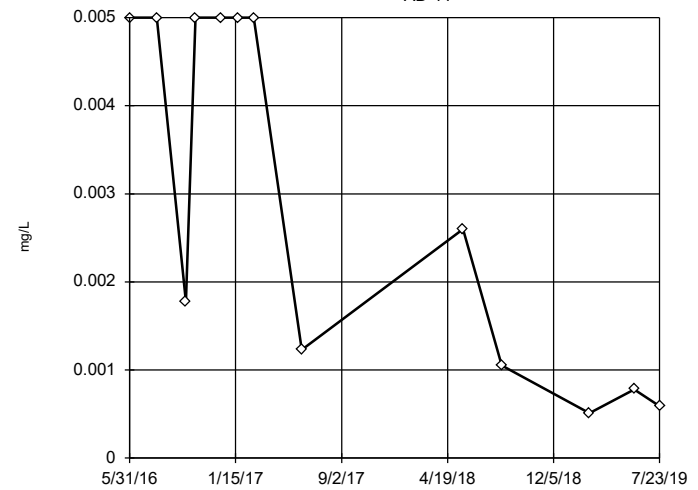


n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 3804, low cutoff = 7.2e-11, based on IQR multiplier of 3.

Constituent: Antimony, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

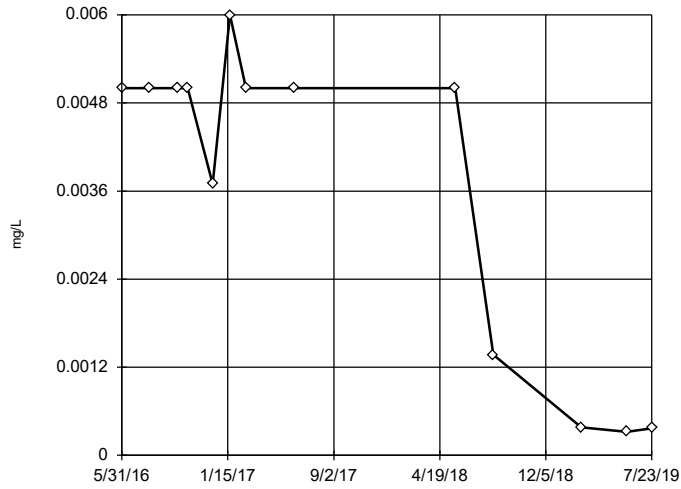
AD-11



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.8432, low cutoff = 0.000005366, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

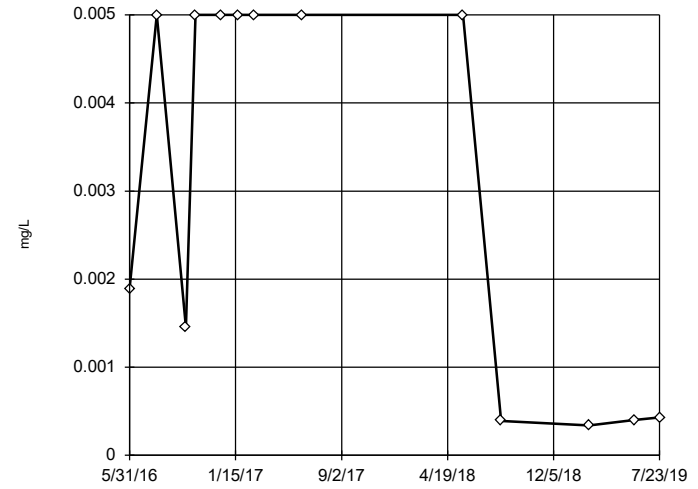
Tukey's Outlier Screening
AD-13



n = 13
No outliers found.
Tukey's method selected by user.
Data were cube transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.007916, low cutoff = -0.007177, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

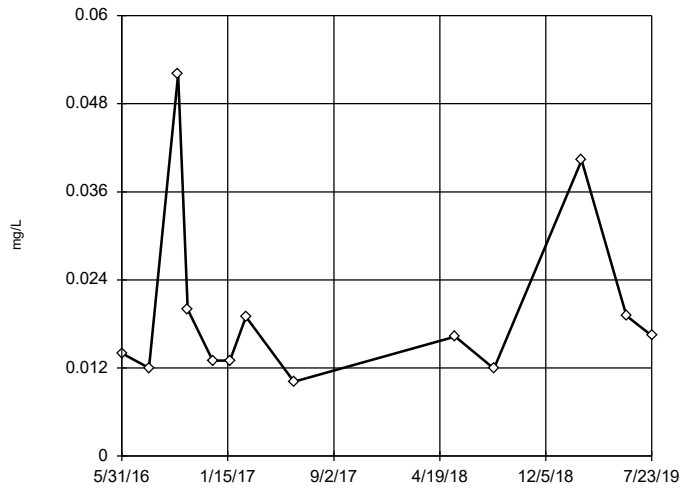
Tukey's Outlier Screening
AD-14



n = 13
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 8.762, low cutoff = 2.4e-7, based on IQR multiplier of 3.

Constituent: Arsenic, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

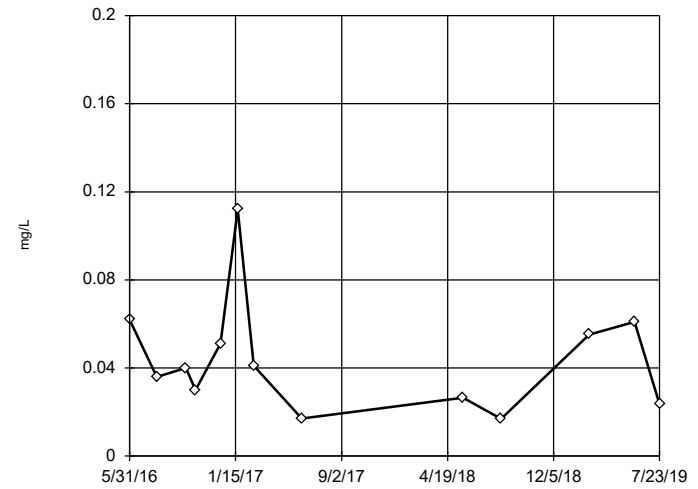
Tukey's Outlier Screening
AD-11



n = 13
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.07489, low cutoff = 0.00326, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

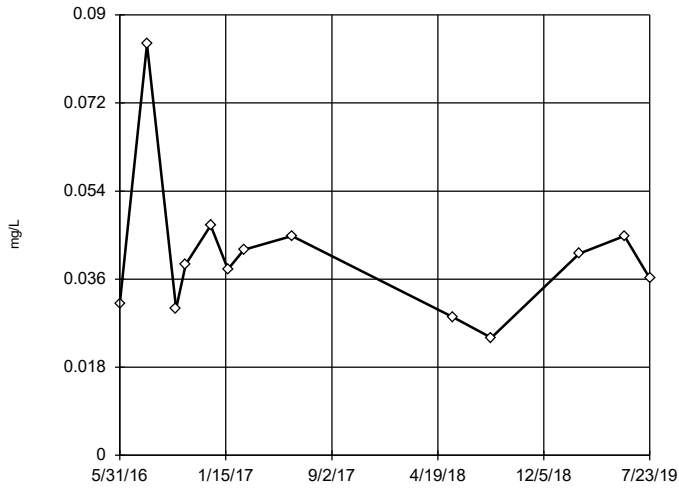
Tukey's Outlier Screening
AD-13



n = 13
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.7226, low cutoff = 0.002007, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

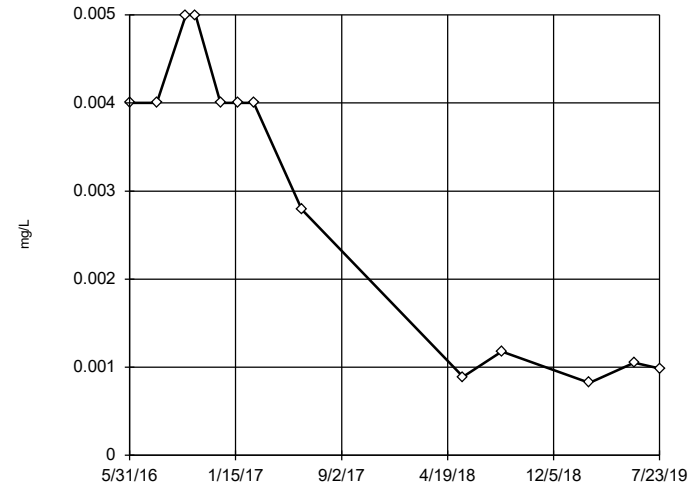
Tukey's Outlier Screening AD-14



n = 13
No outliers found. Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.1422, low cutoff = 0.009609, based on IQR multiplier of 3.

Constituent: Barium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

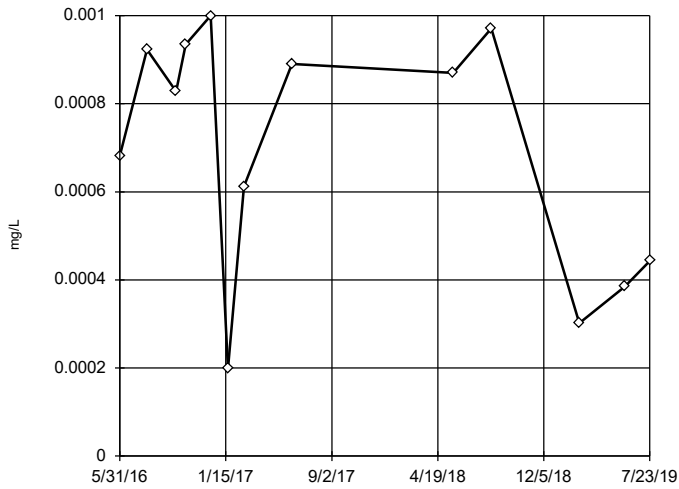
Tukey's Outlier Screening AD-11



n = 13
No outliers found. Tukey's method selected by user.
Data were square transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.007803, low cutoff = -0.006622, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

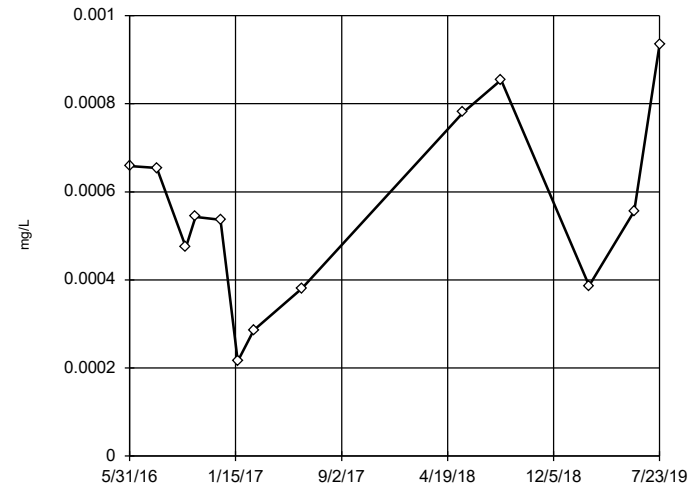
Tukey's Outlier Screening AD-13



n = 13
No outliers found. Tukey's method selected by user.
Data were cube transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.00144, low cutoff = -0.001284, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

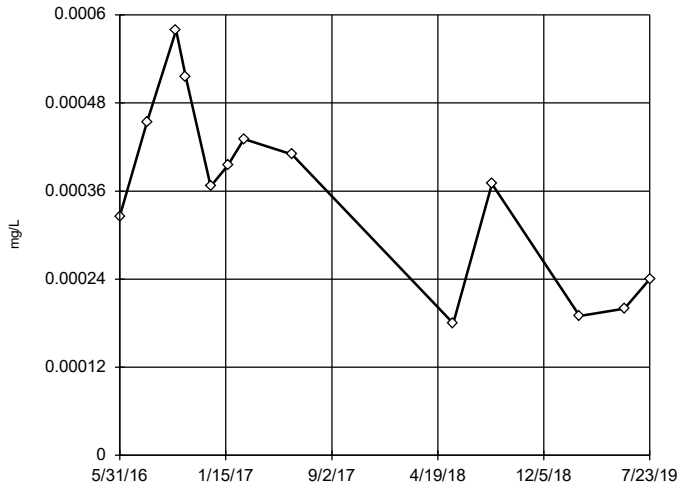
Tukey's Outlier Screening AD-14



n = 13
No outliers found. Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.002345, low cutoff = -0.000004208, based on IQR multiplier of 3.

Constituent: Beryllium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

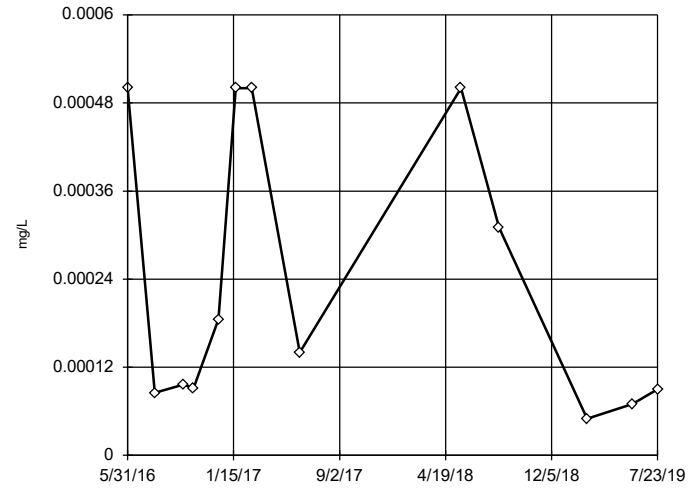
Tukey's Outlier Screening AD-11



n = 13
 No outliers found.
 Tukey's method selected by user.
 Ladder of Powers transformations did not improve normality; analysis run on raw data.
 High cutoff = 0.001109, low cutoff = -0.0004469, based on IQR multiplier of 3.

Constituent: Cadmium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

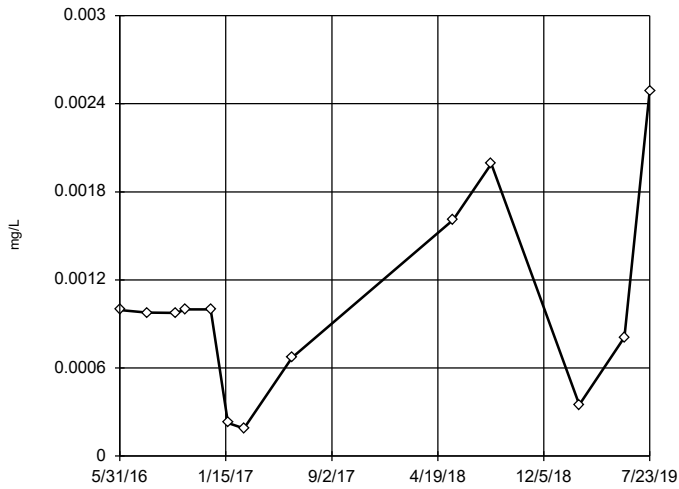
Tukey's Outlier Screening AD-13



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.09341, low cutoff = 4.7e-7, based on IQR multiplier of 3.

Constituent: Cadmium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

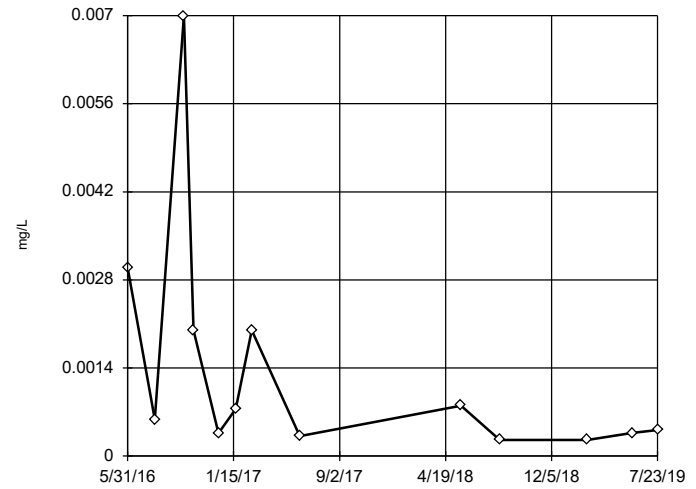
Tukey's Outlier Screening AD-14



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.005869, low cutoff = -0.0003399, based on IQR multiplier of 3.

Constituent: Cadmium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

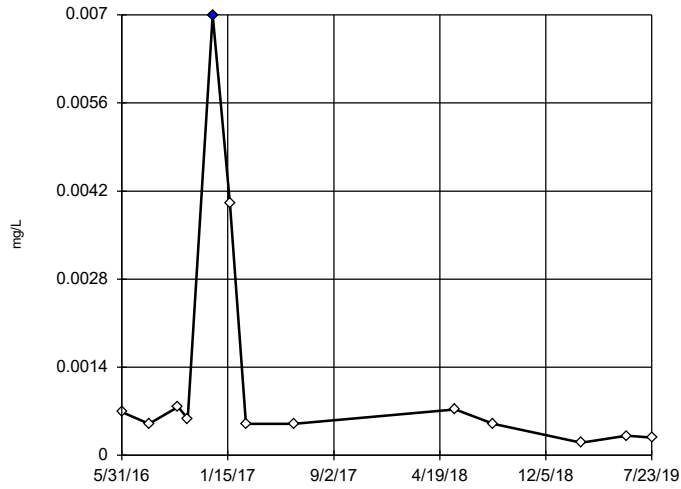
Tukey's Outlier Screening AD-11



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.4005, low cutoff = 0.000001707, based on IQR multiplier of 3.

Constituent: Chromium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

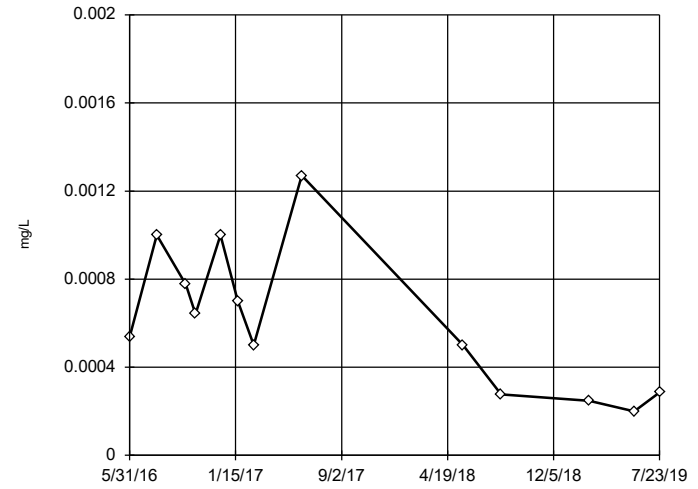
Tukey's Outlier Screening AD-13



n = 13
 Outlier is drawn as solid.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.005201, low cutoff = 0.00005681, based on IQR multiplier of 3.

Constituent: Chromium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

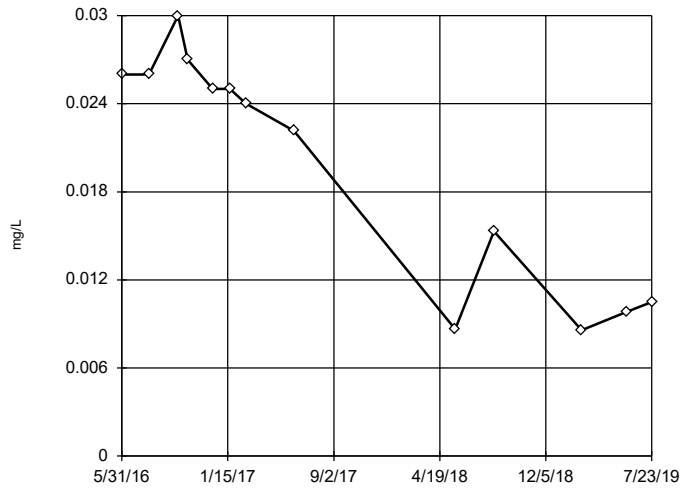
Tukey's Outlier Screening AD-14



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were cube root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.006562, low cutoff = -0.00001716, based on IQR multiplier of 3.

Constituent: Chromium, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

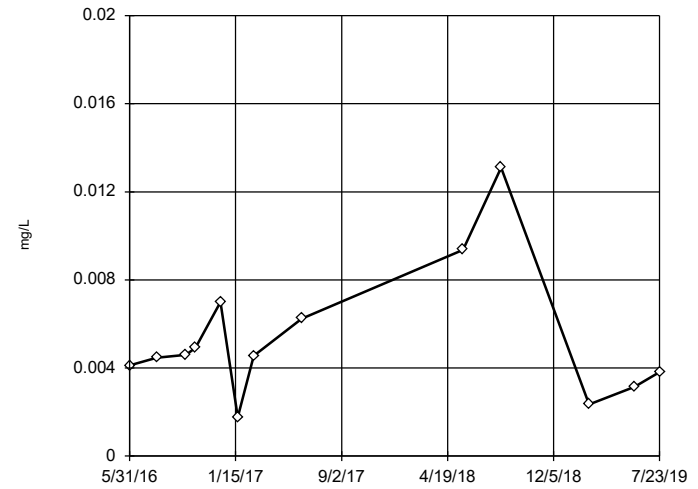
Tukey's Outlier Screening AD-11



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were x^4 transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.03661, low cutoff = -0.03395, based on IQR multiplier of 3.

Constituent: Cobalt, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

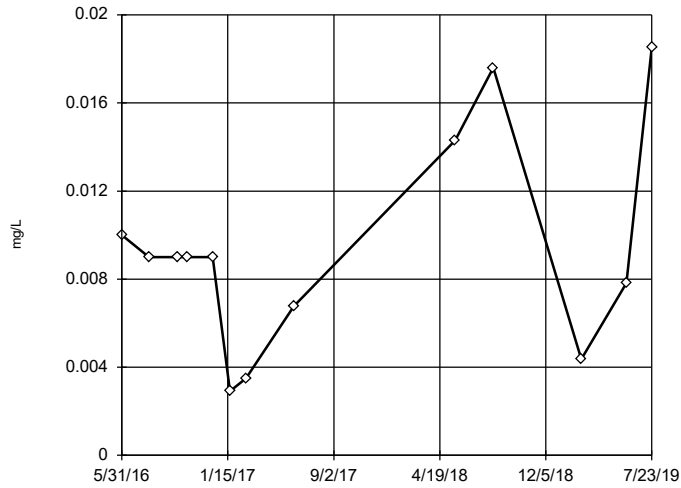
Tukey's Outlier Screening AD-13



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.04571, low cutoff = 0.0005016, based on IQR multiplier of 3.

Constituent: Cobalt, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

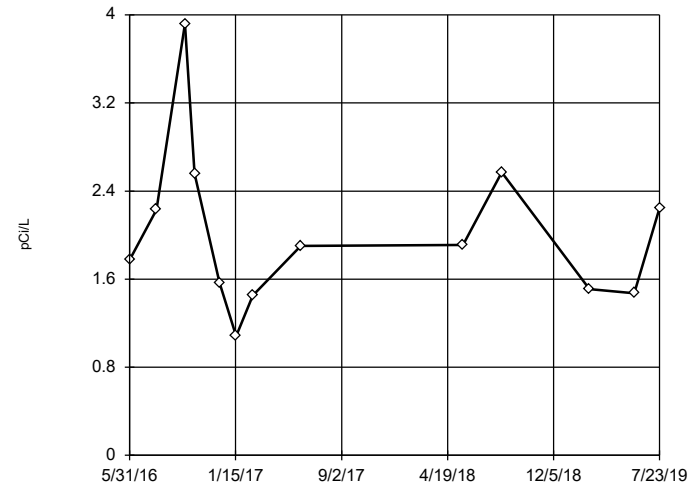
Tukey's Outlier Screening AD-14



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were cube root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.05805, low cutoff = 0.000006095, based on IQR multiplier of 3.

Constituent: Cobalt, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

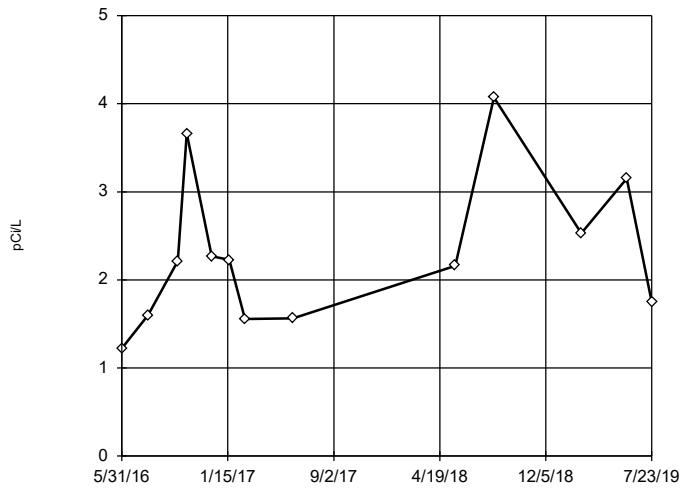
Tukey's Outlier Screening AD-11



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 9.966, low cutoff = 0.3588, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

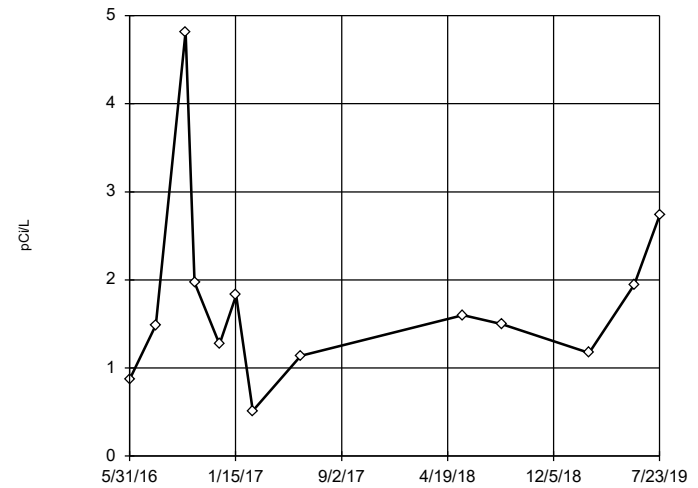
Tukey's Outlier Screening AD-13



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 16.01, low cutoff = 0.279, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

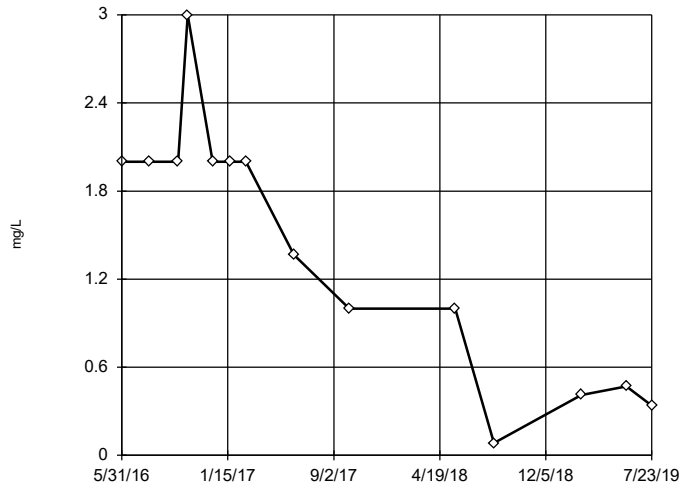
Tukey's Outlier Screening AD-14



n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 9.585, low cutoff = 0.2358, based on IQR multiplier of 3.

Constituent: Combined Radium 226 + 228 Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

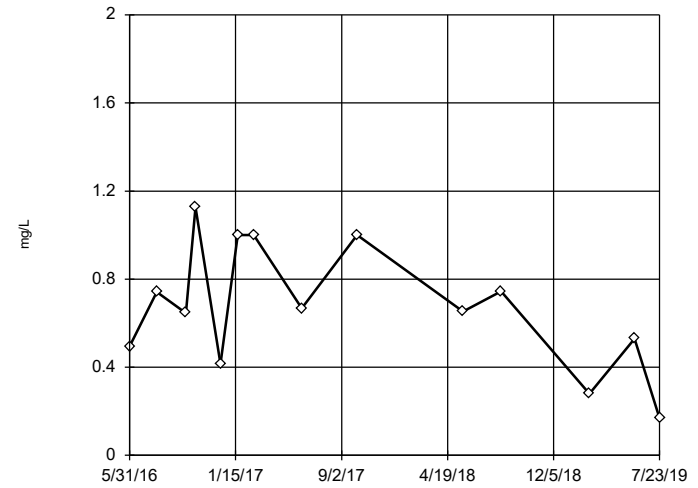
Tukey's Outlier Screening AD-11



n = 14
No outliers found.
Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
High cutoff = 6.68, low cutoff = -4.24, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

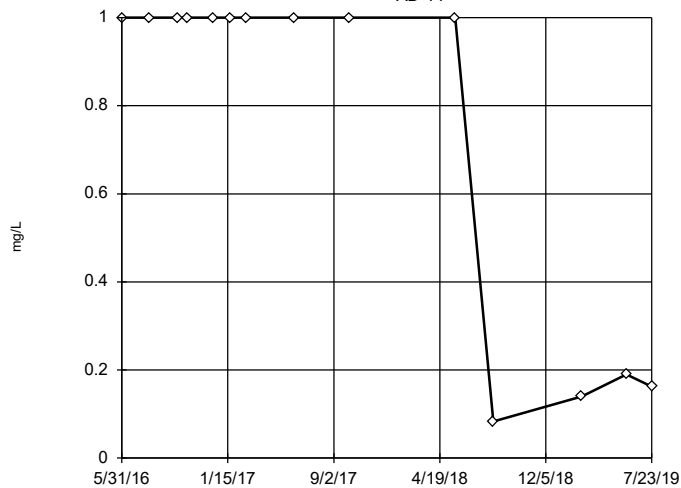
Tukey's Outlier Screening AD-13



n = 14
No outliers found.
Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
High cutoff = 2.635, low cutoff = -1.181, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

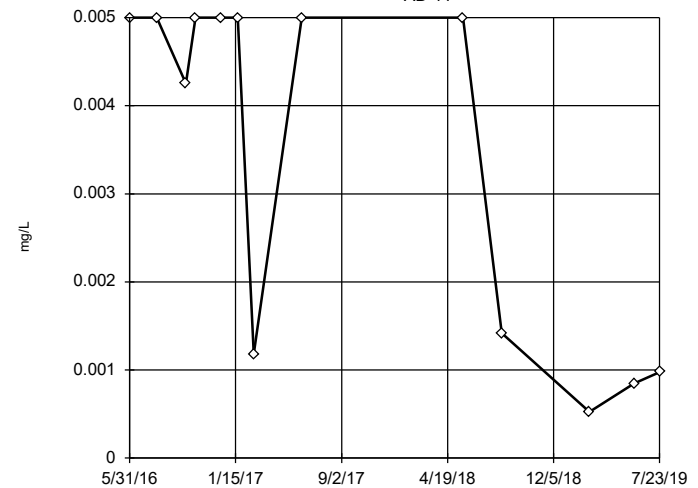
Tukey's Outlier Screening AD-14



n = 14
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 185.2, low cutoff = 0.0009474, based on IQR multiplier of 3.

Constituent: Fluoride, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening AD-11

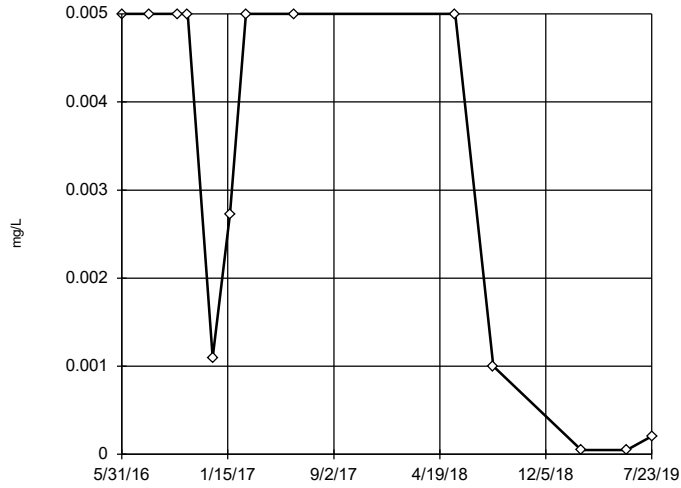


n = 13
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.5038, low cutoff = 0.00001066, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-13

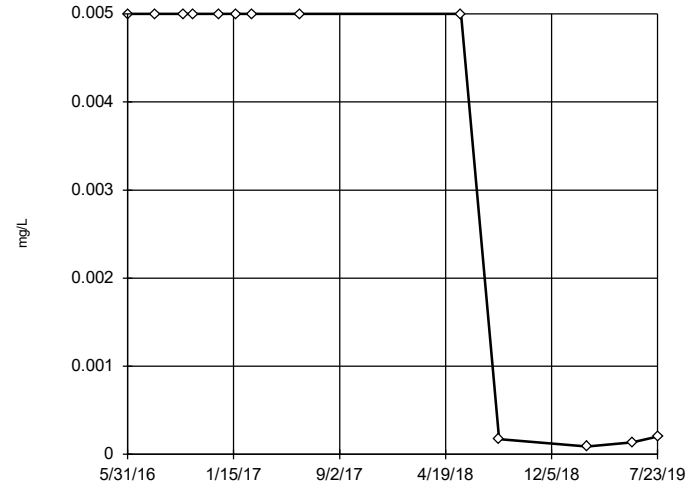


n = 13
No outliers found.
Tukey's method selected by user.
Data were square root transformed to achieve best W statistic (graph shown in original units).
High cutoff = 0.04579, low cutoff = -0.01448, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-14

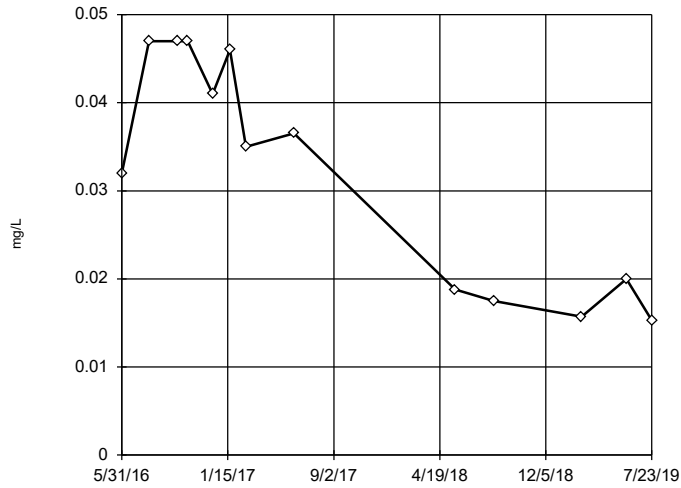


n = 13
No outliers found.
Tukey's method selected by user.
Data were natural log transformed to achieve best W statistic (graph shown in original units).
High cutoff = 96.27, low cutoff = 9.7e-9, based on IQR multiplier of 3.

Constituent: Lead, total Analysis Run 11/20/2019 1:20 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-11

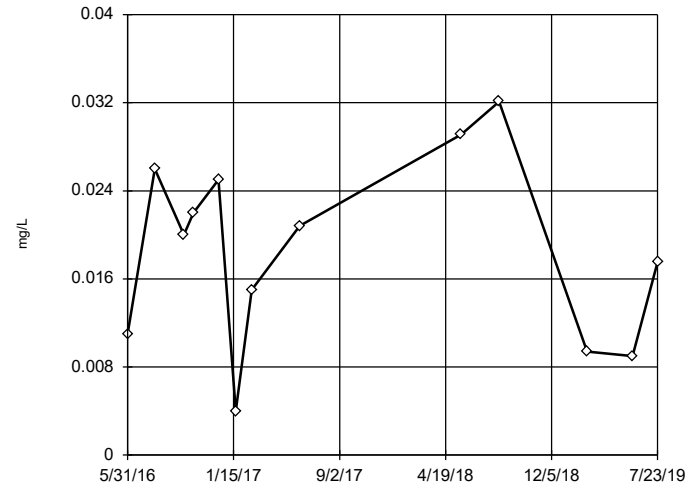


n = 13
No outliers found.
Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
High cutoff = 0.1316, low cutoff = -0.0669, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

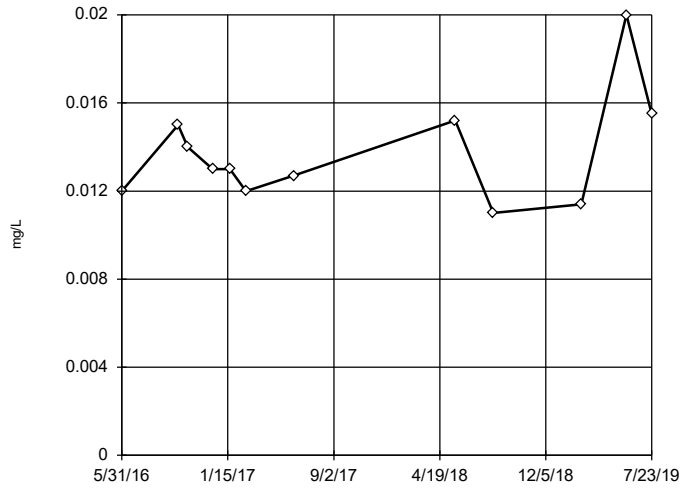
AD-13



n = 13
No outliers found.
Tukey's method selected by user.
Ladder of Powers transformations did not improve normality; analysis run on raw data.
High cutoff = 0.0714, low cutoff = -0.0357, based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

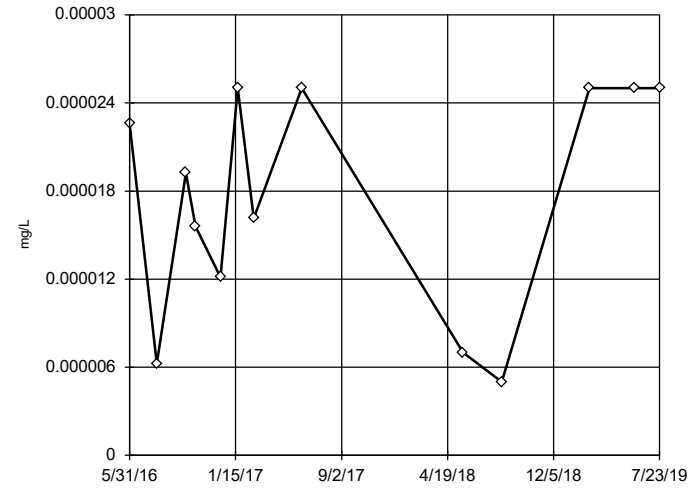
Tukey's Outlier Screening AD-14



n = 12
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.03008,
 low cutoff = 0.006023,
 based on IQR multiplier of 3.

Constituent: Lithium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

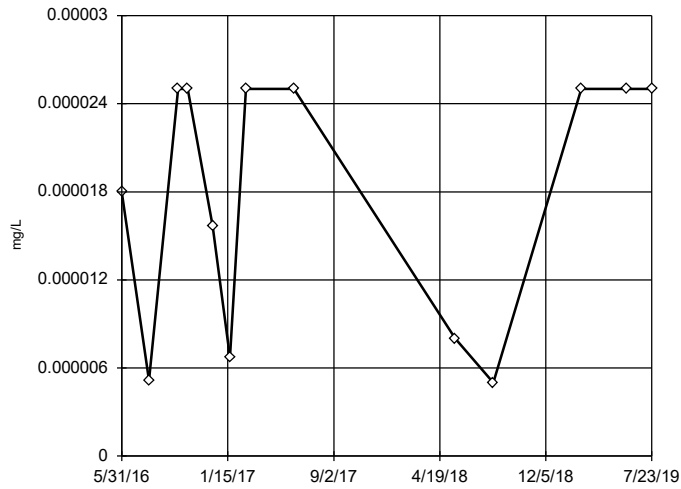
Tukey's Outlier Screening AD-11



n = 13
 No outliers found.
 Tukey's method selected by user.
 Ladder of Powers transformations did not improve normality; analysis run on raw data.
 High cutoff = 0.00007132,
 low cutoff = -0.00003676,
 based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

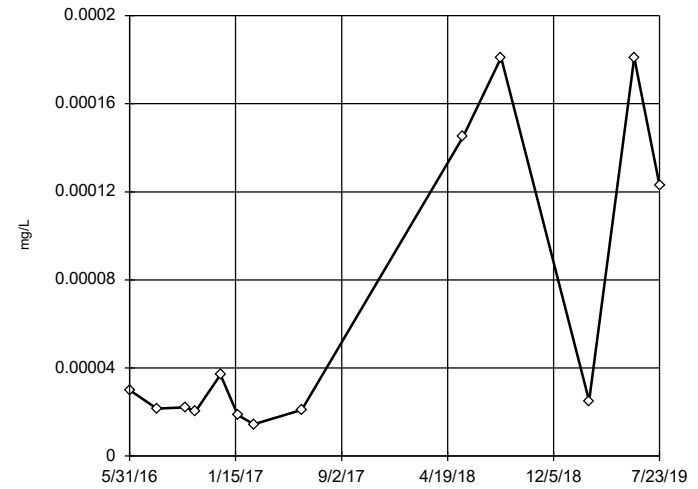
Tukey's Outlier Screening AD-13



n = 13
 No outliers found.
 Tukey's method selected by user.
 Ladder of Powers transformations did not improve normality; analysis run on raw data.
 High cutoff = 0.0000779,
 low cutoff = -0.00004554,
 based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening AD-14

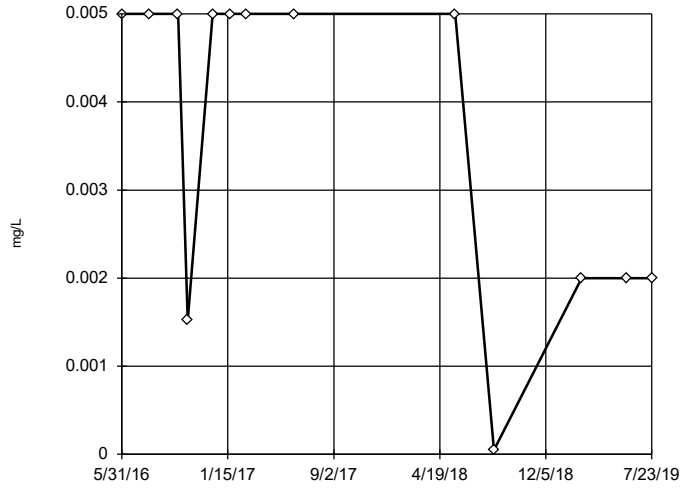


n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.0363,
 low cutoff = 7.6e-8,
 based on IQR multiplier of 3.

Constituent: Mercury, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-11

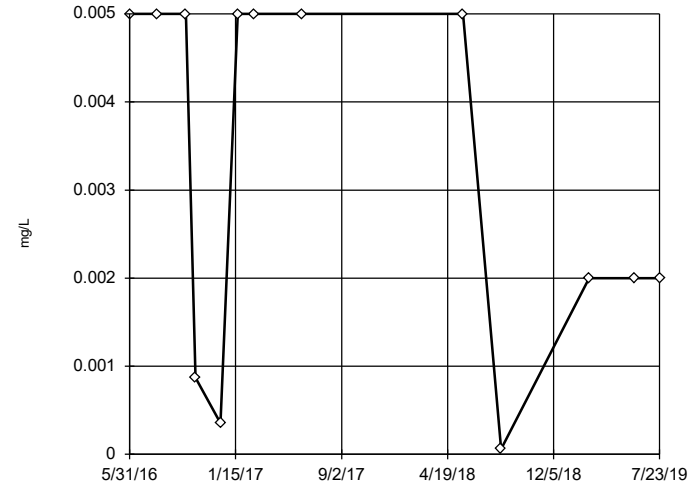


n = 13
 No outliers found.
 Tukey's method selected by user.
 Ladder of Powers transformations did not improve normality; analysis run on raw data.
 The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Molybdenum, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-13

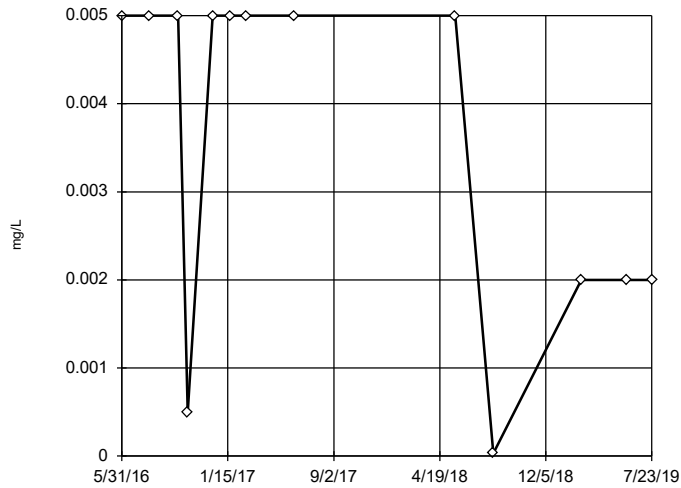


n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.02941, low cutoff = -0.004055, based on IQR multiplier of 3.

Constituent: Molybdenum, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-14

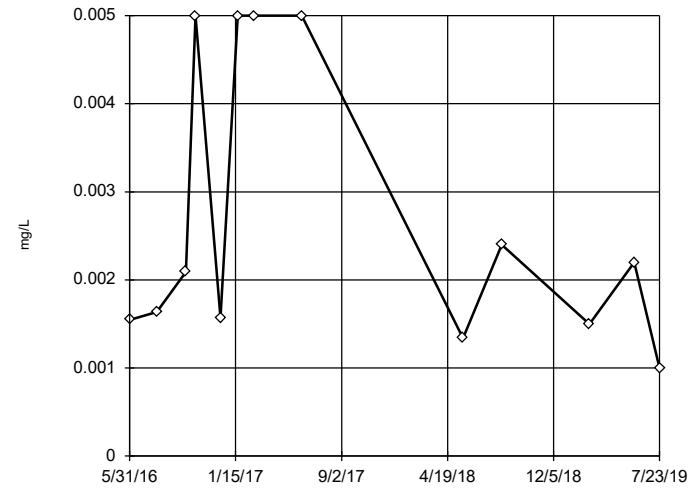


n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were square root transformed to achieve best W statistic (graph shown in original units).
 The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Molybdenum, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-11

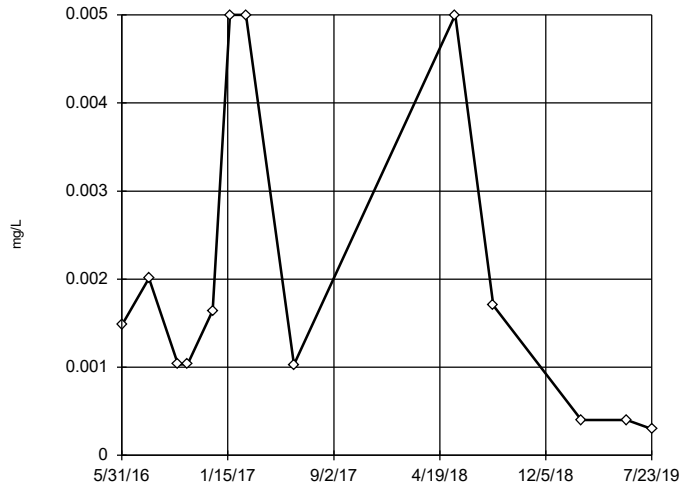


n = 13
 No outliers found.
 Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.1769, low cutoff = 0.00004305, based on IQR multiplier of 3.

Constituent: Selenium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-13

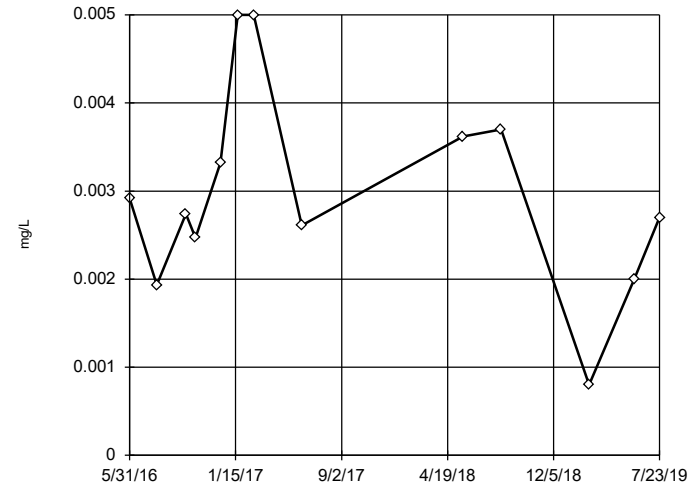


n = 13
 No outliers found. Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 0.3819, low cutoff = 0.000005328, based on IQR multiplier of 3.

Constituent: Selenium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-14

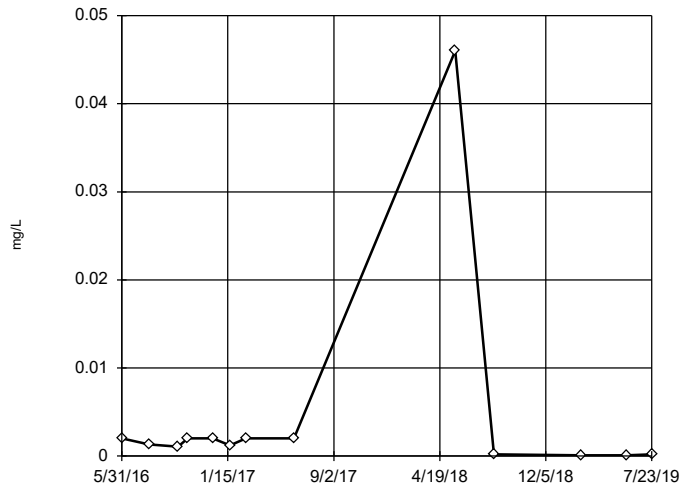


n = 13
 No outliers found. Tukey's method selected by user.
 Ladder of Powers transformations did not improve normality; analysis run on raw data.
 High cutoff = 0.007936, low cutoff = -0.002042, based on IQR multiplier of 3.

Constituent: Selenium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

AD-11

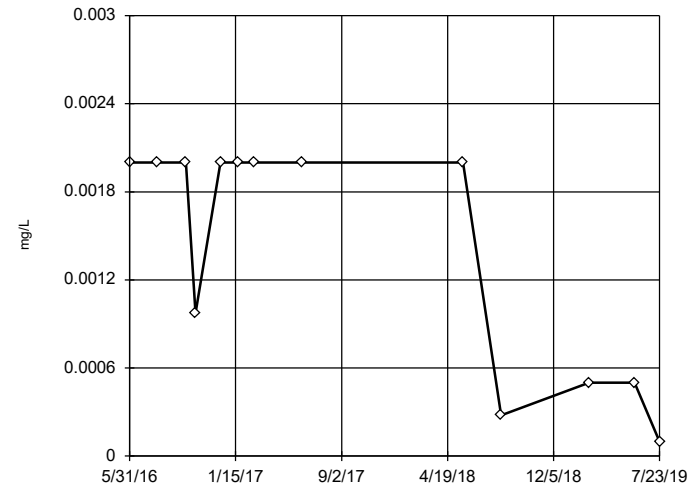


n = 13
 No outliers found. Tukey's method selected by user.
 Data were natural log transformed to achieve best W statistic (graph shown in original units).
 High cutoff = 2, low cutoff = 2.0e-7, based on IQR multiplier of 3.

Constituent: Thallium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening

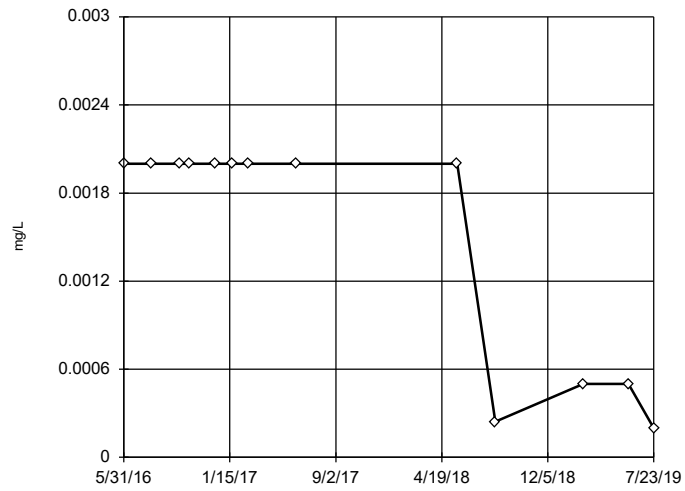
AD-13



n = 13
 No outliers found. Tukey's method selected by user.
 Data were cube root transformed to achieve best W statistic (graph shown in original units).
 The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Thallium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Tukey's Outlier Screening AD-14



n = 13

No outliers found.
Tukey's method selected by user.

Data were natural log transformed to achieve best W statistic (graph shown in original units).

The results were invalidated, because both the lower and upper quartiles represent reporting limits.

Constituent: Thallium, total Analysis Run 11/20/2019 1:21 PM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Mann-Whitney - Significant Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/8/2019, 3:23 PM

<u>Constituent</u>	<u>Well</u>	<u>Calc.</u>	<u>0.01</u>	<u>Sig.</u>	<u>Method</u>
Chloride, total (mg/L)	AD-5 (bg)	2.589	Yes	Yes	Mann-W
Sulfate, total (mg/L)	AD-11	-2.633	Yes	Yes	Mann-W

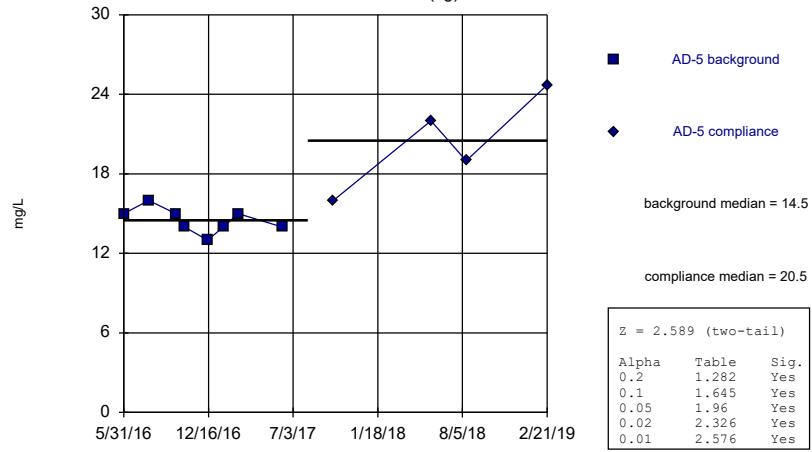
Mann-Whitney - All Results

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/8/2019, 3:23 PM

<u>Constituent</u>	<u>Well</u>	<u>Calc.</u>	<u>0.01</u>	<u>Sig.</u>	<u>Method</u>
Calcium, total (mg/L)	AD-5 (bg)	-2.123	No	No	Mann-W
Calcium, total (mg/L)	AD-11	-1.444	No	No	Mann-W
Calcium, total (mg/L)	AD-13	1.104	No	No	Mann-W
Calcium, total (mg/L)	AD-14	1.021	No	No	Mann-W
Calcium, total (mg/L)	AD-1 (bg)	-1.274	No	No	Mann-W
Calcium, total (mg/L)	AD-17 (bg)	-0.9358	No	No	Mann-W
Chloride, total (mg/L)	AD-5 (bg)	2.589	Yes	Yes	Mann-W
Chloride, total (mg/L)	AD-11	-0.1073	No	No	Mann-W
Chloride, total (mg/L)	AD-13	-0.7194	No	No	Mann-W
Chloride, total (mg/L)	AD-14	1.306	No	No	Mann-W
Chloride, total (mg/L)	AD-1 (bg)	-1.051	No	No	Mann-W
Chloride, total (mg/L)	AD-17 (bg)	1.366	No	No	Mann-W
Sulfate, total (mg/L)	AD-5 (bg)	-1.531	No	No	Mann-W
Sulfate, total (mg/L)	AD-11	-2.633	Yes	Yes	Mann-W
Sulfate, total (mg/L)	AD-13	1.444	No	No	Mann-W
Sulfate, total (mg/L)	AD-14	0.9207	No	No	Mann-W
Sulfate, total (mg/L)	AD-1 (bg)	0.6866	No	No	Mann-W
Sulfate, total (mg/L)	AD-17 (bg)	-0.08507	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-5 (bg)	-1.953	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-11	-2.123	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-13	0.5944	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-14	0.7144	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-1 (bg)	-1.786	No	No	Mann-W
Total Dissolved Solids (mg/L)	AD-17 (bg)	0.9341	No	No	Mann-W

Mann-Whitney (Wilcoxon Rank Sum)

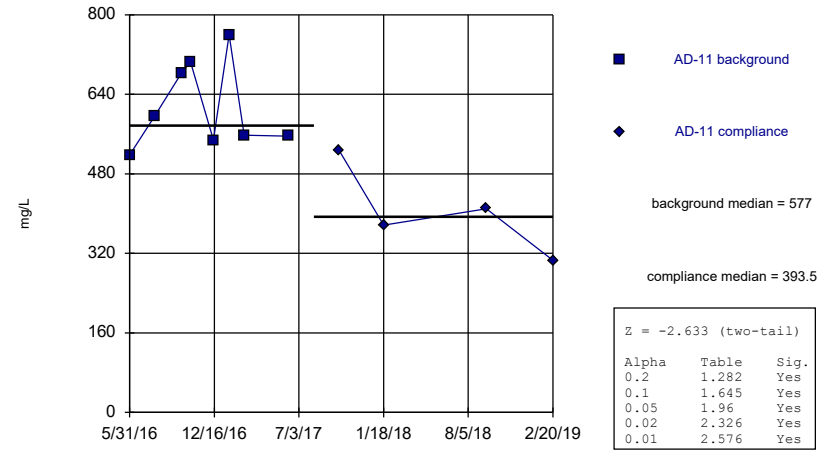
AD-5 (bg)



Constituent: Chloride, total Analysis Run 12/8/2019 3:10 PM View: Mann Whitney
 Welsh LF Client: Geosyntec Data: Welsh LF

Mann-Whitney (Wilcoxon Rank Sum)

AD-11



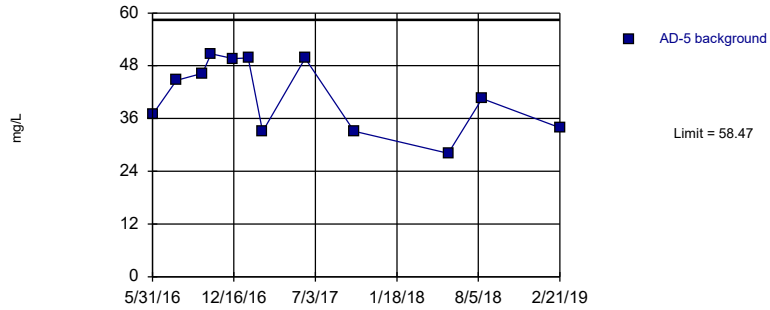
Constituent: Sulfate, total Analysis Run 12/8/2019 3:10 PM View: Mann Whitney
 Welsh LF Client: Geosyntec Data: Welsh LF

Intrawell Prediction Limit Summary

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/8/2019, 3:34 PM

Constituent	Well	Upper Lim.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Calcium, total (mg/L)	AD-5	58.47	n/a	12	41.36	8.1	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-11	17.13	n/a	12	3.021	0.5295	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-13	28.43	n/a	12	2.755	1.22	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-14	12.23	n/a	12	5.119	3.367	0	None	No	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-1	206	n/a	12	3.196	1.283	0	None	x^(1/3)	0.002505	Param Intra 1 of 2
Calcium, total (mg/L)	AD-17	206.7	n/a	12	193.3	6.384	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-5	24.25	n/a	12	4.039	0.4191	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-11	14.32	n/a	11	3.256	0.2425	0	None	sqrt(x)	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-13	24	n/a	11	13.72	4.724	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-14	11.47	n/a	12	5.636	2.764	0	None	No	0.002505	Param Intra 1 of 2
Chloride, total (mg/L)	AD-1	9	n/a	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2
Chloride, total (mg/L)	AD-17	45.62	n/a	12	35.02	5.02	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-5	318.3	n/a	12	154	77.83	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-11	829.3	n/a	12	545.4	134.4	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-13	421.9	n/a	12	228.4	91.62	0	None	No	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-14	188.9	n/a	11	4.854	0.4062	0	None	x^(1/3)	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-1	70.37	n/a	12	3.801	0.2145	0	None	ln(x)	0.002505	Param Intra 1 of 2
Sulfate, total (mg/L)	AD-17	1445	n/a	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2
Total Dissolved Solids (mg/L)	AD-5	542	n/a	12	351.4	90.26	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-11	1326	n/a	12	831.9	233.8	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-13	880.8	n/a	12	493.9	183.2	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-14	369.2	n/a	11	273.3	44.1	0	None	No	0.002505	Param Intra 1 of 2
Total Dissolved Solids (mg/L)	AD-1	612	n/a	12	n/a	n/a	0	n/a	n/a	0.01077	NP Intra (normality) 1 of 2
Total Dissolved Solids (mg/L)	AD-17	1872	n/a	12	1664	98.5	0	None	No	0.002505	Param Intra 1 of 2

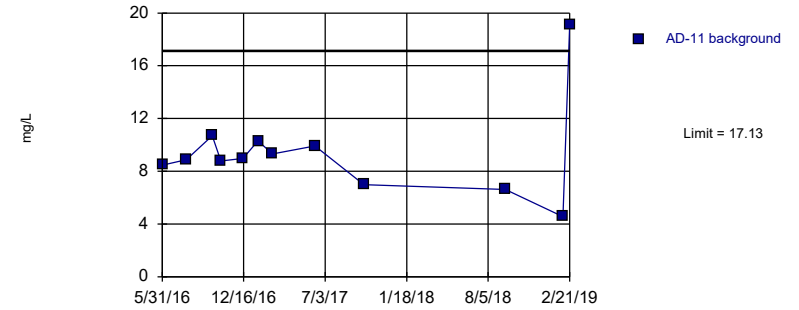
Prediction Limit
Intrawell Parametric, AD-5 (bg)



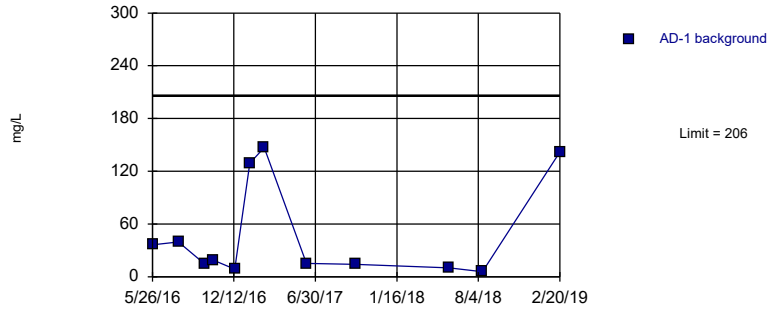
Background Data Summary: Mean=41.36, Std. Dev.=8.1, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8897, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Calcium, total Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

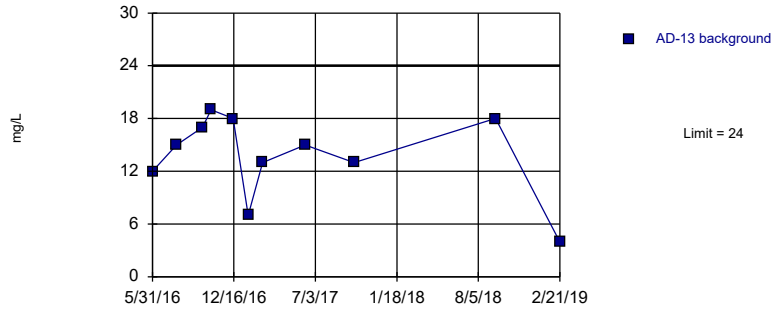
Prediction Limit
Intrawell Parametric, AD-11



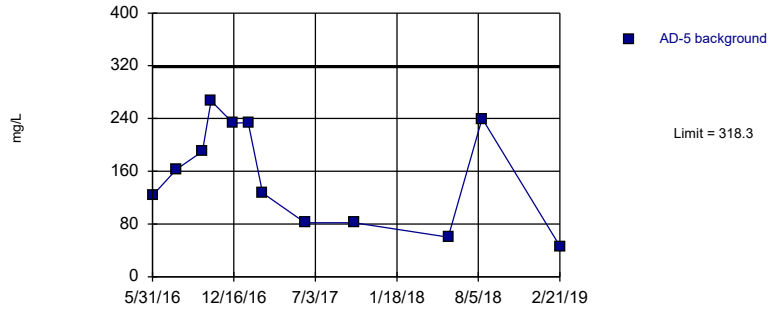
Prediction Limit
Intrawell Parametric, AD-1 (bg)



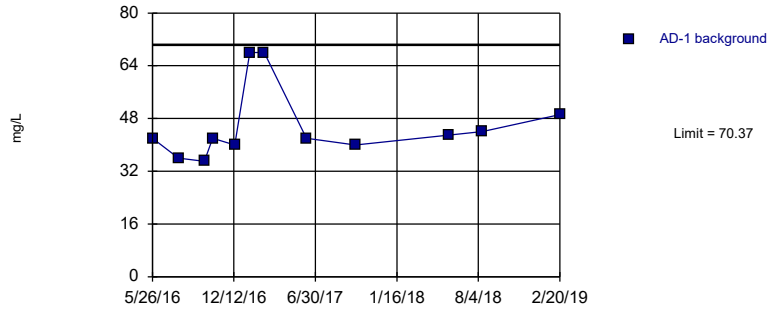
Prediction Limit
Intrawell Parametric, AD-13



Prediction Limit
Intrawell Parametric, AD-5 (bg)



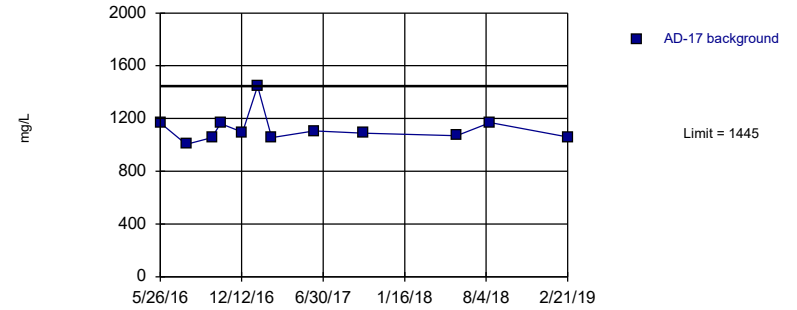
Prediction Limit
Intrawell Parametric, AD-1 (bg)



Background Data Summary (based on natural log transformation): Mean=3.801, Std. Dev.=0.2145, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.812, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

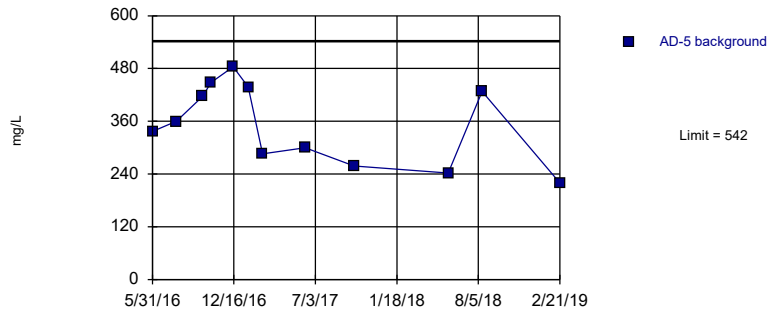
Prediction Limit
Intrawell Non-parametric, AD-17 (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Sulfate, total Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

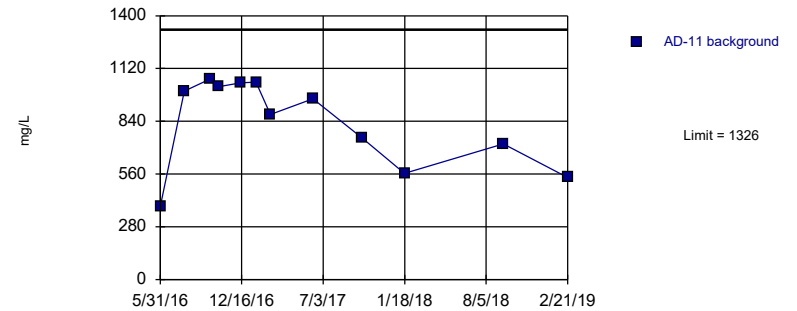
Prediction Limit
Intrawell Parametric, AD-5 (bg)



Background Data Summary: Mean=351.4, Std. Dev.=90.26, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9333, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

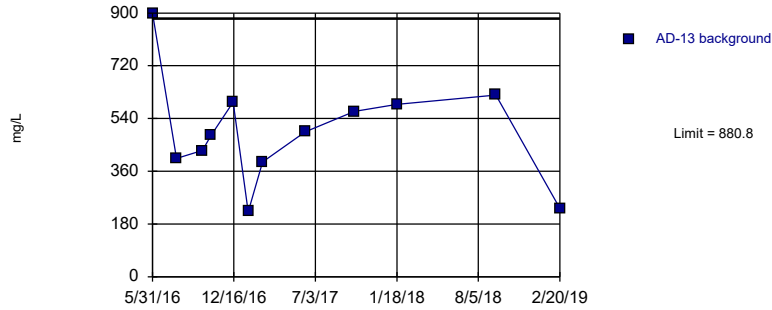
Prediction Limit
Intrawell Parametric, AD-11



Background Data Summary: Mean=831.9, Std. Dev.=233.8, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8746, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

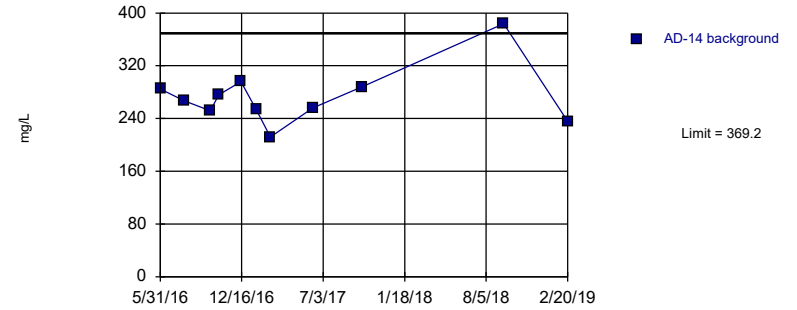
Prediction Limit
Intrawell Parametric, AD-13



Background Data Summary: Mean=493.9, Std. Dev.=183.2, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9408, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

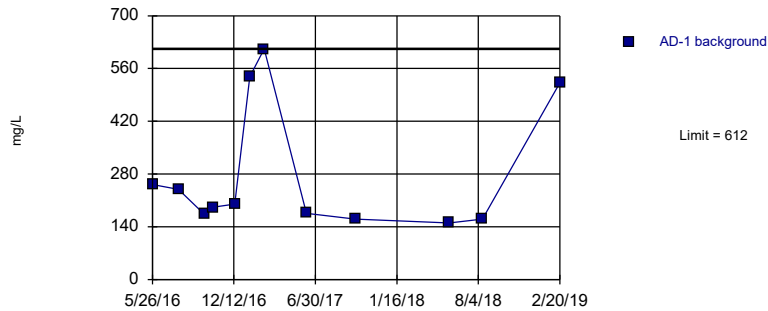
Prediction Limit
Intrawell Parametric, AD-14



Background Data Summary: Mean=273.3, Std. Dev.=44.1, n=11. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8716, critical = 0.792. Kappa = 2.175 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

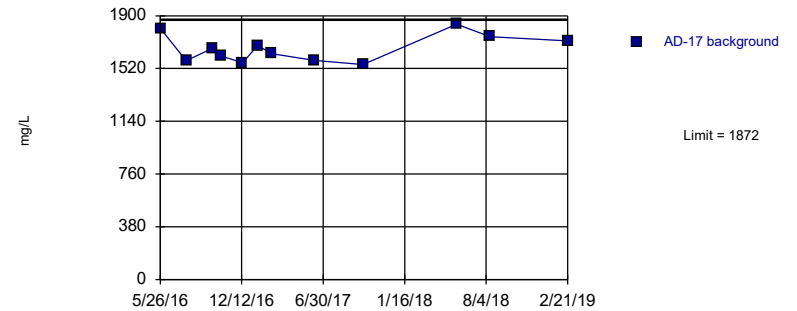
Prediction Limit
Intrawell Non-parametric, AD-1 (bg)



Non-parametric test used in lieu of parametric prediction limit because the Shapiro Wilk normality test showed the data to be non-normal at the 0.01 alpha level. Limit is highest of 12 background values. Well-constituent pair annual alpha = 0.02143. Individual comparison alpha = 0.01077 (1 of 2). Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

Prediction Limit
Intrawell Parametric, AD-17 (bg)



Background Data Summary: Mean=1664, Std. Dev.=98.5, n=12. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9253, critical = 0.805. Kappa = 2.112 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505. Assumes 1 future value.

Constituent: Total Dissolved Solids Analysis Run 12/8/2019 3:31 PM View: PL's - Intrawell
Welsh LF Client: Geosyntec Data: Welsh LF

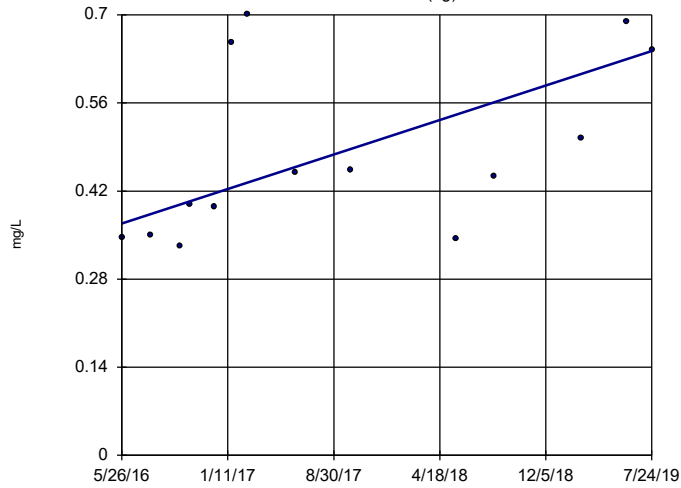
Trend Test Summary Table - All Results (No Significant)

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/22/2019, 4:51 PM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
Boron, total (mg/L)	AD-1 (bg)	0.08662	41	48	No	14	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-17 (bg)	0.01085	21	48	No	14	0	n/a	n/a	0.01	NP
Boron, total (mg/L)	AD-5 (bg)	0	3	48	No	14	0	n/a	n/a	0.01	NP
Fluoride, total (mg/L)	AD-1 (bg)	0	-34	-48	No	14	78.57	n/a	n/a	0.01	NP
Fluoride, total (mg/L)	AD-17 (bg)	0	0	48	No	14	50	n/a	n/a	0.01	NP
Fluoride, total (mg/L)	AD-5 (bg)	0	-17	-48	No	14	64.29	n/a	n/a	0.01	NP
pH, field (SU)	AD-1 (bg)	0.01649	4	48	No	14	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-17 (bg)	-0.05848	-9	-48	No	14	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-5 (bg)	0.07449	23	48	No	14	0	n/a	n/a	0.01	NP

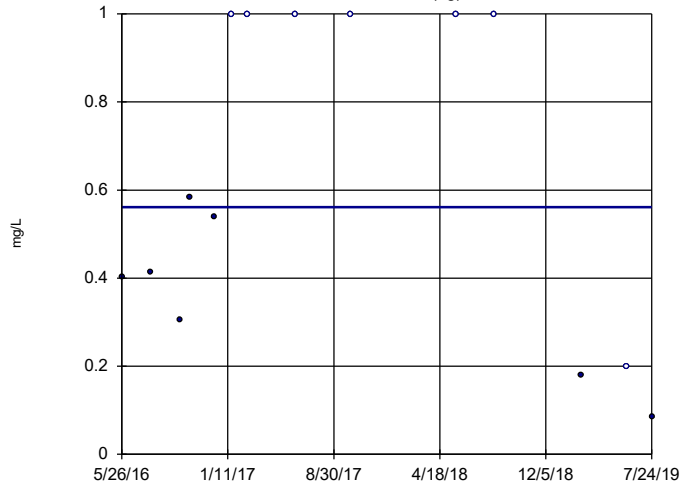
Sen's Slope Estimator

AD-1 (bg)



Sen's Slope Estimator

AD-17 (bg)

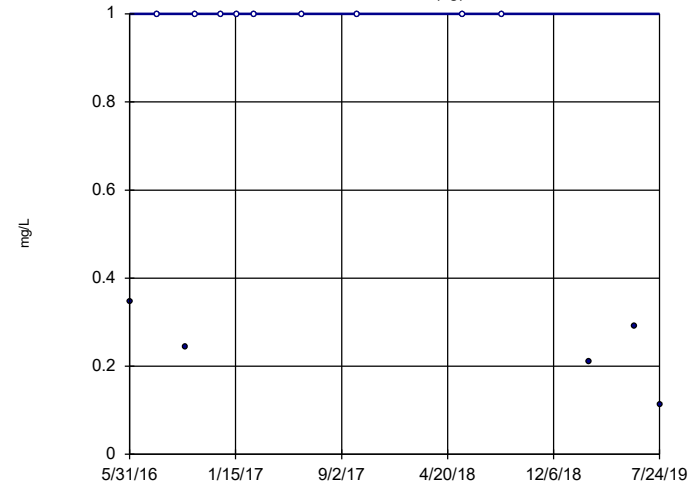


n = 14
Slope = 0
units per year.
Mann-Kendall
statistic = 0
critical = 48
Trend not sig-
nificant at 99%
confidence level
($\alpha = 0.005$ per
tail).

Constituent: Fluoride, total Analysis Run 11/22/2019 4:51 PM View: Interwell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-5 (bg)

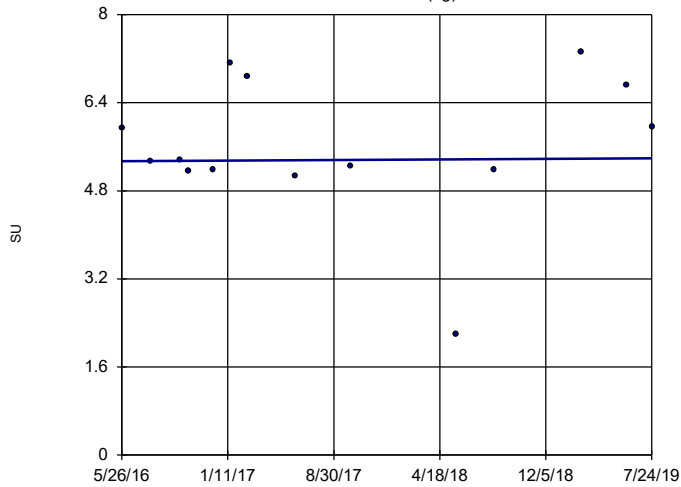


n = 14
Slope = 0
units per year.
Mann-Kendall
statistic = -17
critical = -48
Trend not sig-
nificant at 99%
confidence level
($\alpha = 0.005$ per
tail).

Constituent: Fluoride, total Analysis Run 11/22/2019 4:51 PM View: Interwell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-1 (bg)

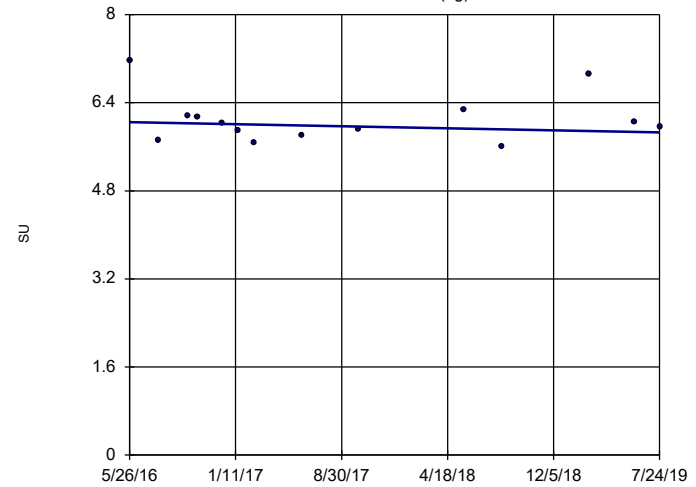


n = 14
Slope = 0.01649
units per year.
Mann-Kendall
statistic = 4
critical = 48
Trend not sig-
nificant at 99%
confidence level
($\alpha = 0.005$ per
tail).

Constituent: pH, field Analysis Run 11/22/2019 4:51 PM View: Interwell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-17 (bg)

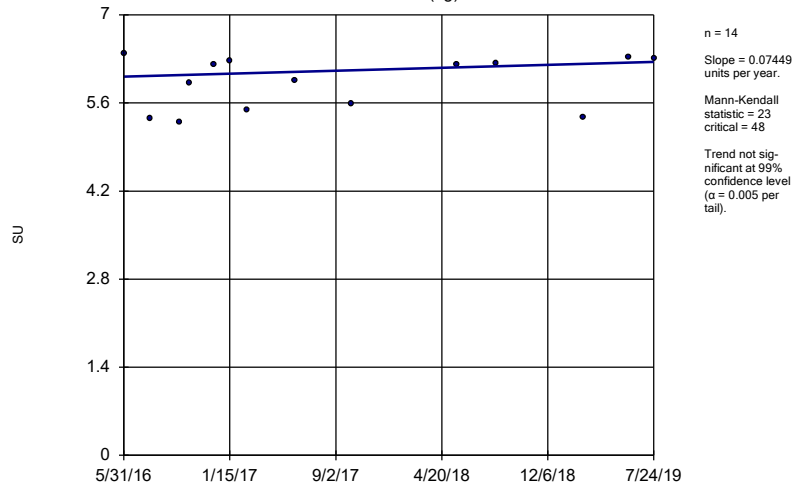


n = 14
Slope = -0.05848
units per year.
Mann-Kendall
statistic = -9
critical = -48
Trend not sig-
nificant at 99%
confidence level
($\alpha = 0.005$ per
tail).

Constituent: pH, field Analysis Run 11/22/2019 4:51 PM View: Interwell All
Welsh Landfill Client: Geosyntec Data: Welsh LF

Sen's Slope Estimator

AD-5 (bg)



Interwell Prediction Limit Summary

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/8/2019, 3:44 PM

Constituent	Well	Upper Lim.	Lower Lim.	Sig.	Bg N	Bg Mean	Std. Dev.	%NDs	ND Adj.	Transform	Alpha	Method
Boron, total (mg/L)	n/a	0.7	n/a	n/a	36	n/a	n/a	0	n/a	n/a	0.001409	NP Inter (normality) 1 of 2
Fluoride, total (mg/L)	n/a	0.583	n/a	n/a	42	n/a	n/a	64.29	n/a	n/a	0.001066	NP Inter (NDs) 1 of 2
pH, field (SU)	n/a	7.109	4.327	n/a	36	34.63	9.009	0	None	x^2	0.001253	Param Inter 1 of 2

Tolerance Limit Summary Table

Welsh LF Client: Geosyntec Data: Welsh LF Printed 12/5/2019, 12:30 PM

<u>Constituent</u>	<u>Well</u>	<u>Upper Lim.</u>	<u>Bg N</u>	<u>Bg Mean</u>	<u>Std. Dev.</u>	<u>%NDs</u>	<u>ND Adj.</u>	<u>Transform</u>	<u>Alpha</u>	<u>Method</u>
Antimony, total (mg/L)	n/a	0.00317	39	n/a	n/a	71.79	n/a	n/a	0.1353	NP Inter(normality)
Arsenic, total (mg/L)	n/a	0.005	39	n/a	n/a	48.72	n/a	n/a	0.1353	NP Inter(normality)
Barium, total (mg/L)	n/a	0.6226	39	-2.778	1.08	0	None	ln(x)	0.05	Inter
Beryllium, total (mg/L)	n/a	0.0007877	39	0.0565	0.0168	10.26	None	x^(1/3)	0.05	Inter
Cadmium, total (mg/L)	n/a	0.00646	39	n/a	n/a	30.77	n/a	n/a	0.1353	NP Inter(normality)
Chromium, total (mg/L)	n/a	0.004	38	n/a	n/a	23.68	n/a	n/a	0.1424	NP Inter(normality)
Cobalt, total (mg/L)	n/a	0.0748	39	n/a	n/a	0	n/a	n/a	0.1353	NP Inter(normality)
Combined Radium 226 + 228 (pCi/L)	n/a	4.113	39	2.091	0.9476	0	None	No	0.05	Inter
Fluoride, total (mg/L)	n/a	0.583	42	n/a	n/a	64.29	n/a	n/a	0.116	NP Inter(normality)
Lead, total (mg/L)	n/a	0.003384	39	n/a	n/a	69.23	n/a	n/a	0.1353	NP Inter(normality)
Lithium, total (mg/L)	n/a	0.394	39	n/a	n/a	2.564	n/a	n/a	0.1353	NP Inter(normality)
Mercury, total (mg/L)	n/a	0.000033	39	n/a	n/a	53.85	n/a	n/a	0.1353	NP Inter(normality)
Molybdenum, total (mg/L)	n/a	0.00243	39	n/a	n/a	69.23	n/a	n/a	0.1353	NP Inter(normality)
Selenium, total (mg/L)	n/a	0.005	39	n/a	n/a	41.03	n/a	n/a	0.1353	NP Inter(normality)
Thallium, total (mg/L)	n/a	0.001251	39	n/a	n/a	87.18	n/a	n/a	0.1353	NP Inter(NDs)

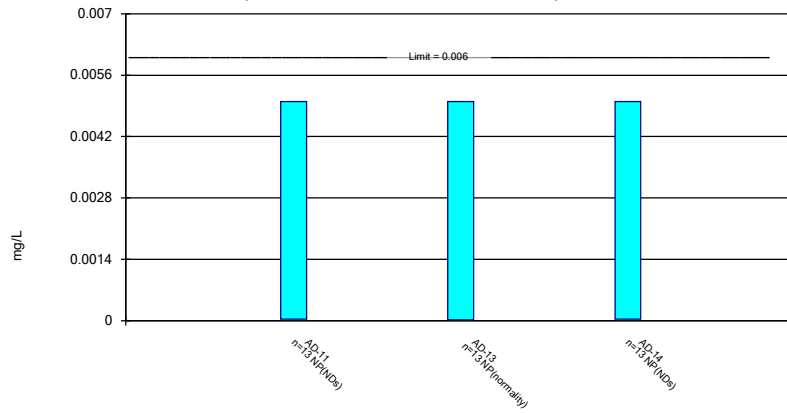
Confidence Interval Summary Table - All Results (No Significant)

Welsh Landfill Client: Geosyntec Data: Welsh LF Printed 11/25/2019, 9:47 AM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	AD-11	0.005	0.00003	0.006	No	13	84.62	No	0.01	NP (NDs)
Antimony, total (mg/L)	AD-13	0.005	0.00002	0.006	No	13	61.54	No	0.01	NP (normality)
Antimony, total (mg/L)	AD-14	0.005	0.00003	0.006	No	13	76.92	No	0.01	NP (NDs)
Arsenic, total (mg/L)	AD-11	0.005	0.00059	0.01	No	13	46.15	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-13	0.006	0.00037	0.01	No	13	53.85	No	0.01	NP (normality)
Arsenic, total (mg/L)	AD-14	0.005	0.00039	0.01	No	13	53.85	No	0.01	NP (normality)
Barium, total (mg/L)	AD-11	0.0403	0.0119	2	No	13	0	No	0.01	NP (normality)
Barium, total (mg/L)	AD-13	0.05991	0.02574	2	No	13	0	sqrt(x)	0.01	Param.
Barium, total (mg/L)	AD-14	0.04972	0.03072	2	No	13	0	x^(1/3)	0.01	Param.
Beryllium, total (mg/L)	AD-11	0.005	0.00089	0.004	No	13	0	No	0.01	NP (normality)
Beryllium, total (mg/L)	AD-13	0.0009026	0.000488	0.004	No	13	0	No	0.01	Param.
Beryllium, total (mg/L)	AD-14	0.0007186	0.0003981	0.004	No	13	0	No	0.01	Param.
Cadmium, total (mg/L)	AD-11	0.0004523	0.000264	0.0065	No	13	0	No	0.01	Param.
Cadmium, total (mg/L)	AD-13	0.0005	0.00007	0.0065	No	13	30.77	No	0.01	NP (normality)
Cadmium, total (mg/L)	AD-14	0.00152	0.0005231	0.0065	No	13	0	No	0.01	Param.
Chromium, total (mg/L)	AD-11	0.001255	0.000329	0.1	No	12	0	ln(x)	0.01	Param.
Chromium, total (mg/L)	AD-13	0.0007718	0.000283	0.1	No	12	25	No	0.01	NP (normality)
Chromium, total (mg/L)	AD-14	0.001025	0.000423	0.1	No	13	15.38	No	0.01	Param.
Cobalt, total (mg/L)	AD-11	0.0259	0.01533	0.075	No	13	0	x^2	0.01	Param.
Cobalt, total (mg/L)	AD-13	0.007241	0.003164	0.075	No	13	0	sqrt(x)	0.01	Param.
Cobalt, total (mg/L)	AD-14	0.013	0.005734	0.075	No	13	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-11	2.556	1.474	5	No	13	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-13	2.944	1.668	5	No	13	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-14	2.395	1.022	5	No	13	0	sqrt(x)	0.01	Param.
Fluoride, total (mg/L)	AD-11	2	0.338	4	No	13	23.08	No	0.01	NP (normality)
Fluoride, total (mg/L)	AD-13	0.964	0.4729	4	No	14	21.43	No	0.01	Param.
Fluoride, total (mg/L)	AD-14	1	0.162	4	No	14	78.57	No	0.01	NP (NDs)
Lead, total (mg/L)	AD-11	0.005	0.000847	0.015	No	13	53.85	No	0.01	NP (normality)
Lead, total (mg/L)	AD-13	0.005	0.000204	0.015	No	13	53.85	No	0.01	NP (normality)
Lead, total (mg/L)	AD-14	0.005	0.000137	0.015	No	13	69.23	No	0.01	NP (normality)
Lithium, total (mg/L)	AD-11	0.047	0.0157	0.39	No	13	0	No	0.01	NP (normality)
Lithium, total (mg/L)	AD-13	0.02486	0.01221	0.39	No	13	0	No	0.01	Param.
Lithium, total (mg/L)	AD-14	0.01567	0.01179	0.39	No	12	0	No	0.01	Param.
Mercury, total (mg/L)	AD-11	0.000025	0.00000624	0.002	No	13	46.15	No	0.01	NP (normality)
Mercury, total (mg/L)	AD-13	0.000025	0.00000515	0.002	No	13	61.54	No	0.01	NP (normality)
Mercury, total (mg/L)	AD-14	0.000145	0.00001863	0.002	No	13	7.692	No	0.01	NP (normality)
Molybdenum, total (mg/L)	AD-11	0.005	0.001519	0.1	No	13	84.62	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	AD-13	0.005	0.0003533	0.1	No	13	76.92	No	0.01	NP (NDs)
Molybdenum, total (mg/L)	AD-14	0.005	0.000497	0.1	No	13	84.62	No	0.01	NP (NDs)
Selenium, total (mg/L)	AD-11	0.005	0.00134	0.05	No	13	30.77	No	0.01	NP (normality)
Selenium, total (mg/L)	AD-13	0.005	0.0004	0.05	No	13	23.08	No	0.01	NP (Cohens/xfrm)
Selenium, total (mg/L)	AD-14	0.004072	0.002084	0.05	No	13	15.38	No	0.01	Param.
Thallium, total (mg/L)	AD-11	0.002	0.0001	0.002	No	12	41.67	No	0.01	NP (normality)
Thallium, total (mg/L)	AD-13	0.002	0.000277	0.002	No	13	76.92	No	0.01	NP (NDs)
Thallium, total (mg/L)	AD-14	0.002	0.000242	0.002	No	13	84.62	No	0.01	NP (NDs)

Non-Parametric Confidence Interval

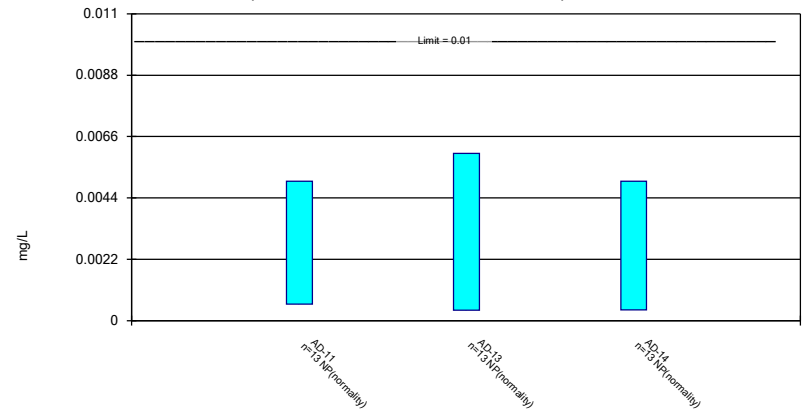
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Antimony, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

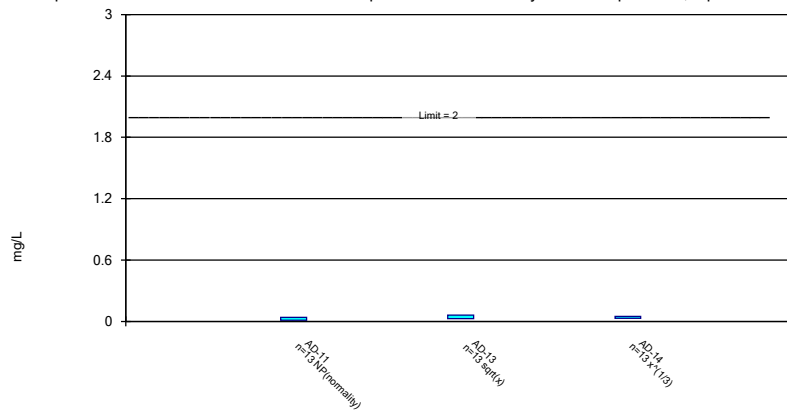
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Arsenic, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

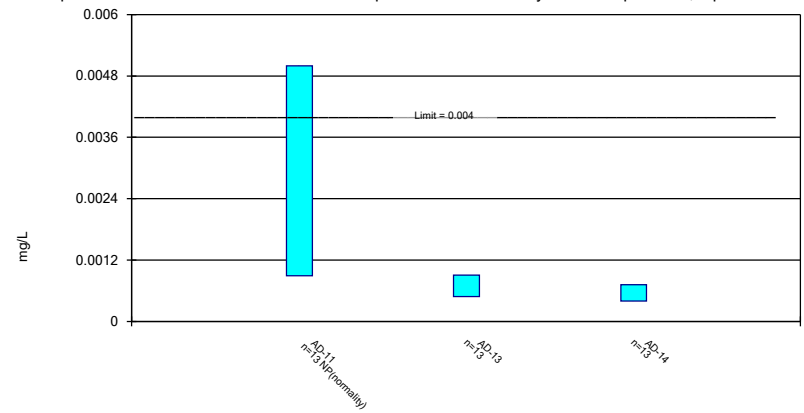
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

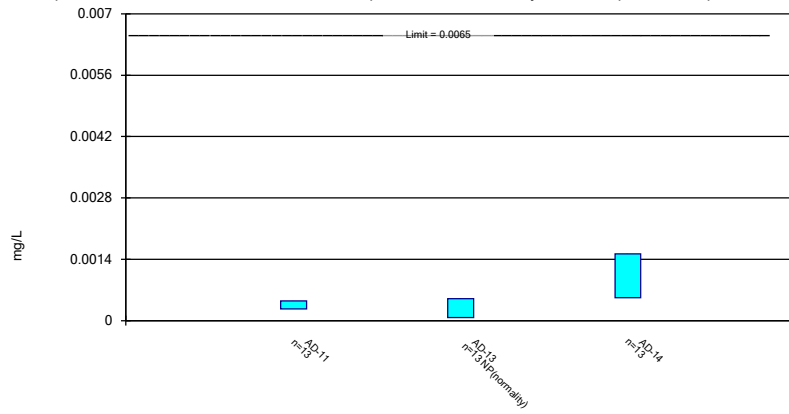
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Beryllium, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

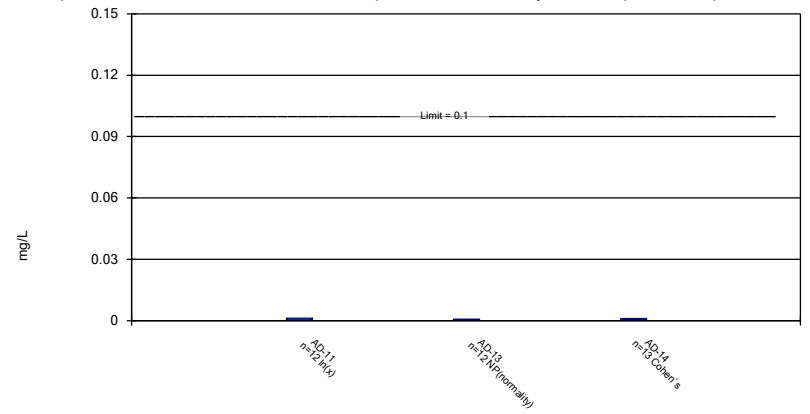
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

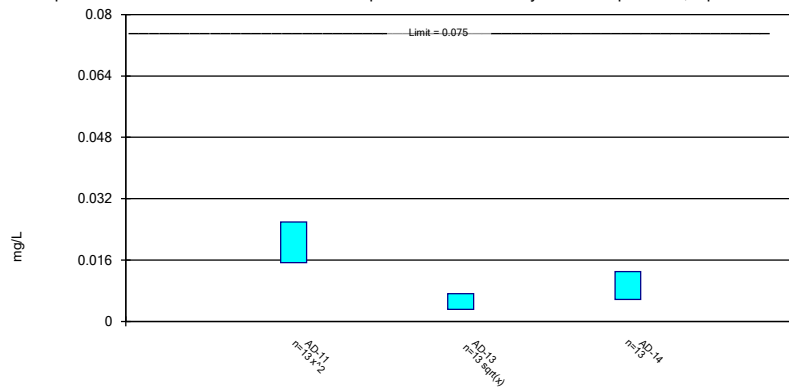
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

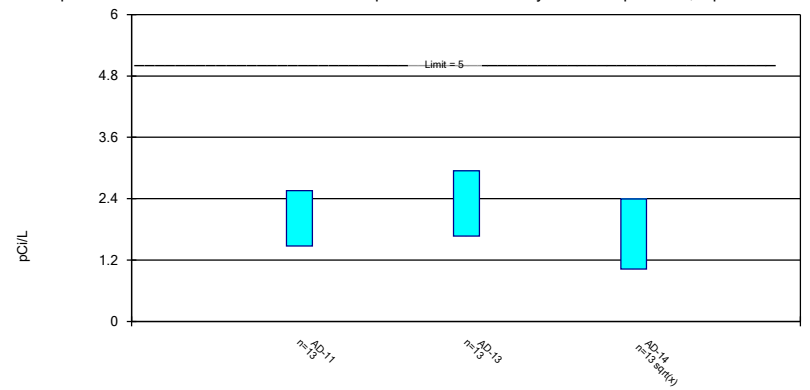
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric Confidence Interval

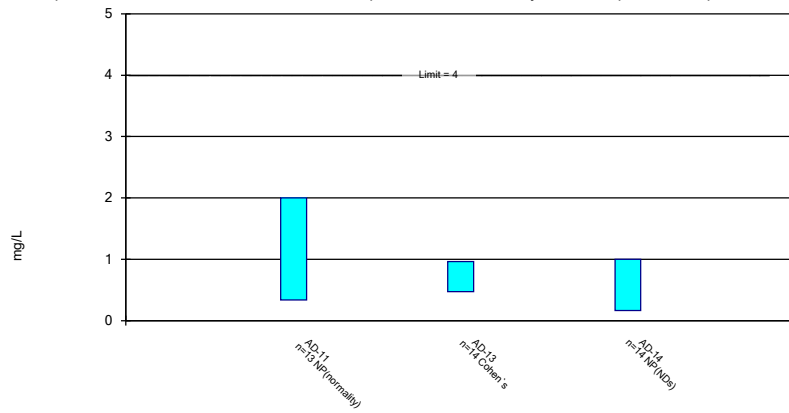
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
 Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

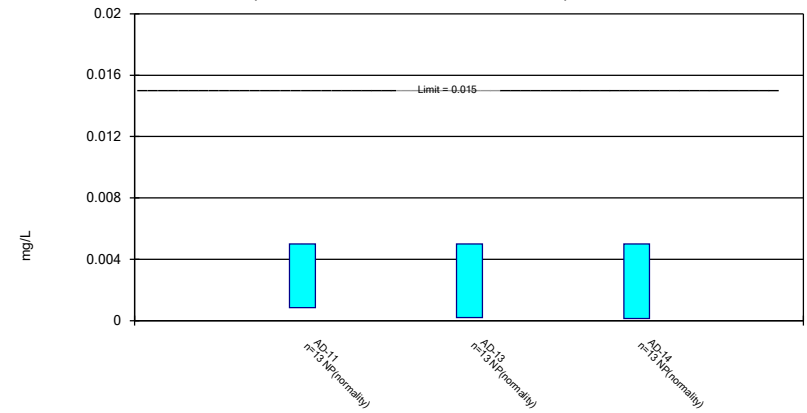
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

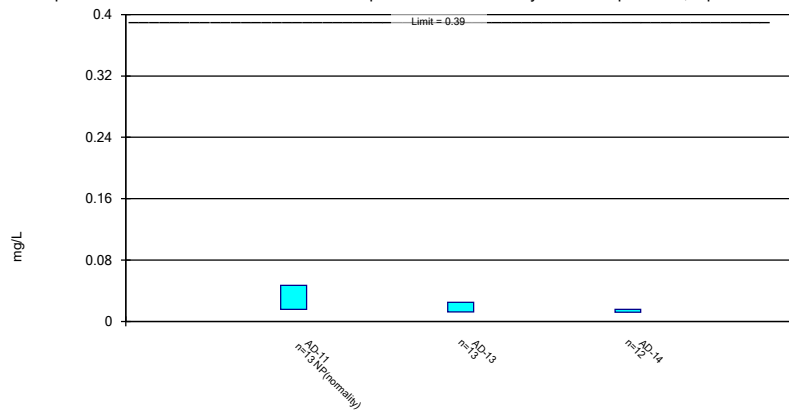
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Lead, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

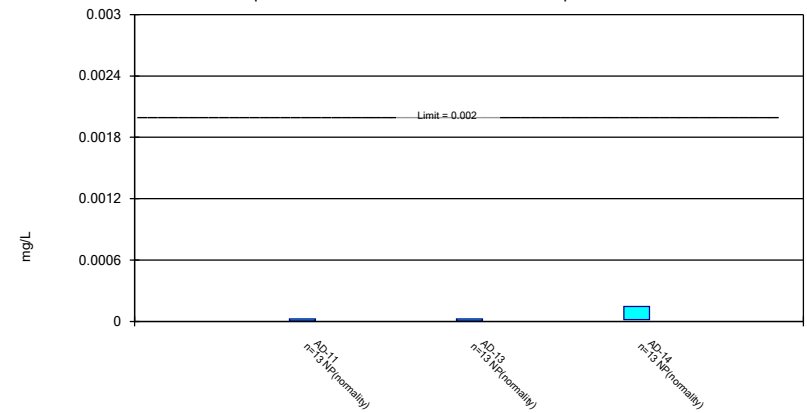
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

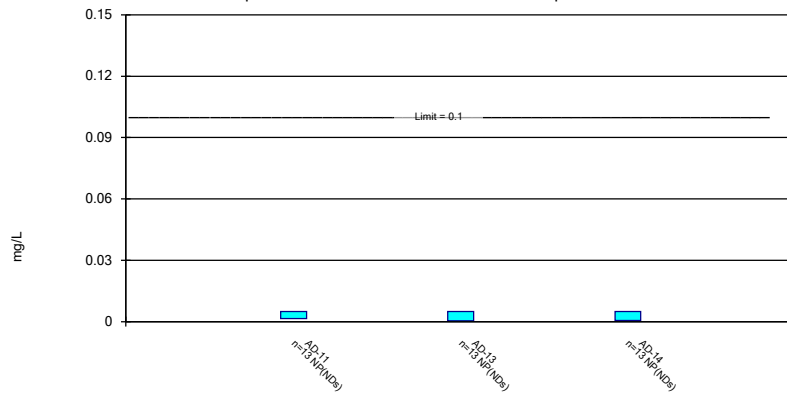
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Mercury, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

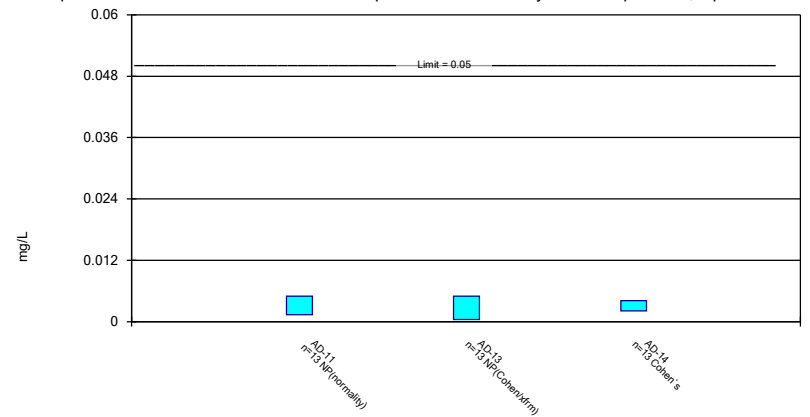
Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Molybdenum, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Parametric and Non-Parametric (NP) Confidence Interval

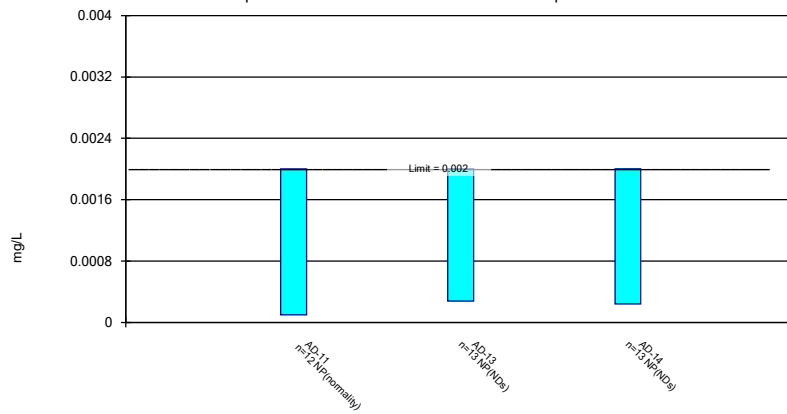
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Selenium, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

Non-Parametric Confidence Interval

Compliance Limit is not exceeded. Per-well alpha = 0.01.



Constituent: Thallium, total Analysis Run 11/25/2019 9:45 AM View: Interwell AIV
Welsh Landfill Client: Geosyntec Data: Welsh LF

APPENDIX III

Alternate source demonstrations are included in this appendix. Alternate sources are sources or reasons that explain that statistically significant increases over background or statistically significant levels above the groundwater protection standard are not attributable to the CCR unit.

APPENDIX IV

Notices of groundwater monitoring programs are included in this appendix.

APPENDIX V- NA

Reports documenting monitoring well plugging and abandonment or well installation are included in the appendix.