STATISTICAL ANALYSIS SUMMARY
PRIMARY BOTTOM ASH POND
J. Robert Welsh Plant
Pittsburg, Texas

Submitted to

AMERICAN ELECTRIC POWER

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Submitted by

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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
LFB	Laboratory Fortified Blanks
LRB	Laboratory Reagent Blanks
MCL	Maximum Contaminant Level
NELAP	National Environmental Laboratory Accreditation Program
PBAP	Primary Bottom Ash Pond
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 Primary Bottom Ash Pond (PBAP), an existing CCR unit at the Welsh Power Plant located in Pittsburg, Texas.

Based on detection monitoring conducted in 2017 and 2018, a statistically significant increase (SSI) over background was concluded for boron at the PBAP. An alternate source was not identified at the time, so two assessment monitoring events were conducted at the PBAP 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. An SSL was identified for lithium. Thus, either the unit will move to an assessment of corrective measures or an alternative source demonstration (ASD) will be conducted to evaluate if the unit can remain in assessment monitoring. Certification of the selected statistical methods by a qualified professional engineer is documented in Attachment A.

SECTION 2

PRIMARY BOTTOM ASH POND 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 event 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 PBAP 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. Outliers for the Appendix III parameters identified from the background and detection monitoring events conducted through January 2018 were summarized in a previous report (Geosyntec, 2018). 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. No other 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 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.

The following SSL was identified at the Welsh PBAP:

- The LCL for lithium exceeded the GWPS of 0.390 mg/L at AD-9 (0.935 mg/L).

As a result, the Welsh PBAP will either move to an assessment of corrective measures or an alternative source demonstration will be conducted to evaluate if the unit can 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. An SSL for lithium was identified.

Based on this evaluation, the Welsh PBAP CCR unit will either move to an assessment of corrective measures or an ASD will be conducted to evaluate if the unit can 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 – Primary Bottom Ash Pond, J Robert Welsh Plant, Pittsburg, Texas. January 15, 2018.

TABLES

Table 1 – Groundwater Data Summary
Welsh – Primary Bottom Ash Pond

Parameter	Unit	AD-1		AD-5		AD-8			AD-9			AD-15			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	8/15/2018	9/17/2018	5/23/2018	8/15/2018	9/17/2018	5/24/2018	8/15/2018
Antimony	mg/L	0.00317 J	0.0000300 J	0.005 U	0.0000100 J	0.00319 J	0.0000100 J	-	0.005 U	0.00005 U	-	0.005 U	0.0000300 J	-	0.005 U	0.0000200 J
Arsenic	mg/L	0.005 U	0.000210	0.005 U	0.00169	0.005 U	0.000310	-	0.005 U	0.00168	-	0.00256 J	0.00326	-	0.005 U	0.00183
Barium	mg/L	0.0799	0.0630	0.0712	0.0637	0.0221	0.0212	-	0.0305	0.0242	-	0.102	0.0852	-	0.00965	0.0128
Beryllium	mg/L	0.000390 J	0.000482	0.001 U	0.0000550	0.001 U	0.00000800 J	-	0.000320 J	0.000268	-	0.0000300 J	0.000116	-	0.001 U	0.0000690
Boron	mg/L	0.345	0.443	0.0501	0.0500	-	-	1.30	-	-	0.198	-	-	0.341	0.239	0.118
Cadmium	mg/L	0.001 U	0.0000200	0.000230 J	0.00000800 J	0.001 U	0.0000200 J	-	0.00288	0.0000600	-	0.000100 J	0.0000100 J	-	0.00646	0.000250
Calcium	mg/L	10.2	5.95	28.1	40.5	-	-	15.0	-	-	230	-	-	3.04	193	187
Chloride	mg/L	4.00	5.00	22.0	19.0	-	-	24.0	-	-	103	-	-	37.0	39.0	40.0
Chromium	mg/L	0.001 U	0.000160	0.000800 J	0.0000720	0.001 U	0.0000500	-	0.001 U	0.000420	-	0.00263	0.000481	-	0.001 U	0.000604
Cobalt	mg/L	0.000350 J	0.000797	0.0142	0.0114	0.00319 J	0.00536	-	0.0267	0.0111	-	0.00474 J	0.00371	-	0.0717	0.0435
Combined Radium	pCi/L	1.98	1.10	1.95	0.316	0.337	3.44	-	2.56	1.86	-	1.46	1.08	-	1.94	2.35
Fluoride	mg/L	1 U	1 U	1 U	1 U	0.501 J	0.615	-	1 U	1 U	-	1 U	1 U	-	1 U	1 U
Lead	mg/L	0.005 U	NR	0.005 U	NR	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR
Lithium	mg/L	0.00814	0.00708	0.121	0.147	0.0956	0.0555	-	1.20	0.851	-	0.00562	0.00338	-	0.308	0.243
Mercury	mg/L	0.00000600 J	0.0000130 J	0.000025 U	0.000025 U	0.000025 U	0.00000700 J	-	0.000025 U	0.000013 J	-	0.000025 U	0.000008 J	-	0.000025 U	0.0000110 J
Molybdenum	mg/L	0.005 U	NR	0.005 U	NR	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR	-	0.005 U	NR
Selenium	mg/L	0.00138 J	0.00170	0.005 U	0.0000800 J	0.00175 J	0.0000700 J	-	0.005 U	0.000300	-	0.00154 J	0.000900	-	0.005 U	0.000300
Total Dissolved Solids	mg/L	150	160	242	428	-	-	288	-	-	2690	-	-	174	1840	1750
Sulfate	mg/L	43.0	44.0	60.0	240	-	-	122	-	-	1910	-	-	24.0	1070	1170
Thallium	mg/L	0.002 U	0.0000300 J	0.002 U	0.00005 U	0.002 U	0.000129	-	0.00846	0.0000620	-	0.00137 J	0.0000900	-	0.002 U	0.0000740
pH	SU	5.19	5.18	6.22	6.23	6.20	6.77	-	5.30	4.96	-	4.76	4.59	-	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 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
The fluoride and pH values collected on 8/15/2018 were also used in Appendix III analyses.

Table 2: Groundwater Protection Standards
Welsh Plant - Primary Bottom Ash Pond

Geosyntec Consultants, Inc.

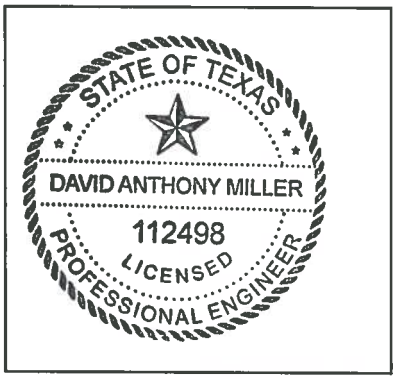
Constituent Name	MCL	Rule Specified	Background Limit
Antimony, Total (mg/L)	0.006		0.005
Arsenic, Total (mg/L)	0.01		0.005
Barium, Total (mg/L)	2		0.36
Beryllium, Total (mg/L)	0.004		0.00077
Cadmium, Total (mg/L)	0.005		0.0065
Chromium, Total (mg/L)	0.1		0.004
Cobalt, Total (mg/L)	n/a	0.006	0.075
Combined 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		0.0013

Notes:
Grey cell indicates calculated UTL is higher than MCL.
MCL = Maximum Contaminant Level
RSL = Regional Screening Level
Calculated UTL (Upper Tolerance Limit) represents site-specific background values.
The higher of the calculated UTL or MCL/RSL is used as the GWPS.

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 Primary Bottom Ash Pond 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	TEXAS	01.08.19
License Number	Licensing State	Date

ATTACHMENT B

Statistical Analysis Output

GROUNDWATER STATS CONSULTING

December 16, 2018

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

Re: Welsh PBAP
Assessment Monitoring Event – September 2018

Dear Ms. Kreinberg,

Groundwater Stats Consulting, formerly the statistical consulting division of Sanitas Technologies, is pleased to provide the statistical analysis of September 2018 groundwater data for American Electric Power Inc.'s Welsh PBAP. 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-8, AD-9, and AD-15.

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. Values previously flagged during the screening as outliers may be seen in a lighter font and disconnected symbol on the time series graphs.

Evaluation of Appendix III Parameters

Interwell prediction limits combined with a 1-of-2 verification strategy were constructed for boron and pH; and intrawell prediction limits combined with a 1-of-2 verification strategy were constructed for calcium, chloride, fluoride, sulfate and TDS. The statistical method selected for each parameter was determined based on the results of the screening analysis performed in December 2017.

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 SSIs were noted for any of the Appendix III parameters in downgradient wells except for boron in well AD-8 and pH (lower limit) in well AD-15. Chloride in upgradient well AD-5 exceeded its intrawell prediction limit which 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. Upgradient wells are included in the trend analyses to identify whether similar patters 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 downgradient 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). 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.

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. 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 except for lithium in well AD-9. A summary of the confidence interval results follows this letter.

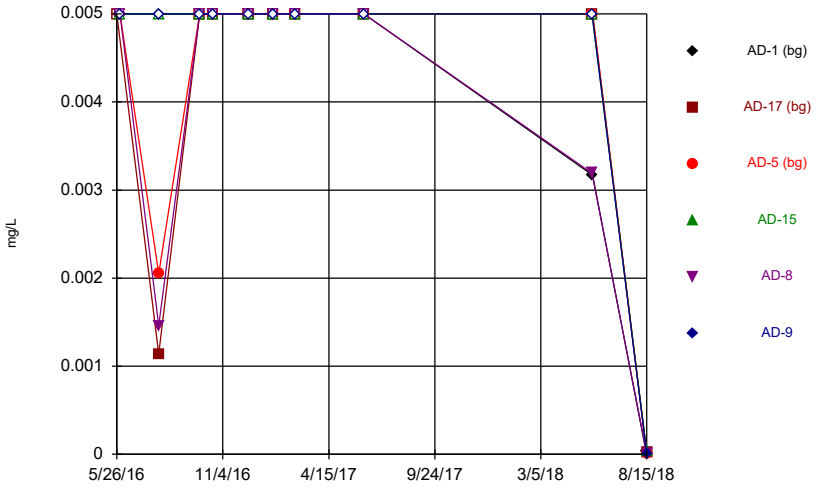
Thank you for the opportunity to assist you in the statistical analysis of groundwater quality for the Welsh PBAP. If you have any questions or comments, please feel free to contact me.

For Groundwater Stats Consulting,

Kristina L. Rayner
Groundwater Statistician

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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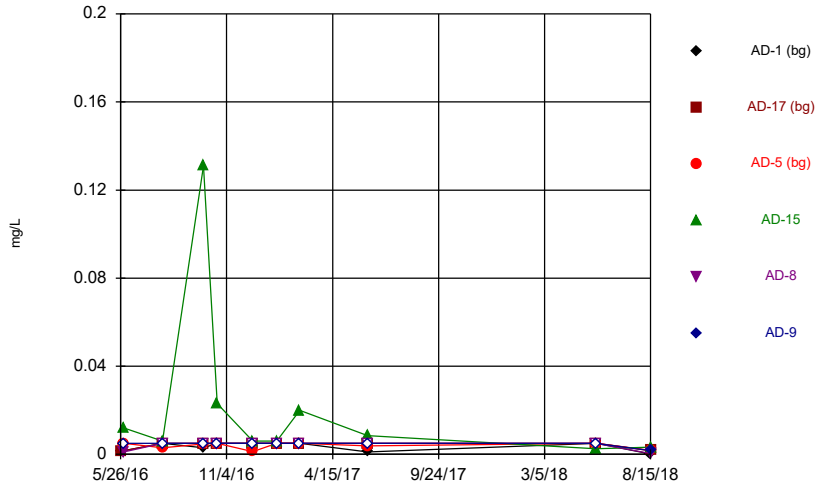
Hollow symbols indicate censored values.

Time Series



Constituent: Arsenic, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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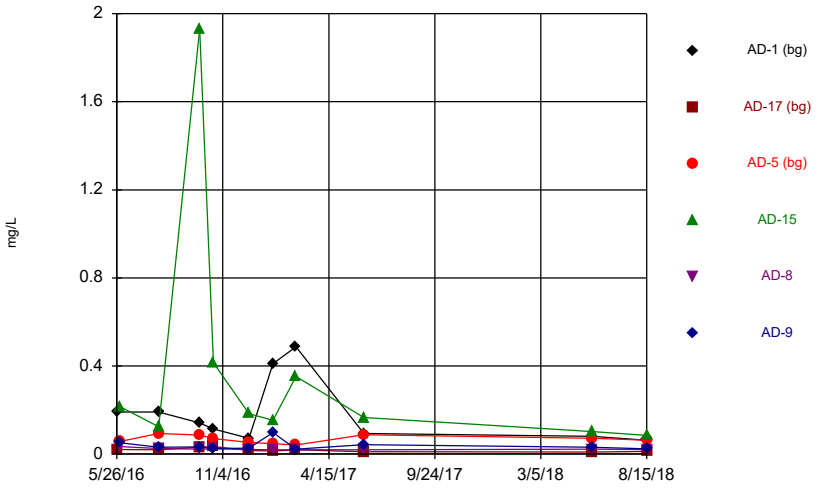
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Barium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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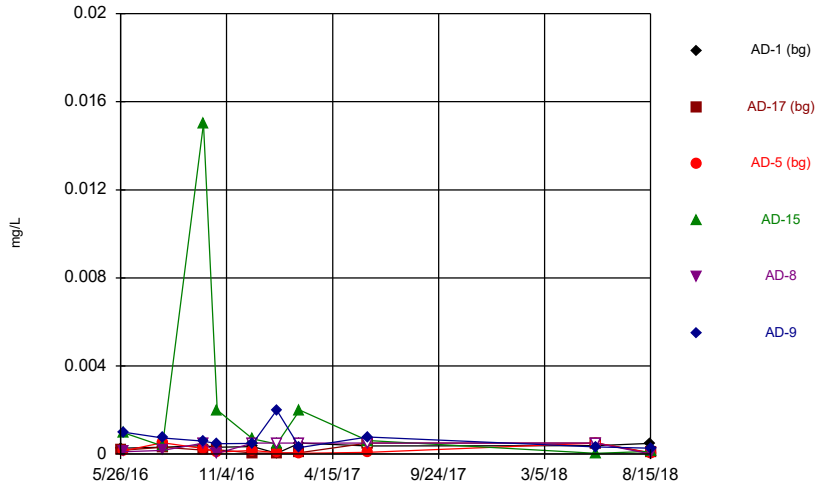
Hollow symbols indicate censored values.

Time Series



Constituent: Beryllium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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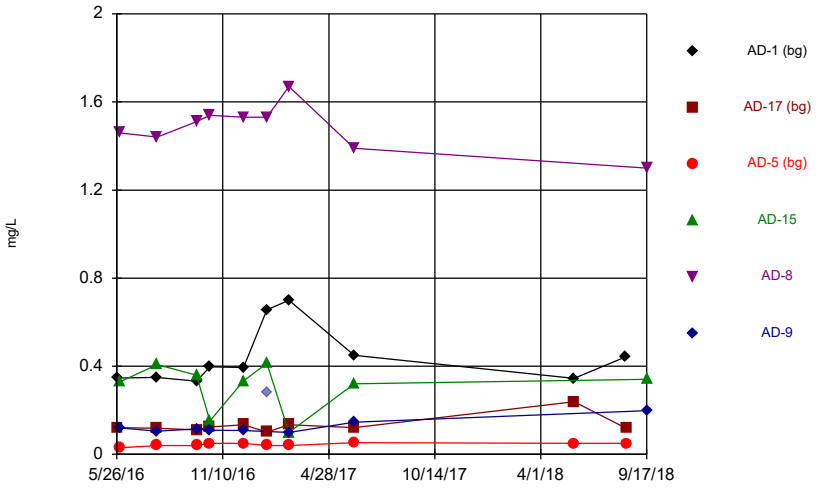
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



Constituent: Boron, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
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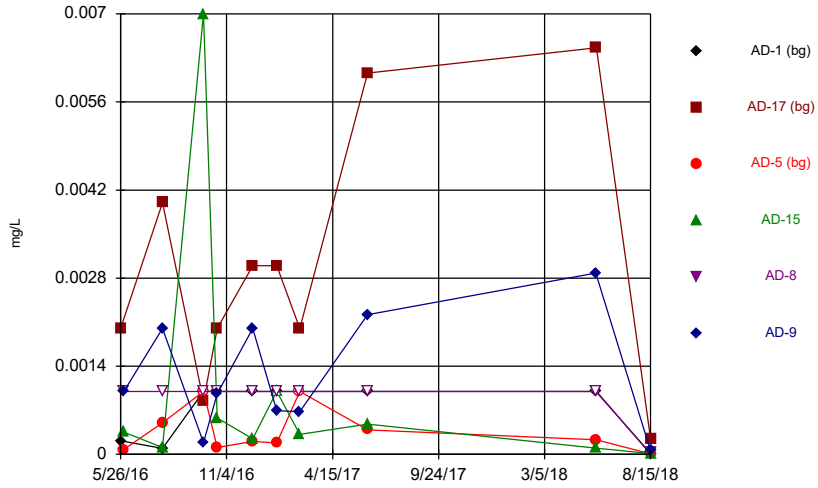
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

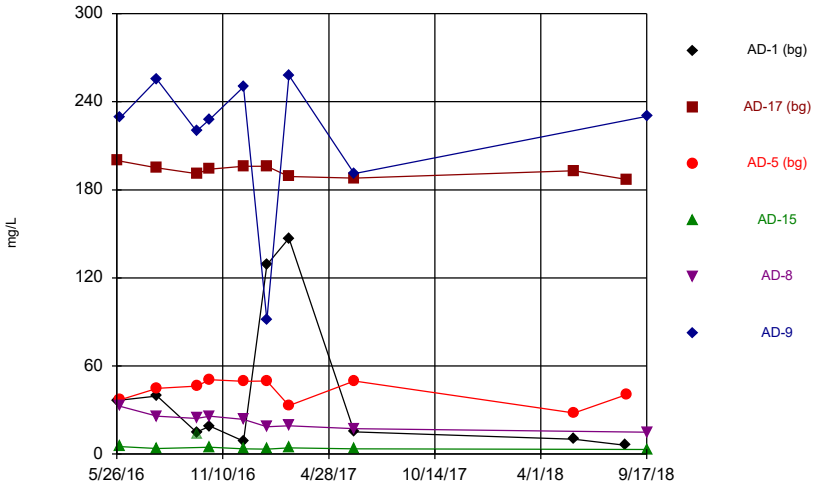
Time Series



Constituent: Cadmium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

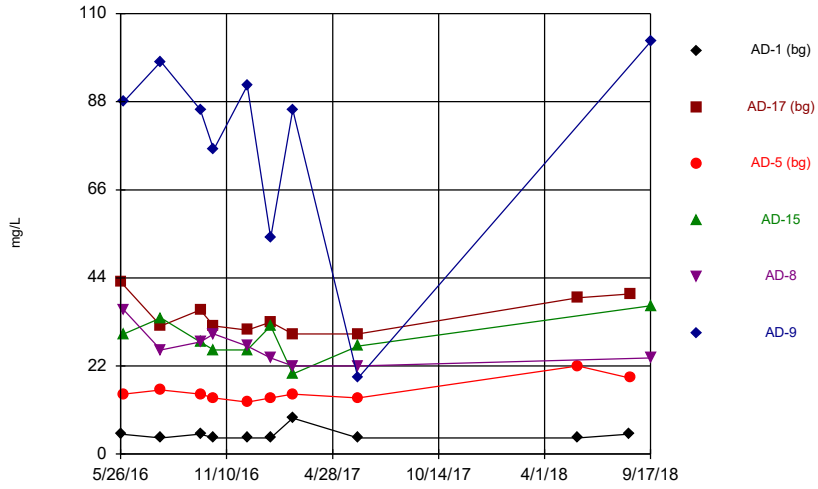
Time Series



Constituent: Calcium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

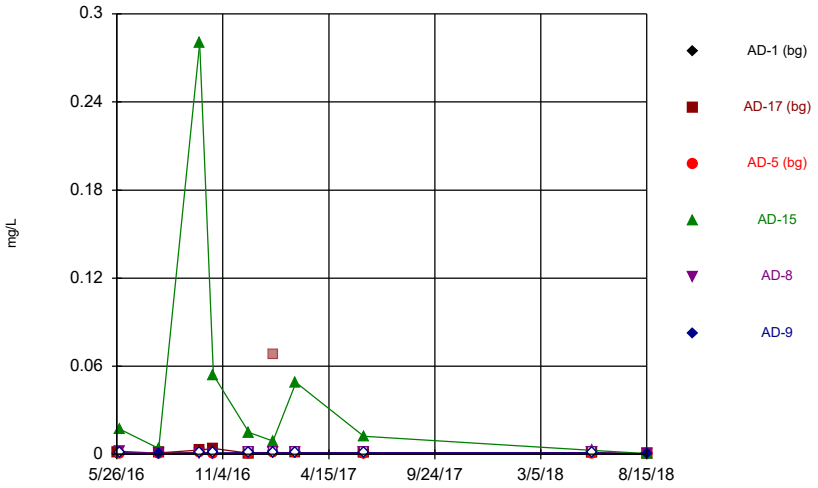
Time Series



Constituent: Chloride, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



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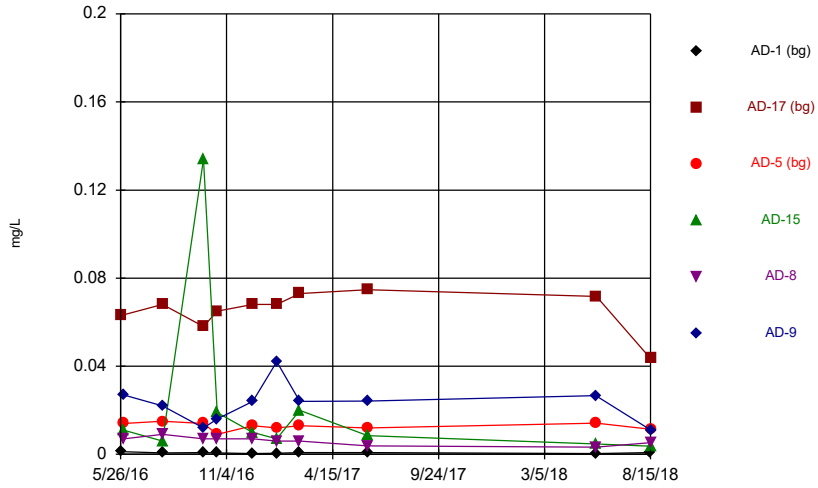
Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Time Series



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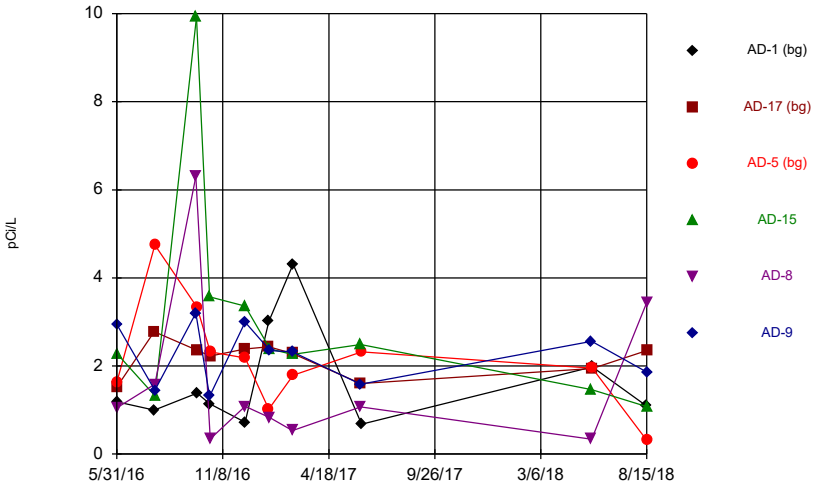
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

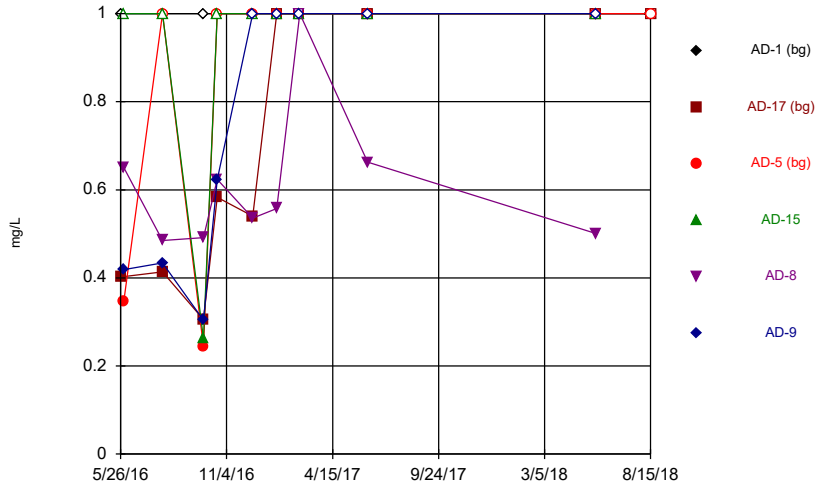
Time Series



Constituent: Combined Radium 226 + 228 Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

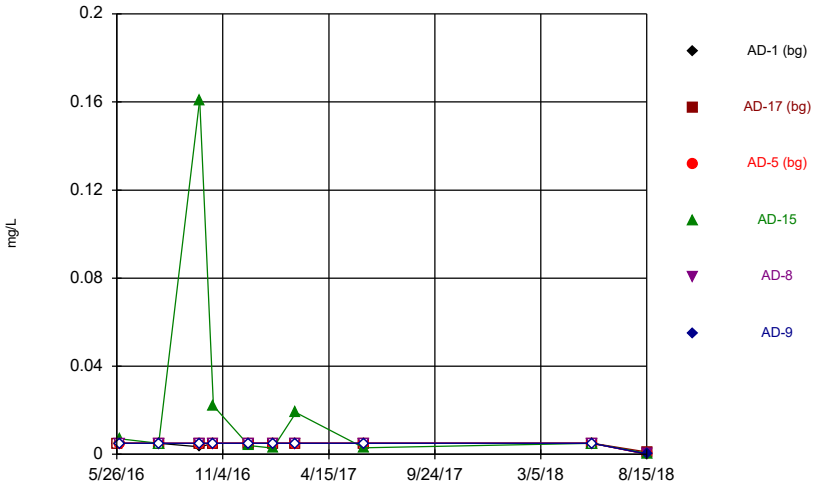
Time Series



Constituent: Fluoride, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

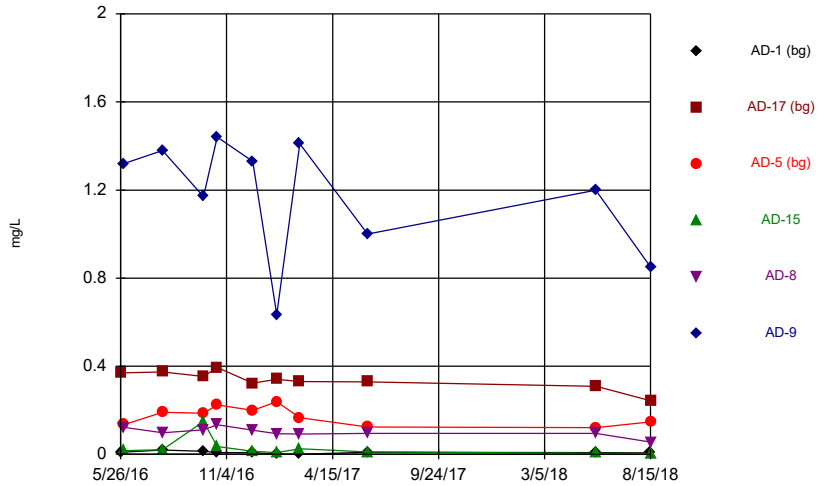
Time Series



Constituent: Lead, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

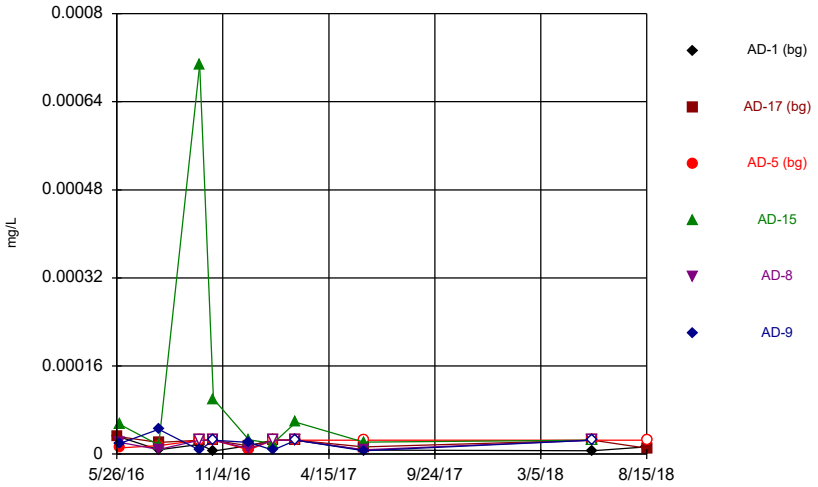
Time Series



Constituent: Lithium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

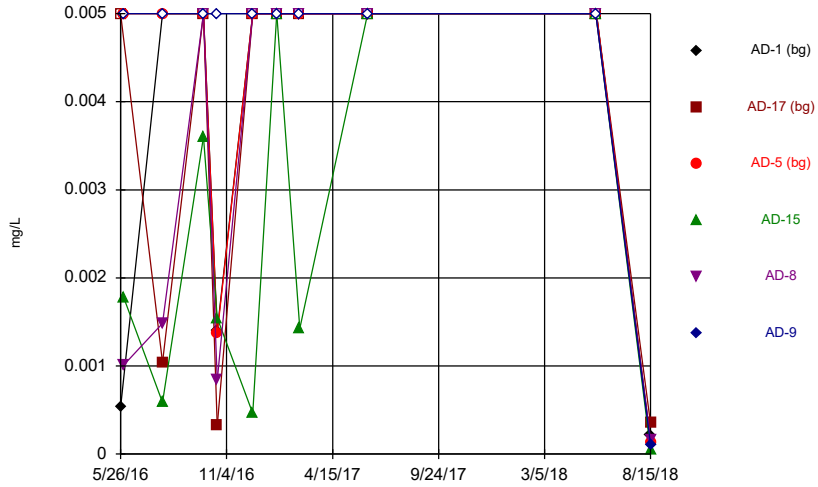
Time Series



Constituent: Mercury, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

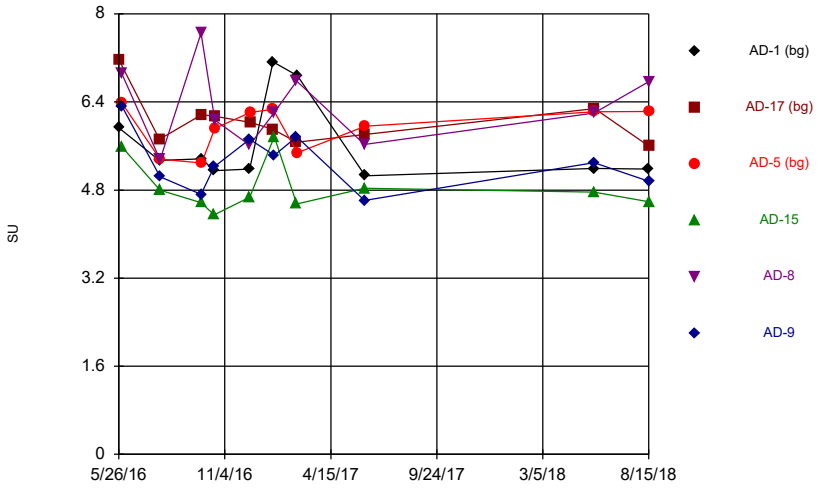
Time Series



Constituent: Molybdenum, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

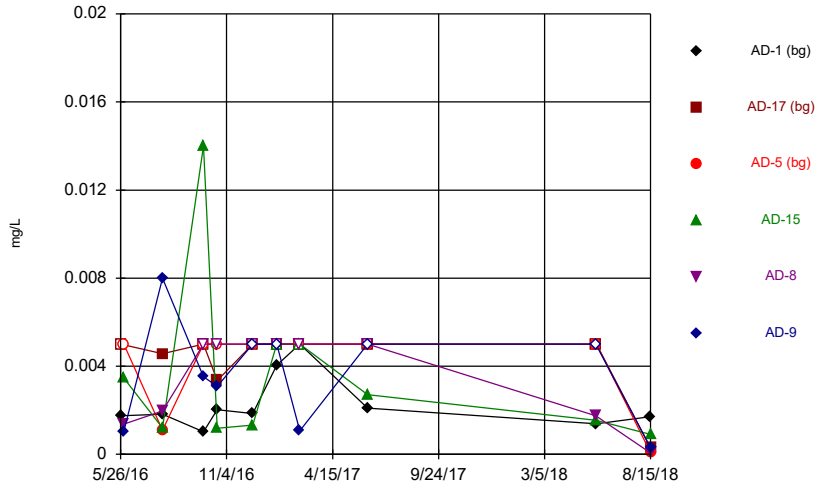
Time Series



Constituent: pH, field Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

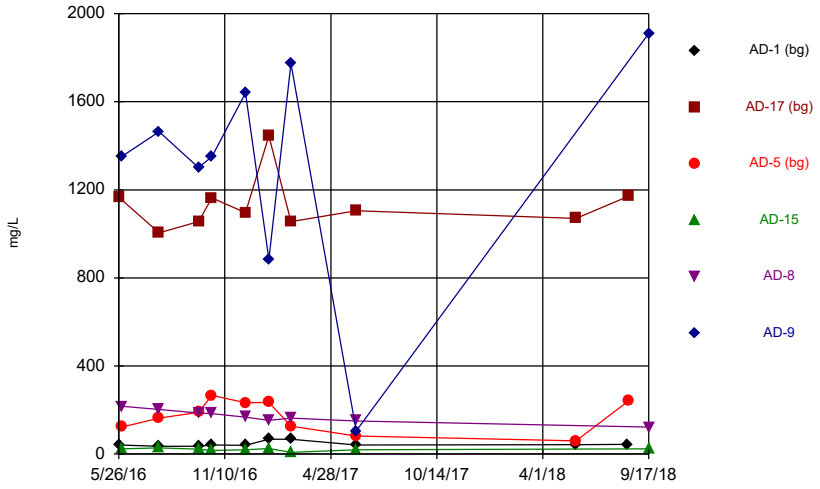
Time Series



Constituent: Selenium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

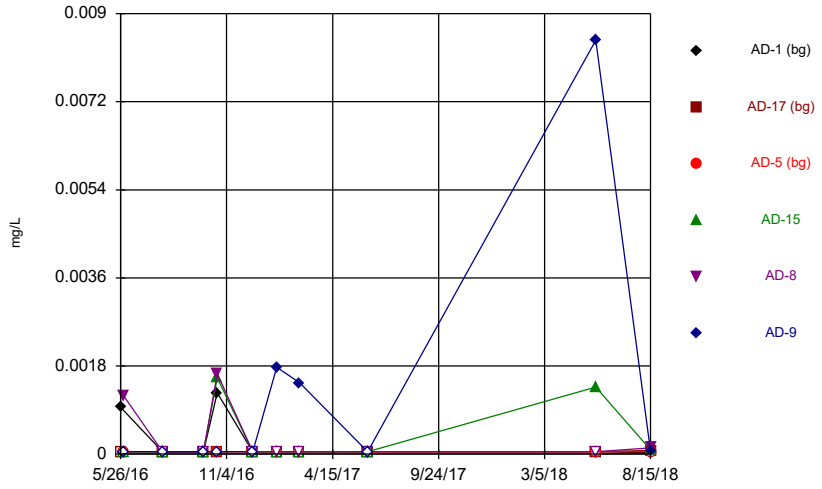
Time Series



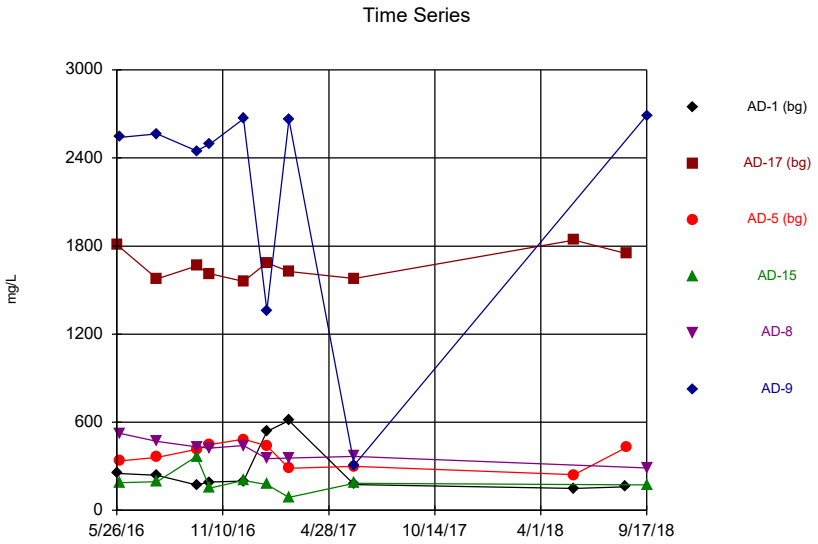
Constituent: Sulfate, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Time Series



Constituent: Thallium, total Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP



Constituent: Total Dissolved Solids Analysis Run 12/16/2018 8:11 AM View: Descriptive
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Interwell Prediction Limit Summary Table - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/16/2018, 8:10 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-8**	**0.765**	**n/a**	**9/17/2018**	**1.3**	**Yes**	**30**	**-2.011**	**0.9717**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**
pH, field (SU)	**AD-15**	**6.899**	**4.849**	**8/15/2018**	**4.59**	**Yes**	**30**	**5.874**	**0.5713**	**0**	**None**	**No**	**0.001253**	**Param Inter 1 of 2**

Interwell Prediction Limit Summary Table - All Results

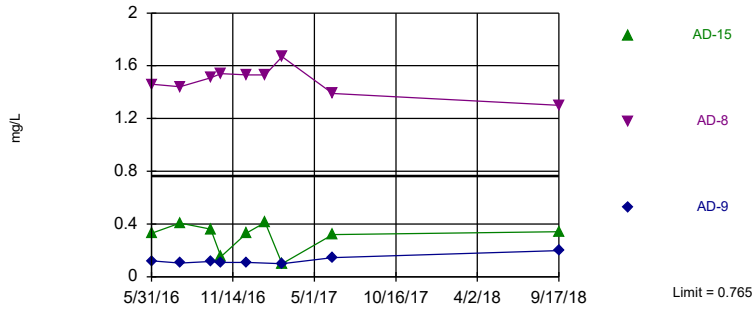
Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/16/2018, 8:10 AM

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-15	0.765	n/a	9/17/2018	0.341	No	30	-2.011	0.9717	0	None	ln(x)	0.002505	Param Inter 1 of 2
Boron, total (mg/L)	**AD-8**	**0.765**	**n/a**	**9/17/2018**	**1.3**	**Yes**	**30**	**-2.011**	**0.9717**	**0**	**None**	**ln(x)**	**0.002505**	**Param Inter 1 of 2**
Boron, total (mg/L)	AD-9	0.765	n/a	9/17/2018	0.198	No	30	-2.011	0.9717	0	None	ln(x)	0.002505	Param Inter 1 of 2
pH, field (SU)	**AD-15**	**6.899**	**4.849**	**8/15/2018**	**4.59**	**Yes**	**30**	**5.874**	**0.5713**	**0**	**None**	**No**	**0.001253**	**Param Inter 1 of 2**
pH, field (SU)	AD-8	6.899	4.849	8/15/2018	6.77	No	30	5.874	0.5713	0	None	No	0.001253	Param Inter 1 of 2
pH, field (SU)	AD-9	6.899	4.849	8/15/2018	4.96	No	30	5.874	0.5713	0	None	No	0.001253	Param Inter 1 of 2

Exceeds Limit: AD-8

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.

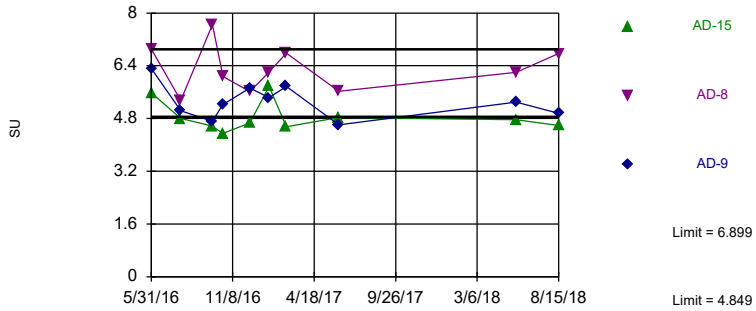
Constituent: Boron, total Analysis Run 12/16/2018 8:00 AM View: PL's - Interwell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Exceeds Limits: AD-15

Prediction Limit

Interwell Parametric



Background Data Summary: Mean=5.874, Std. Dev.=0.5713, n=30. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9326, 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 12/16/2018 8:00 AM View: PL's - Interwell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Intrawell Prediction Limit Summary Table - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/9/2018, 2:22 PM

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**	**Yes**	**8**	**14.5**	**0.9258**	**0**	**None**	**No**	**0.002505**	Param 1 of 2

Intrawell Prediction Limit Summary Table - All Results

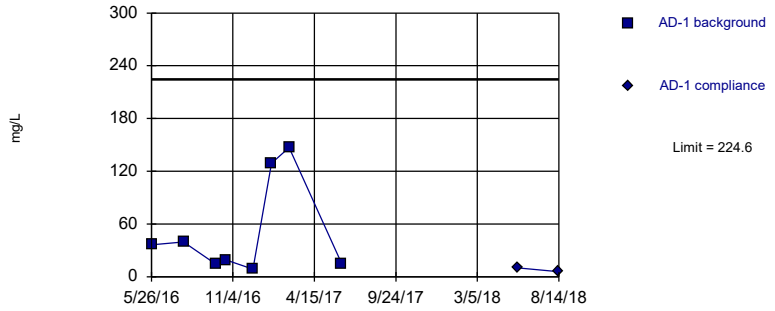
Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/9/2018, 2:22 PM

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-1	224.6	n/a	8/14/2018	5.95	No	8	6.363	3.508	0	None	sqrt(x)	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-15	5.711	n/a	9/17/2018	3.04	No	7	4.031	0.6254	0	None	No	0.002505	Param 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 1 of 2
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 1 of 2
Calcium, total (mg/L)	AD-8	35.68	n/a	9/17/2018	15	No	8	23.46	4.969	0	None	No	0.002505	Param 1 of 2
Calcium, total (mg/L)	AD-9	349.9	n/a	9/17/2018	230	No	8	215.3	54.76	0	None	No	0.002505	Param 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 (normality) 1 of 2
Chloride, total (mg/L)	AD-15	38.42	n/a	9/17/2018	37	No	8	27.88	4.291	0	None	No	0.002505	Param 1 of 2
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 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 1 of 2
Chloride, total (mg/L)	AD-8	38.29	n/a	9/17/2018	24	No	8	26.88	4.643	0	None	No	0.002505	Param 1 of 2
Chloride, total (mg/L)	AD-9	139.3	n/a	9/17/2018	103	No	8	74.88	26.2	0	None	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-1	1	n/a	8/14/2018	1ND	No	8	n/a	n/a	100	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-15	1	n/a	5/23/2018	1ND	No	8	n/a	n/a	87.5	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-17	0.6953	n/a	8/15/2018	1ND	No	8	0.4488	0.1003	37.5	Kapla..	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-5	1	n/a	8/15/2018	1ND	No	8	n/a	n/a	75	n/a	n/a	0.02144	NP (NDs) 1 of 2
Fluoride, total (mg/L)	AD-8	1.034	n/a	5/23/2018	0.501	No	8	0.6258	0.166	12.5	None	No	0.002505	Param 1 of 2
Fluoride, total (mg/L)	AD-9	0.7259	n/a	5/23/2018	1ND	No	8	0.4449	0.1143	50	Kapla..	No	0.002505	Param 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 1 of 2
Sulfate, total (mg/L)	AD-15	35.58	n/a	9/17/2018	24	No	8	20.38	6.186	0	None	No	0.002505	Param 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 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 1 of 2
Sulfate, total (mg/L)	AD-8	235.8	n/a	9/17/2018	122	No	8	178	23.53	0	None	No	0.002505	Param 1 of 2
Sulfate, total (mg/L)	AD-9	2527	n/a	9/17/2018	1910	No	8	1234	526.1	0	None	No	0.002505	Param 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 1 of 2
Total Dissolved Solids (mg/L)	AD-15	388.1	n/a	9/17/2018	174	No	8	194.4	78.82	0	None	No	0.002505	Param 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 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 1 of 2
Total Dissolved Solids (mg/L)	AD-8	568.6	n/a	9/17/2018	288	No	8	420.9	60.09	0	None	No	0.002505	Param 1 of 2
Total Dissolved Solids (mg/L)	AD-9	3147	n/a	9/17/2018	2690	No	8	1.3e10	7.4e9	0	None	x^3	0.002505	Param 1 of 2

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.

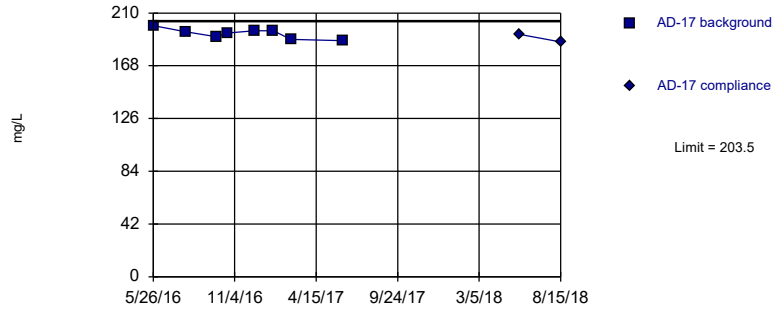
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

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.

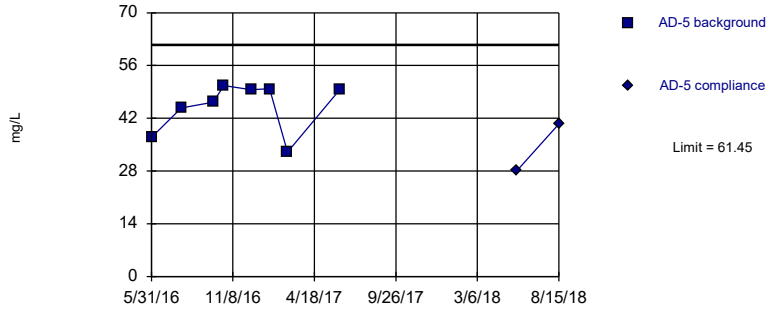
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

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.

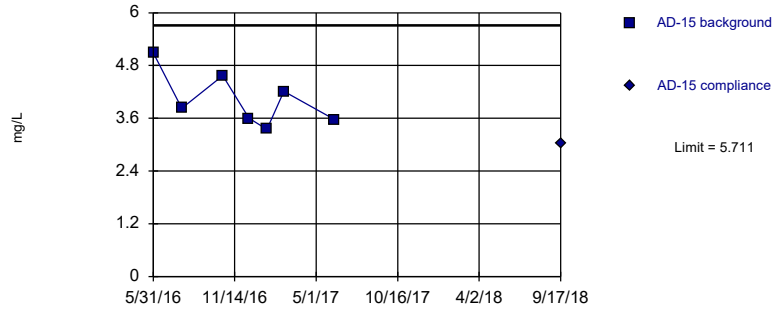
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



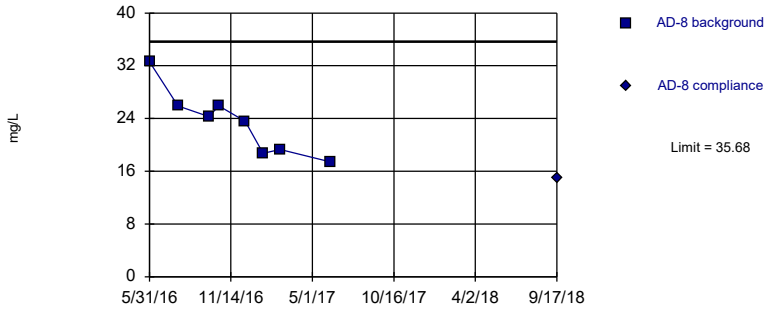
Background Data Summary: Mean=4.031, Std. Dev.=0.6254, n=7. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9248, critical = 0.73. Kappa = 2.685 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=23.46, Std. Dev.=4.969, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9282, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

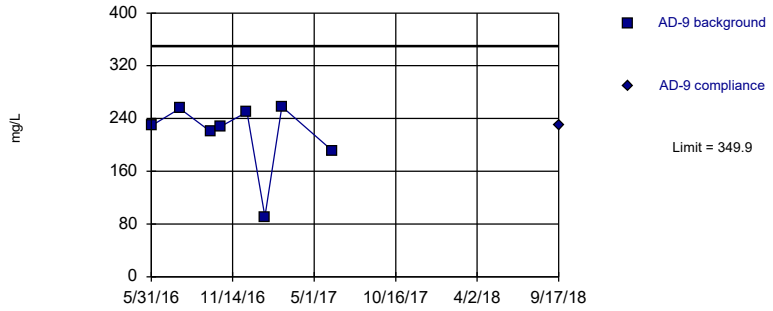
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=215.3, Std. Dev.=54.76, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7629, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

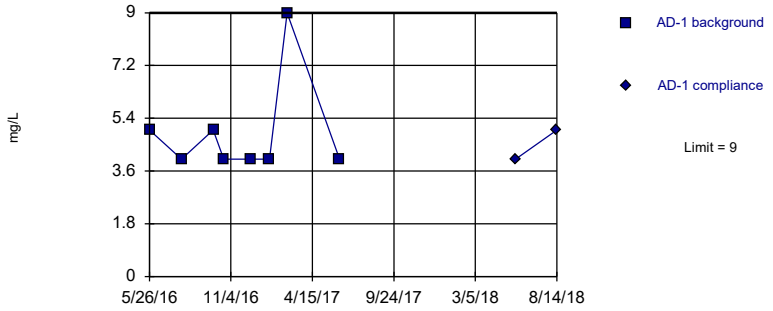
Constituent: Calcium, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

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).

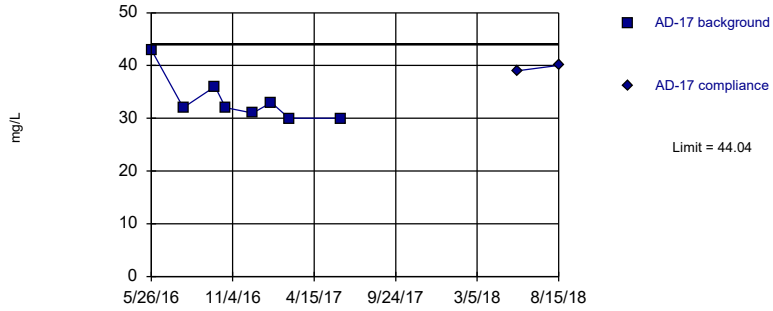
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



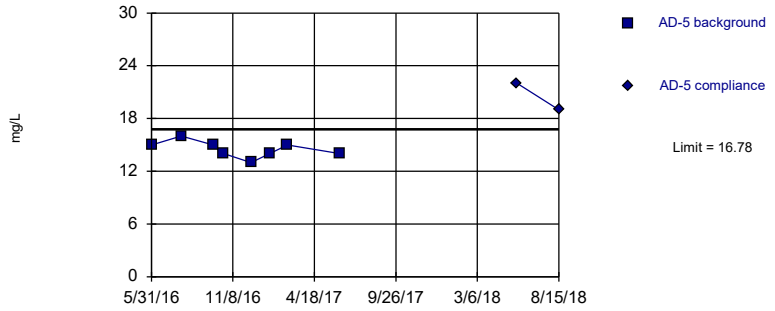
Background Data Summary: Mean=33.38, Std. Dev.=4.34, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7758, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Exceeds Limit

Prediction Limit

Intrawell Parametric



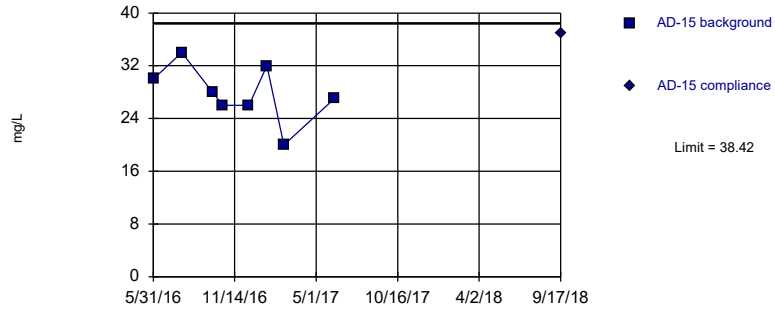
Background Data Summary: Mean=14.5, Std. Dev.=0.9258, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9302, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limit

Prediction Limit

Intrawell Parametric



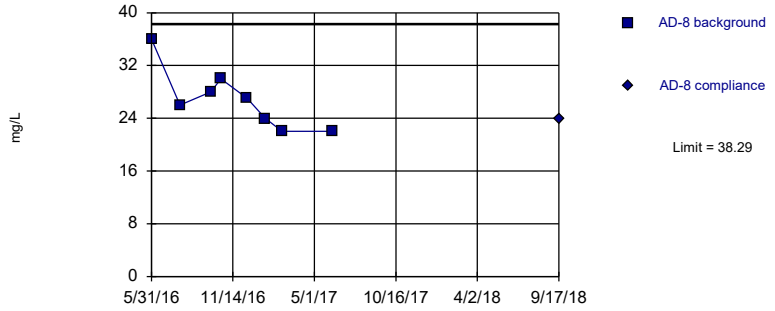
Background Data Summary: Mean=27.88, Std. Dev.=4.291, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9603, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limit

Prediction Limit

Intrawell Parametric



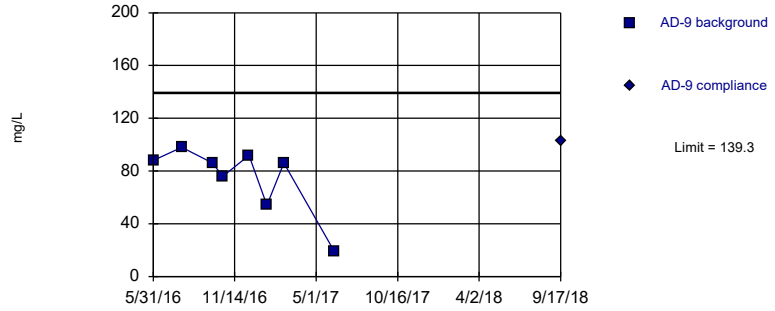
Background Data Summary: Mean=26.88, Std. Dev.=4.643, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9162, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=74.88, Std. Dev.=26.2, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7978, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

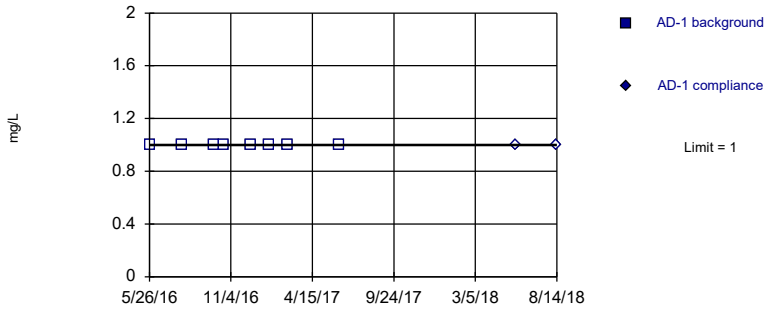
Constituent: Chloride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. All background values (n = 8) were censored; limit is most recent reporting limit. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

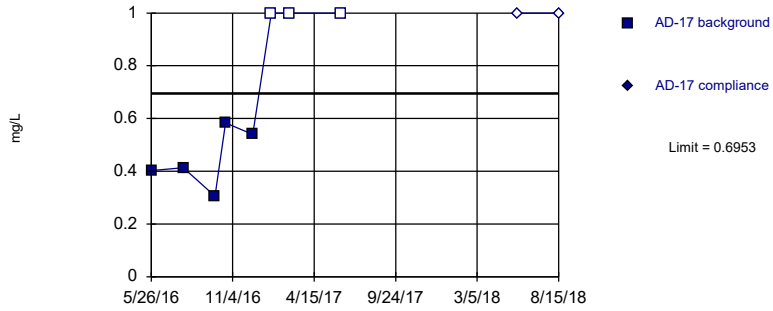
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.4488, Std. Dev.=0.1003, n=8, 37.5% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8226, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

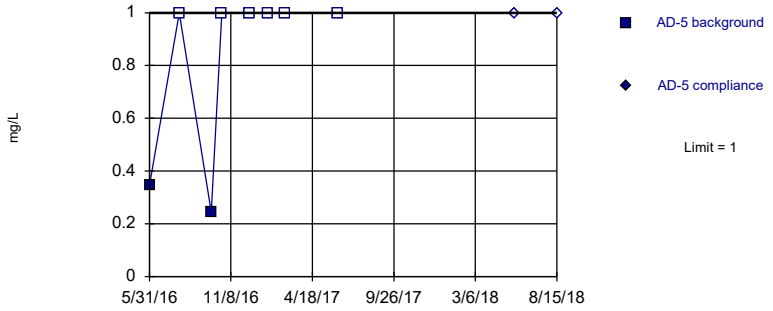
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 8 background values. 75% NDs. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

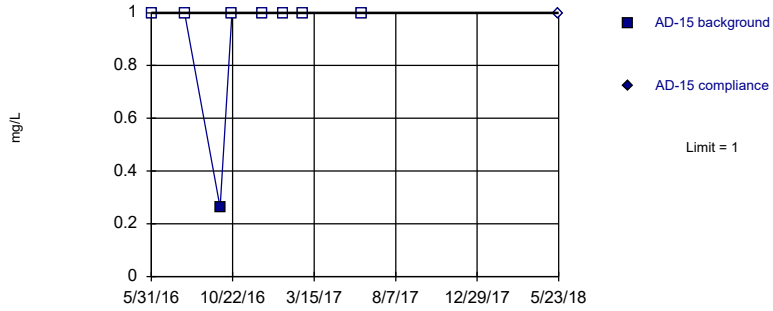
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Non-parametric



Non-parametric test used in lieu of parametric prediction limit because censored data exceeded 50%. Limit is highest of 8 background values. 87.5% NDs. Well-constituent pair annual alpha = 0.04242. Individual comparison alpha = 0.02144 (1 of 2).

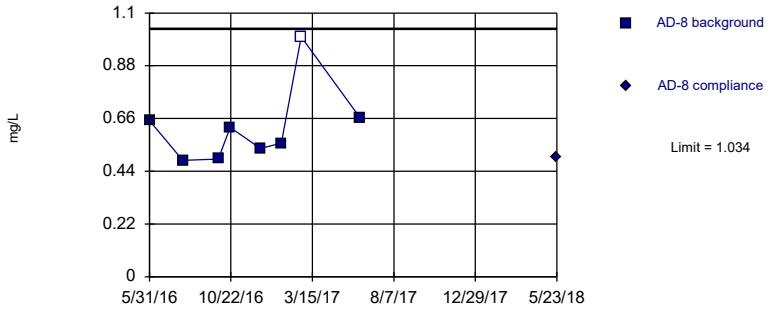
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=0.6258, Std. Dev.=0.166, n=8, 12.5% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7879, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

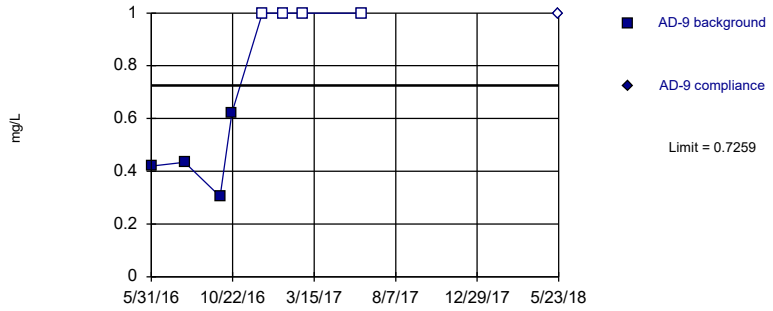
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG
Hollow symbols indicate censored values.

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (after Kaplan-Meier Adjustment): Mean=0.4449, Std. Dev.=0.1143, n=8, 50% NDs. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.786, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

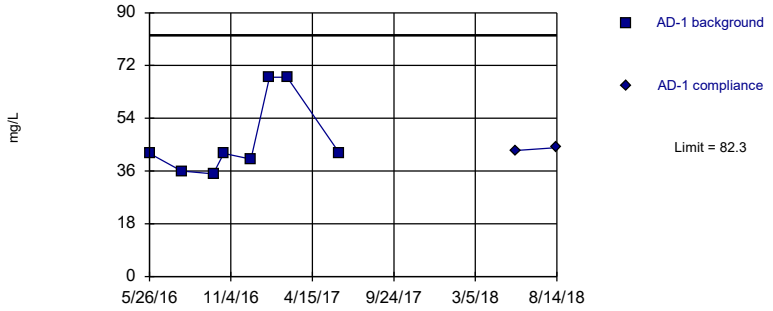
Constituent: Fluoride, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

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.

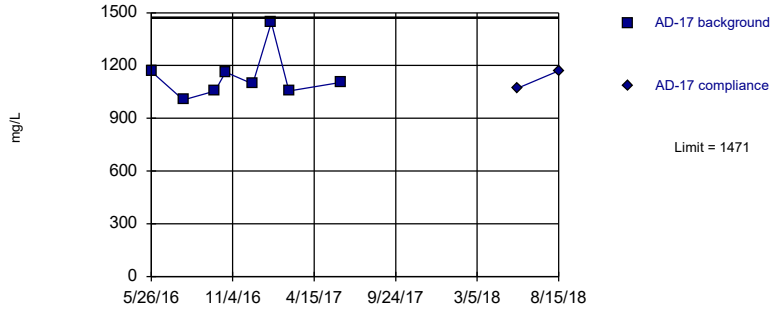
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



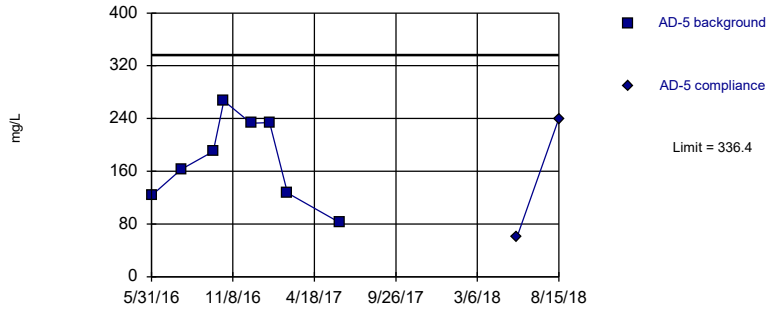
Background Data Summary: Mean=1136, Std. Dev.=136.3, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.7916, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

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 12/9/2018 2:17 PM View: PL's - Intrawell

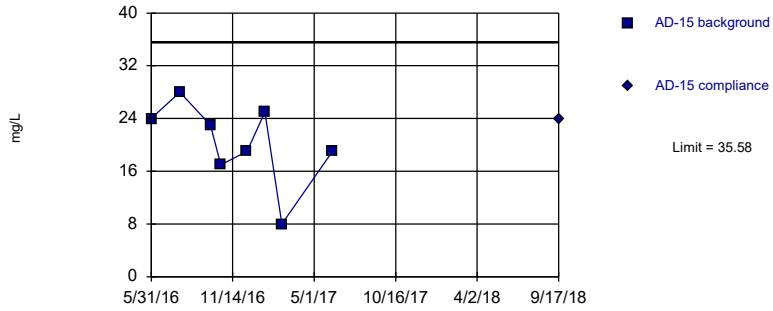
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=20.38, Std. Dev.=6.186, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9238, 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 12/9/2018 2:17 PM View: PL's - Intrawell

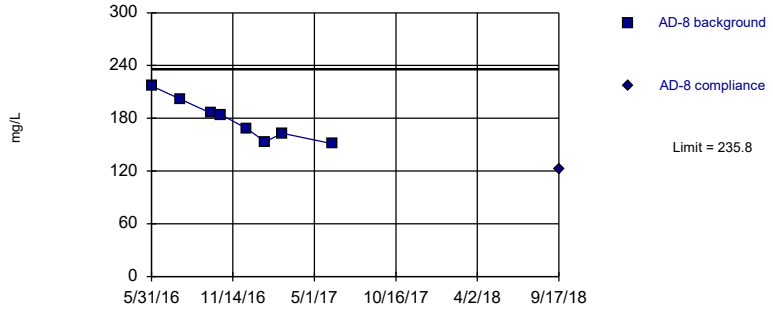
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=178, Std. Dev.=23.53, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9398, 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 12/9/2018 2:17 PM View: PL's - Intrawell

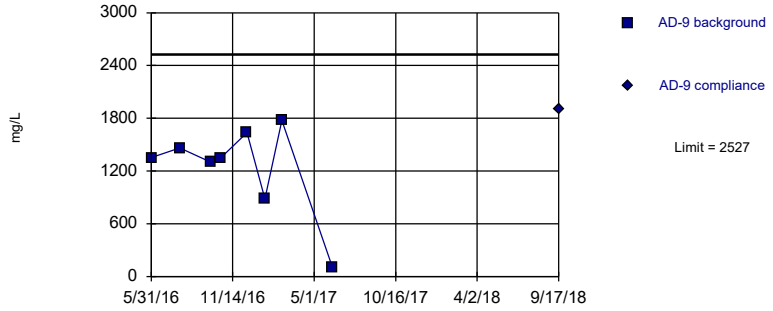
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=1234, Std. Dev.=526.1, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8423, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

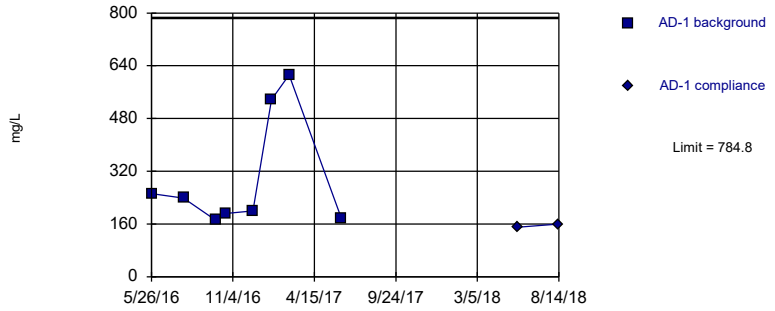
Constituent: Sulfate, total Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

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.

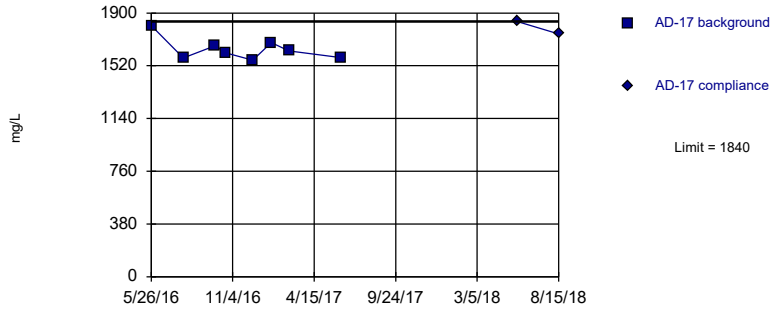
Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

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.

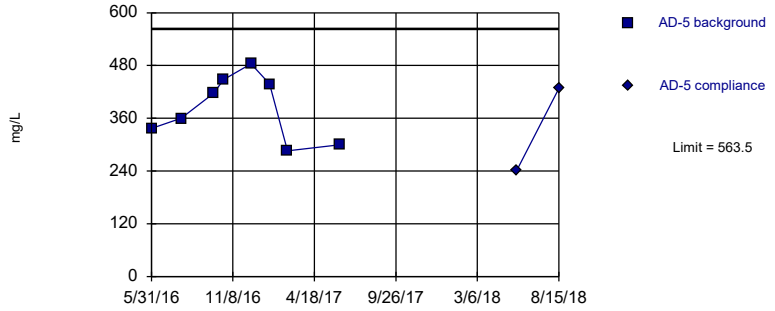
Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

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.

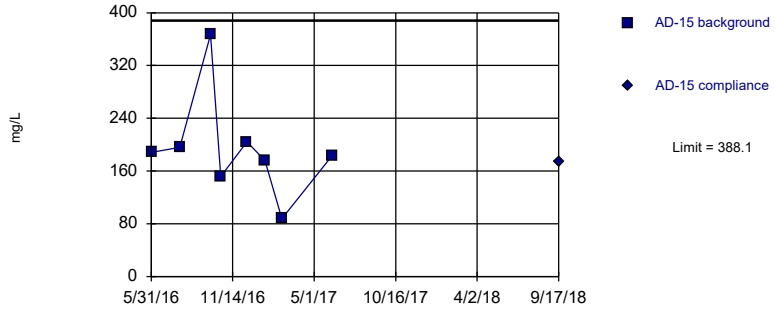
Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



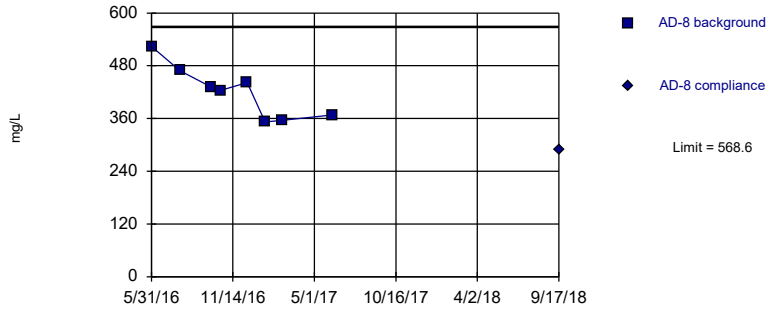
Background Data Summary: Mean=194.4, Std. Dev.=78.82, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.8214, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary: Mean=420.9, Std. Dev.=60.09, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.9284, critical = 0.749. Kappa = 2.458 (c=7, w=3, 1 of 2, event alpha = 0.05132). Report alpha = 0.002505.

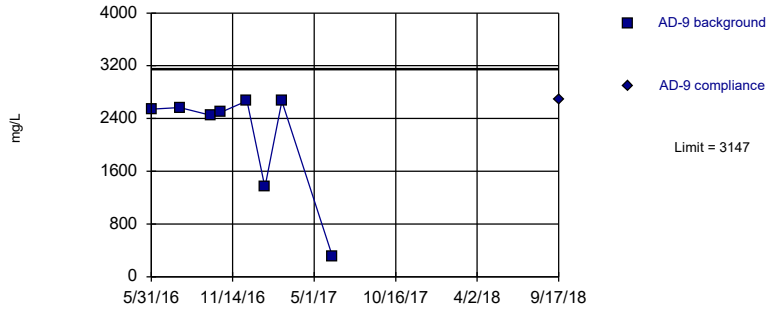
Constituent: Total Dissolved Solids Analysis Run 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Within Limit

Prediction Limit

Intrawell Parametric



Background Data Summary (based on cube transformation): Mean=1.3e10, Std. Dev.=7.4e9, n=8. Normality test: Shapiro Wilk @alpha = 0.01, calculated = 0.759, 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 12/9/2018 2:17 PM View: PL's - Intrawell
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

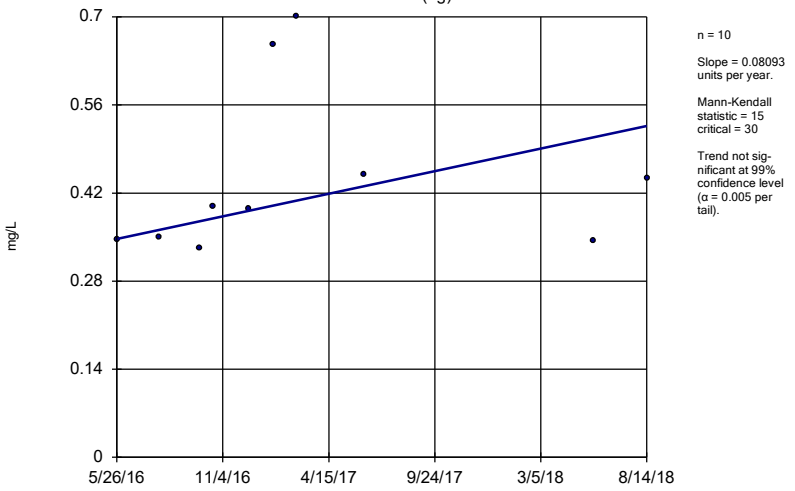
Trend Test Summary Table - All Results (No Significant Results)

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/16/2018, 8:17 AM

Constituent	Well	Slope	Calc.	Critical	Sig.	N	%NDs	Normality	Xform	Alpha	Method
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
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-8	-0.02005	-1	-25	No	9	0	n/a	n/a	0.01	NP
pH, field (SU)	AD-1 (bg)	-0.1093	-10	-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
pH, field (SU)	AD-15	-0.05	-5	-30	No	10	0	n/a	n/a	0.01	NP

Sen's Slope Estimator

AD-1 (bg)



n = 10

Slope = 0.08093 units per year.

Mann-Kendall statistic = 15 critical = 30

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

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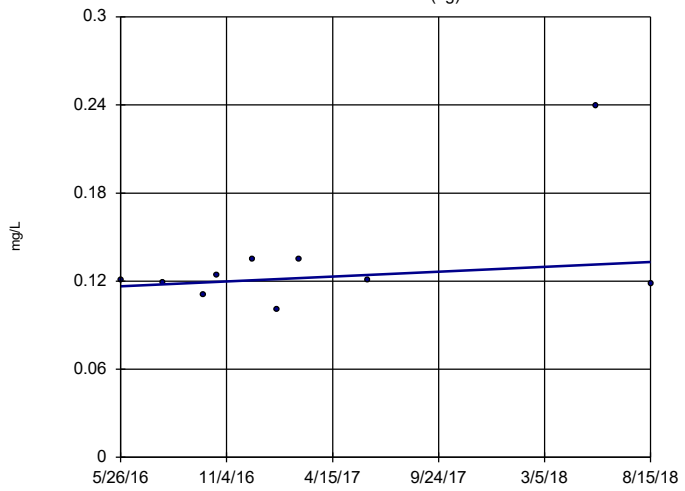
Sen's Slope Estimator

AD-17 (bg)



n = 10

Slope = 0.007399 units per year.

Mann-Kendall statistic = 7 critical = 30

Trend not significant at 99% confidence level (α = 0.005 per tail).

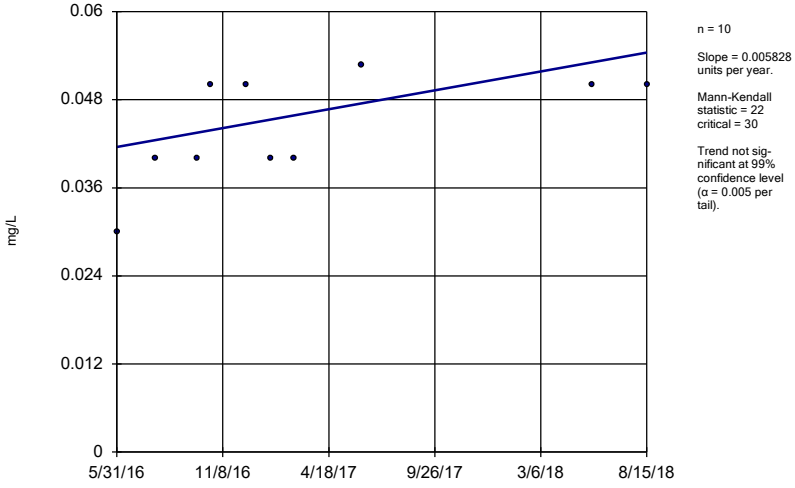
Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

AD-5 (bg)



n = 10

Slope = 0.005828 units per year.

Mann-Kendall statistic = 22 critical = 30

Trend not significant at 99% confidence level (α = 0.005 per tail).

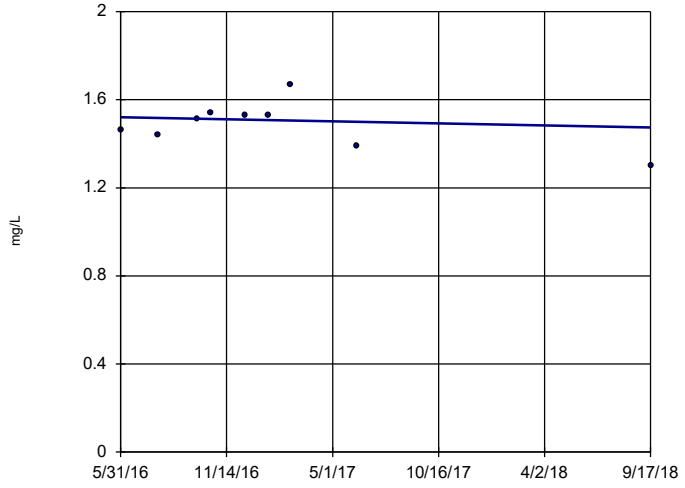
Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

AD-8



n = 9

Slope = -0.02005 units per year.

Mann-Kendall statistic = -1 critical = -25

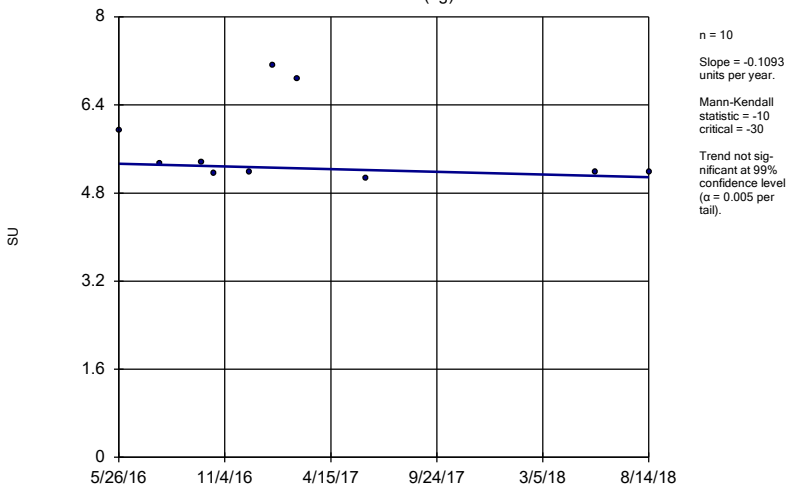
Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: Boron, total Analysis Run 12/16/2018 8:16 AM View: Trend Tests

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sen's Slope Estimator

AD-1 (bg)



n = 10

Slope = -0.1093 units per year.

Mann-Kendall statistic = -10 critical = -30

Trend not significant at 99% confidence level (α = 0.005 per tail).

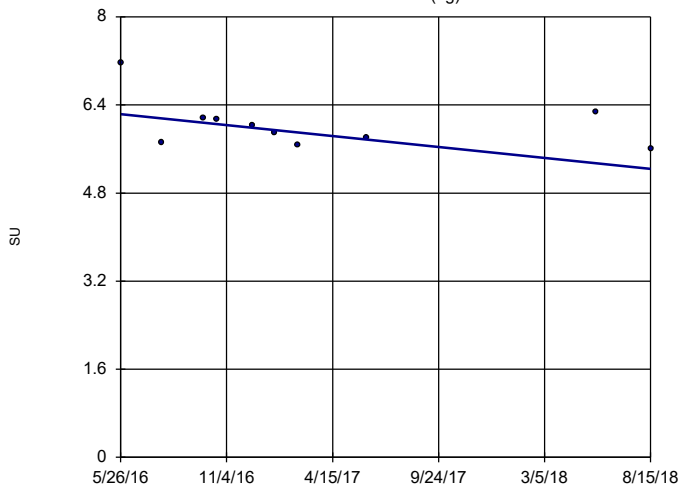
Constituent: pH, field Analysis Run 12/16/2018 8:16 AM View: Trend Tests

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

AD-17 (bg)



n = 10

Slope = -0.4462 units per year.

Mann-Kendall statistic = -19 critical = -30

Trend not significant at 99% confidence level (α = 0.005 per tail).

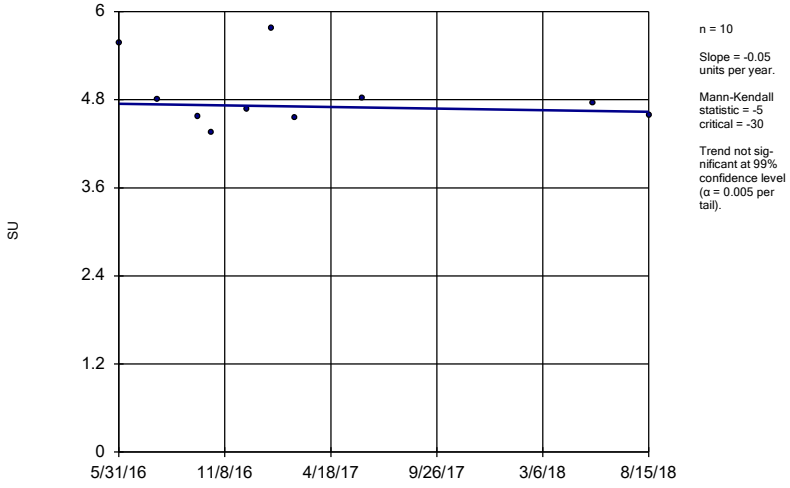
Constituent: pH, field Analysis Run 12/16/2018 8:16 AM View: Trend Tests

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Sanitas™ v.9.6.11 Sanitas software utilized by Groundwater Stats Consulting. UG

Sen's Slope Estimator

AD-15



n = 10

Slope = -0.05 units per year.

Mann-Kendall statistic = -5 critical = -30

Trend not significant at 99% confidence level (α = 0.005 per tail).

Constituent: pH, field Analysis Run 12/16/2018 8:16 AM View: Trend Tests

Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Upper Tolerance Limits - Appendix IV

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/9/2018, 2:38 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)	0.001251	30	n/a	n/a	86.67	n/a	n/a	0.2146	NP Inter(NDs)

Confidence Intervals - Significant Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/9/2018, 2:44 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Lithium, total (mg/L)	**AD-9**	**1.412**	**0.9353**	**0.39**	**Yes**	**10**	**0**	**No**	**0.01**	**Param.**

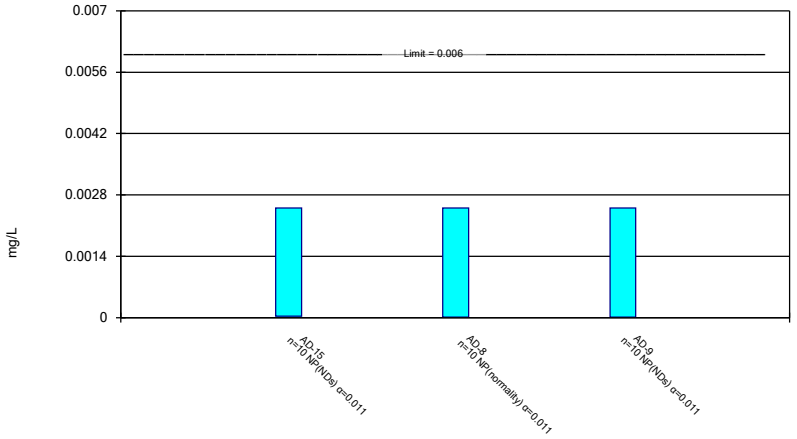
Confidence Intervals - All Results

Welsh PBAP Client: Geosyntec Data: Welsh PBAP Printed 12/9/2018, 2:44 PM

Constituent	Well	Upper Lim.	Lower Lim.	Compliance	Sig.	N	%NDs	Transform	Alpha	Method
Antimony, total (mg/L)	AD-15	0.0025	0.00003	0.006	No	10	90	No	0.011	NP (NDs)
Antimony, total (mg/L)	AD-8	0.0025	0.00001	0.006	No	10	70	No	0.011	NP (normality)
Antimony, total (mg/L)	AD-9	0.0025	0.00001	0.006	No	10	90	No	0.011	NP (NDs)
Arsenic, total (mg/L)	AD-15	0.02801	0.003648	0.01	No	10	0	ln(x)	0.01	Param.
Arsenic, total (mg/L)	AD-8	0.0025	0.00031	0.01	No	10	80	No	0.011	NP (NDs)
Arsenic, total (mg/L)	AD-9	0.0025	0.00168	0.01	No	10	90	No	0.011	NP (NDs)
Barium, total (mg/L)	AD-15	0.5012	0.09935	2	No	10	0	ln(x)	0.01	Param.
Barium, total (mg/L)	AD-8	0.02657	0.01924	2	No	10	0	x^(1/3)	0.01	Param.
Barium, total (mg/L)	AD-9	0.05147	0.02327	2	No	10	0	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-15	0.002922	0.0001454	0.004	No	10	0	ln(x)	0.01	Param.
Beryllium, total (mg/L)	AD-8	0.0005	0.000008	0.004	No	10	60	No	0.011	NP (normality)
Beryllium, total (mg/L)	AD-9	0.001065	0.000306	0.004	No	10	0	sqrt(x)	0.01	Param.
Cadmium, total (mg/L)	AD-15	0.001225	0.00006409	0.0065	No	10	10	ln(x)	0.01	Param.
Cadmium, total (mg/L)	AD-8	0.0005	0.00002	0.0065	No	10	90	No	0.011	NP (NDs)
Cadmium, total (mg/L)	AD-9	0.002112	0.0004252	0.0065	No	10	0	No	0.01	Param.
Chromium, total (mg/L)	AD-15	0.07284	0.001981	0.1	No	10	0	x^(1/3)	0.01	Param.
Chromium, total (mg/L)	AD-8	0.0007512	0.00005	0.1	No	10	50	No	0.011	NP (normality)
Chromium, total (mg/L)	AD-9	0.0005	0.0002622	0.1	No	10	80	No	0.011	NP (NDs)
Cobalt, total (mg/L)	AD-15	0.02826	0.004545	0.075	No	10	0	ln(x)	0.01	Param.
Cobalt, total (mg/L)	AD-8	0.007648	0.004634	0.075	No	10	0	No	0.01	Param.
Cobalt, total (mg/L)	AD-9	0.0308	0.01499	0.075	No	10	0	No	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-15	4.273	1.398	5	No	10	0	ln(x)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-8	2.718	0.4242	5	No	10	0	x^(1/3)	0.01	Param.
Combined Radium 226 + 228 (pCi/L)	AD-9	2.865	1.65	5	No	10	0	No	0.01	Param.
Fluoride, total (mg/L)	AD-15	0.5	0.2621	4	No	9	88.89	No	0.002	NP (NDs)
Fluoride, total (mg/L)	AD-8	0.6628	0.485	4	No	9	11.11	No	0.002	NP (normality)
Fluoride, total (mg/L)	AD-9	0.5584	0.3926	4	No	9	55.56	No	0.01	Param.
Lead, total (mg/L)	AD-15	0.022	0.000438	0.015	No	10	20	No	0.011	NP (Cohens/xfrm)
Lead, total (mg/L)	AD-8	0.0025	0.000039	0.015	No	10	90	No	0.011	NP (NDs)
Lead, total (mg/L)	AD-9	0.0025	0.000262	0.015	No	10	90	No	0.011	NP (NDs)
Lithium, total (mg/L)	AD-15	0.04766	0.005034	0.39	No	10	0	x^(1/3)	0.01	Param.
Lithium, total (mg/L)	AD-8	0.1197	0.08187	0.39	No	10	0	No	0.01	Param.
Lithium, total (mg/L)	**AD-9**	**1.412**	**0.9353**	**0.39**	**Yes**	**10**	**0**	**No**	**0.01**	**Param.**
Mercury, total (mg/L)	AD-15	0.000707	0.0000125	0.002	No	9	11.11	No	0.002	NP (normality)
Mercury, total (mg/L)	AD-8	0.00002103	0.000008	0.002	No	9	55.56	No	0.002	NP (normality)
Mercury, total (mg/L)	AD-9	0.000045	0.000006	0.002	No	9	33.33	No	0.002	NP (Cohens/xfrm)
Molybdenum, total (mg/L)	AD-15	0.005266	0.0005303	0.1	No	10	30	No	0.01	Param.
Molybdenum, total (mg/L)	AD-8	0.0025	0.00016	0.1	No	10	60	No	0.011	NP (normality)
Molybdenum, total (mg/L)	AD-9	0.0025	0.00011	0.1	No	10	90	No	0.011	NP (NDs)
Selenium, total (mg/L)	AD-15	0.003463	0.0009	0.05	No	10	20	No	0.011	NP (Cohens/xfrm)
Selenium, total (mg/L)	AD-8	0.0025	0.00007	0.05	No	10	60	No	0.011	NP (normality)
Selenium, total (mg/L)	AD-9	0.003528	0.0003	0.05	No	10	40	No	0.011	NP (Cohens/xfrm)
Thallium, total (mg/L)	AD-15	0.00137	0.00009	0.002	No	10	70	No	0.011	NP (normality)
Thallium, total (mg/L)	AD-8	0.001185	0.000129	0.002	No	10	70	No	0.011	NP (normality)
Thallium, total (mg/L)	AD-9	0.001776	0.000062	0.002	No	10	60	No	0.011	NP (normality)

Non-Parametric Confidence Interval

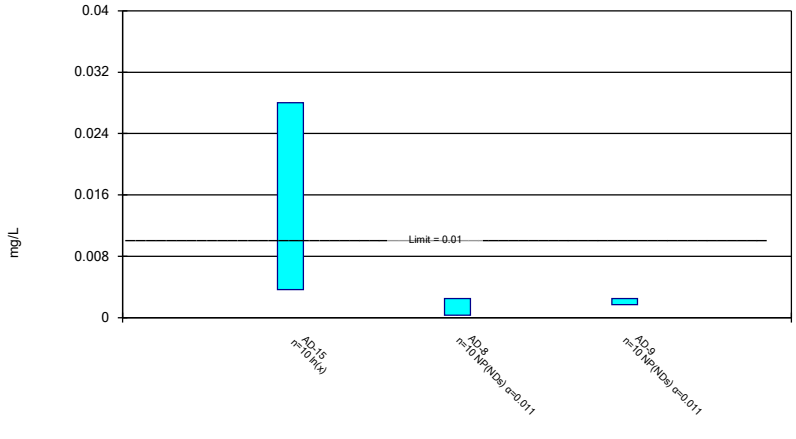
Compliance Limit is not exceeded.



Constituent: Antimony, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric and Non-Parametric (NP) Confidence Interval

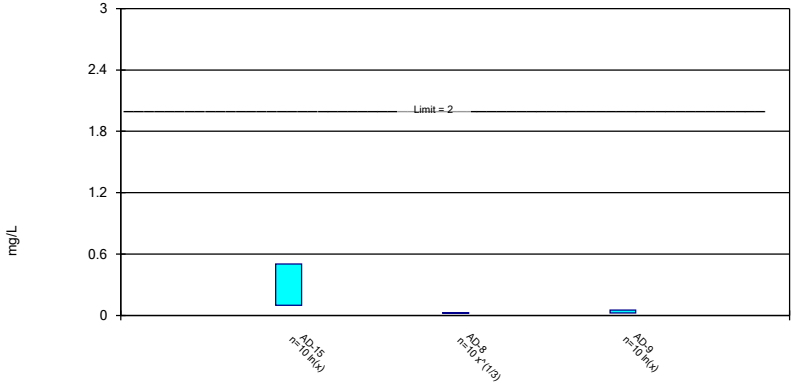
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Arsenic, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric Confidence Interval

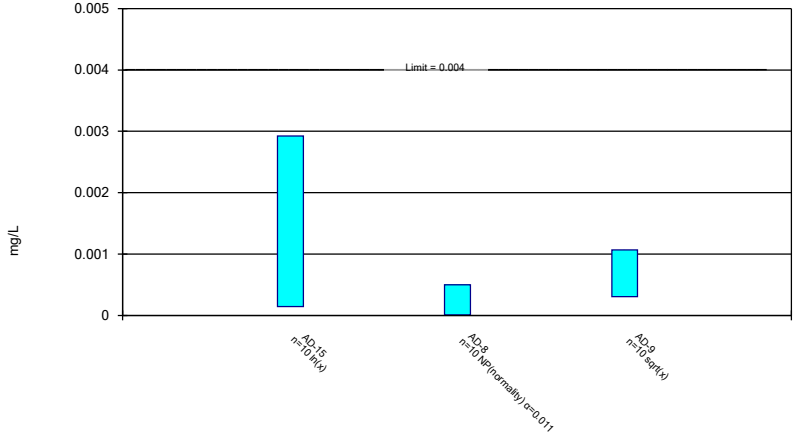
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Barium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric and Non-Parametric (NP) Confidence Interval

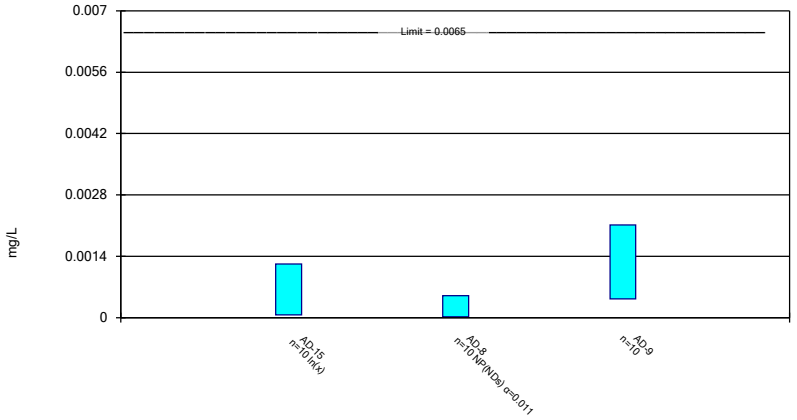
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Beryllium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric and Non-Parametric (NP) Confidence Interval

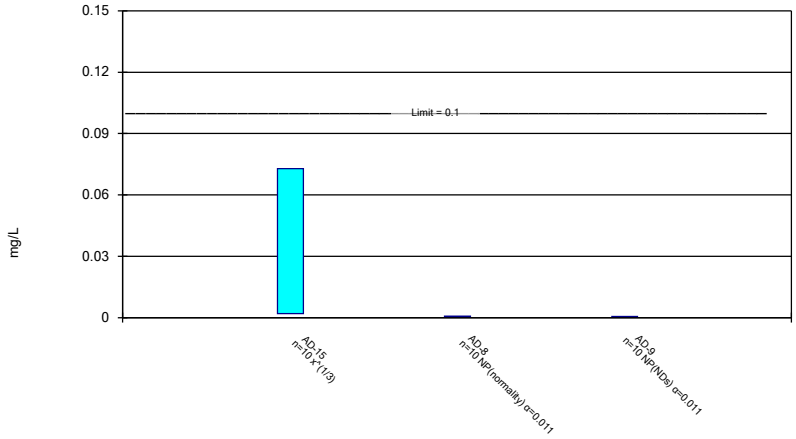
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cadmium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric and Non-Parametric (NP) Confidence Interval

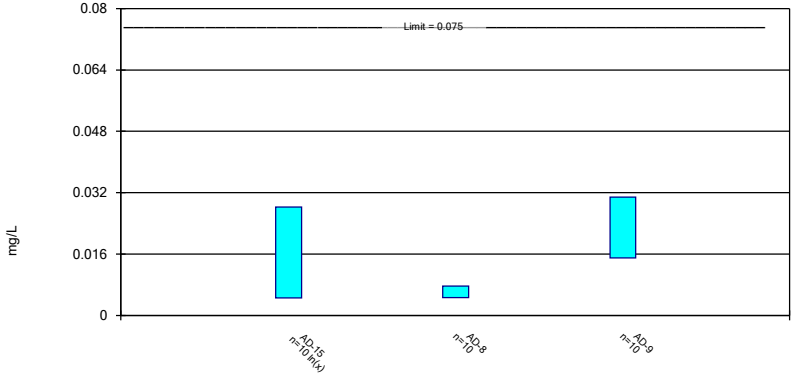
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Chromium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric Confidence Interval

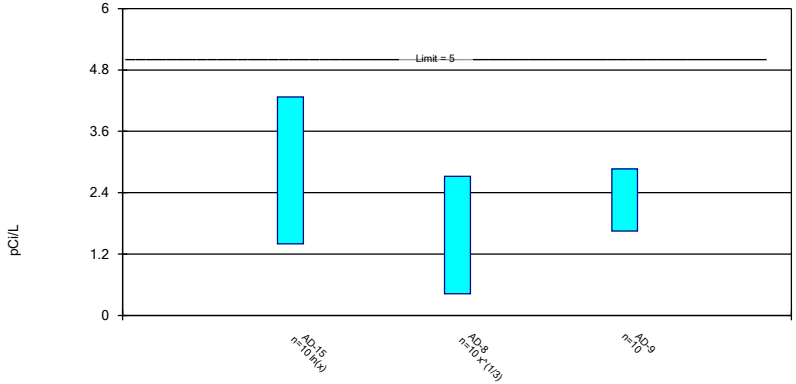
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Cobalt, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric Confidence Interval

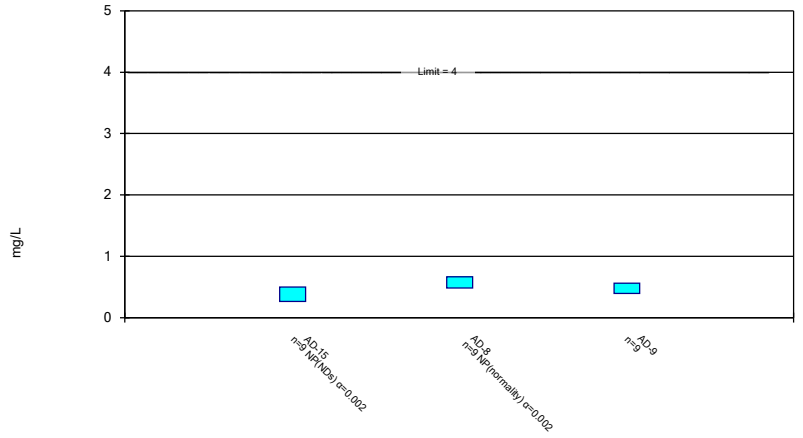
Compliance Limit is not exceeded. Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Combined Radium 226 + 228 Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals -
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric and Non-Parametric (NP) Confidence Interval

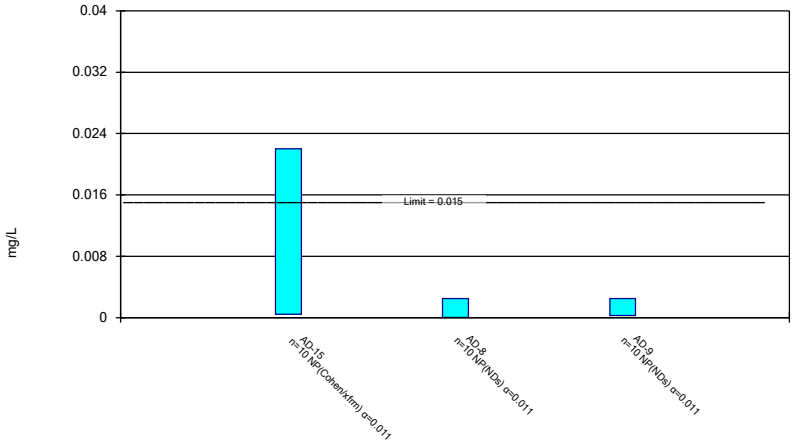
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Fluoride, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Non-Parametric Confidence Interval

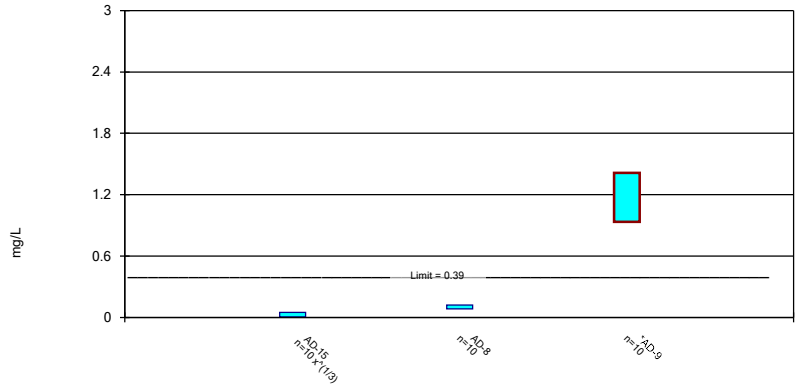
Compliance Limit is not exceeded.



Constituent: Lead, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric Confidence Interval

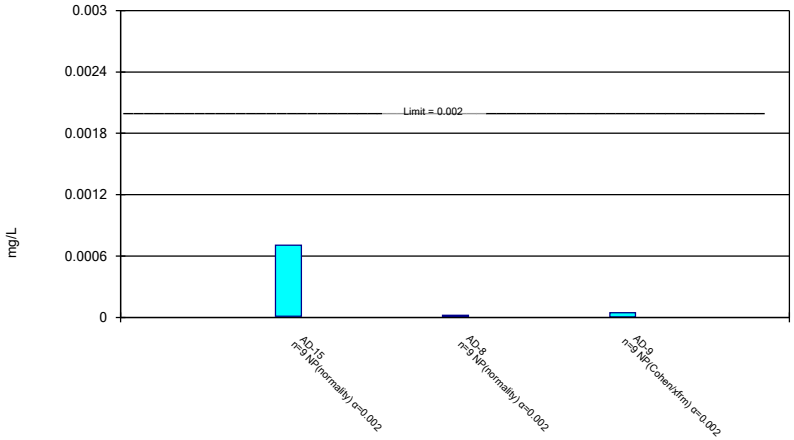
Compliance limit is exceeded.* Per-well alpha = 0.01. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Lithium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Non-Parametric Confidence Interval

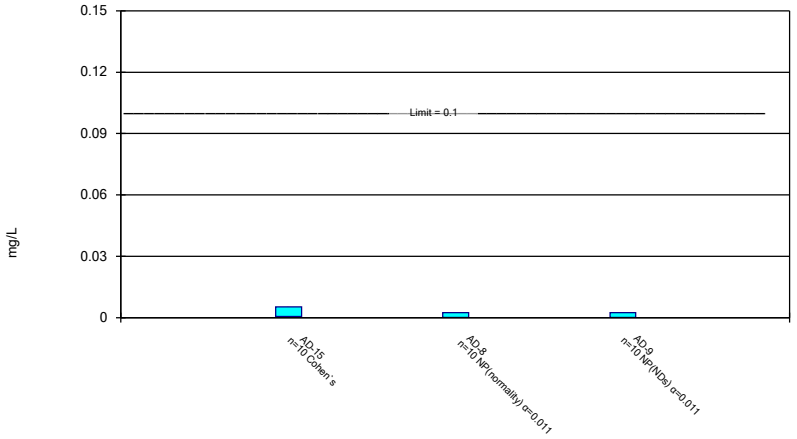
Compliance Limit is not exceeded.



Constituent: Mercury, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Parametric and Non-Parametric (NP) Confidence Interval

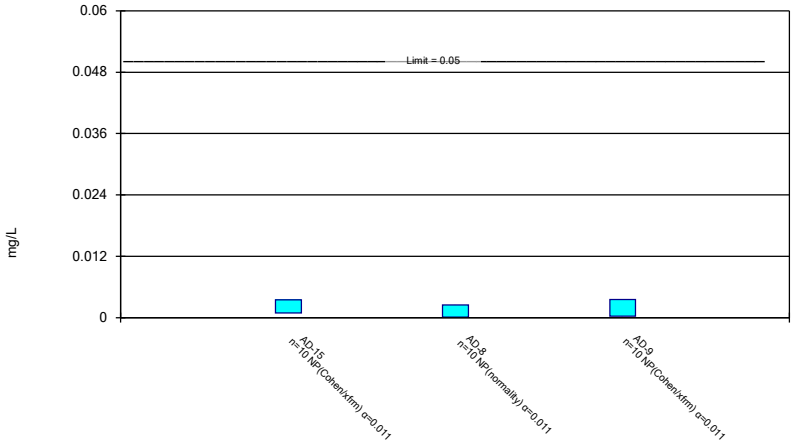
Compliance Limit is not exceeded. Per-well alpha = 0.01 except as noted. Normality Test: Shapiro Wilk, alpha based on n.



Constituent: Molybdenum, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Non-Parametric Confidence Interval

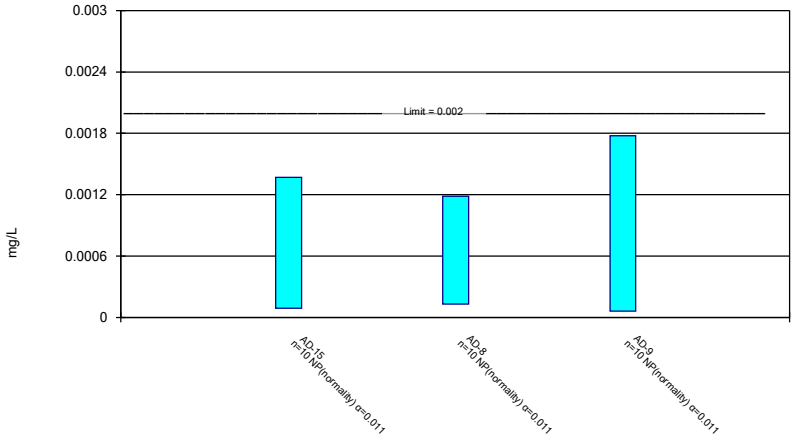
Compliance Limit is not exceeded.



Constituent: Selenium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP

Non-Parametric Confidence Interval

Compliance Limit is not exceeded.



Constituent: Thallium, total Analysis Run 12/9/2018 2:41 PM View: Confidence Intervals - App IV
Welsh PBAP Client: Geosyntec Data: Welsh PBAP