NM2 - ___19_____

Facility Background Review

__March 15, 2022___

Jones, Brad A., EMNRD

From: Jones, Brad A., EMNRD
Sent: Tuesday, March 15, 2022 10:33 AM
To: Boultinghouse, Stacy
Cc: Christine.Mathews@ghd.com; 'wes.dyck@ghd.com'
Subject: Revised Facility Background Review
Attachments: 2022 0315 NM2-019 ETC Texas Pipeline Ltd Limited Partnership Revised Facility Background Review signed.pdf

Stacy,

Please see the attached. OCD has completed the review of the revised facility background demonstration. If you have any questions regarding this matter, please do not hesitate to contact me.

Sincerely,

Brad Jones

Brad A. Jones ● Environmental Scientist Specialist - Advanced
Environmental Bureau
EMNRD - Oil Conservation Division
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State of New Mexico
Energy, Minerals and Natural Resources Department

Michelle Lujan Grisham
Governor

Sarah Cottrell Propst
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Deputy Secretary

Adrienne Sandoval, Division Director
Oil Conservation Division

March 15, 2022

Stacy Boultinghouse
ETC Texas Pipeline Ltd., Limited Partnership
8111 Westchester Dr., Suite 600
Dallas, Texas 75225

Re: Revised Facility Background Review
ETC Texas Pipeline Ltd., Limited Partnership (OGRID 328923)
Permit NM2-019
Location: Unit F of Section 36, Township 23 South, Range 36 East, NMPM,
Lea County, New Mexico

Ms. Boultinghouse:

The Oil Conservation Division (OCD) has completed its review of ETC Texas Pipeline Ltd., Limited Partnership's (ETC) response to OCD's initial review of the facility background demonstration for Jal No. 4 Landfarm under OCD permit NM2-019. OCD has determined that it is unable to consider the proposed assessment of a 99/95 UTL, based upon a review of the administrative record and the discovery of a previous written approval from OCD for a 95/95 UTL to Regency Energy Partners, LP (Regency).

On July 24, 2014, OCD approved the background sampling plan that was included in the 2013 Annual Report and 5-Year Monitoring Report, prepared by Apex TITAN, Inc. on the behalf of Regency. In Section 2.0, Background Sampling, Regency/Apex proposed the following: "An accepted statistical method for determining a background value from a normally distributed set of data will be the 95% upper tolerance limit (UTL). The UTL represents a value that 95% of the population will fall below with 95% confidence. The proposed sampling will be an adequate number of samples for the UTL to represent site background conditions." The July 24, 2014 OCD approval and 2013 Annual Report and 5-Year Monitoring Report can be accessed from the administrative records in OCD Imaging through the following hyperlink:
https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafeadmin/ao/258454/pmjk0131033037_13_ao.pdf

On November 14, 2016 OCD approved ETC Field Services LLC's request to use the statistical software program ProUCL to calculate background concentrations for the assessment of treatment zone performance standards of Subsection F of 19.15.36.15 NMAC and for the comparison to the vadose zone monitoring results to determine whether a release has occurred. The November 14, 2016 OCD approval and ETC/GHD August 24, 2016 email request can be accessed from the administrative records in OCD Imaging through the following hyperlink:
https://ocdimage.emnrd.nm.gov/Imaging/FileStore/santafeadmin/ao/258468/nm2-19_11_15_2016_07_56_56_a.pdf

In accordance with 19.15.36.20.A NMAC, "Existing surface waste management facilities shall comply with the financial assurance, operational, monitoring, waste acceptance and closure and post closure requirements provided in 19.15.36 NMAC, *except as otherwise specifically provided in the applicable permit or order, or in a specific waiver, exception, or agreement that the division has granted in writing to the particular surface waste management facility*." In 2015 when ETC took control of Regency's assets, ETC became subject to the July 24, 2014 OCD approval to calculate a 95/95 UTL. Currently based upon written approvals by OCD, the owner/operator of the surface waste management facility landfarm under Permit NM2-019 is approved to use ProUCL to calculate 95/95 UTLs for the facility background.

OCD wishes to clarify that the outstanding issue with considering a 99/95 UTL is the 2014 background data set. The analytical results from the August 5, 2014 sampling event demonstrated detections of TPH by EPA method 418.1 in all 12 background samples. The detected concentrations that were reported to OCD are as follows: BG-1 at 370 mg/kg; BG-2 at 97.7 mg/kg; BG-3 at 304; BG-4 at 296 mg/kg; BG-5 at 208 mg/kg; BG-6 at 567; BG-7 at 285; BG-8 at 199 mg/kg; BG-9 at 198 mg/kg; BG-10 at 1110 mg/kg; BG-11 at 313 mg/kg; and BG-12 at 122 mg/kg. The 2014 TPH results were replaced by the GRO, DRO. and MRO results obtained from the sampling event that occurred between May 30 and May 31, 2017.

In ETC's response to OCD's initial review of the facility background demonstration, ETC/GHD states "Additional scrutiny was given to the data to look for evidence of sampling or laboratory error in the outlier data. The background samples were collected along the perimeter of the landfarm, three samples to the north, south, east, and west, outside of the facility boundary in areas free from impacts and indicative of native soil." ETC/GHD concludes that "No scientific reason was identified to exclude the apparent outliers from the background data set." The detection of TPH in all the 2014 background samples contradicts the assessment and conclusion. The results of the 2014 background sampling event do not represent a background free from impacts with the detection of TPH in each of the 12 background samples. The results for the remaining constituents from the 2014 data set may be elevated and include outliers. OCD is concerned that calculated 99/95 UTLs, based on the use of the impacted background sample results of the 2014 data set (representing 42 of the 43 or 97.7 % of the constituents), will result in the reporting false negative results.

If ETC wishes to pursue the use of calculated 99/95 UTLs, ETC must resubmit the facility background demonstration that includes an assessment of the 2014 background data set and recognizes the detection of TPH in all the samples. It should also address the influence on the use of laboratory analytical results of the remaining constituents from the 2014 background sampling event can have when calculating a 99/95 UTL. The facility background demonstration needs to be a completely new request with an updated and revised written proposal that includes the laboratory analytical results with their associated chain of custody and QA/QC documents to support the results in the tables and the written assessment. This request should be submitted through OCD Permitting as a C-137 Non-Fee SWMF Submittal.

If ETC does not wish to pursue the use of calculated 99/95 UTLs, then please submit completely new facility background request with an updated and revised written assessment based the use of ProUCL to assess the background to calculate 95/95 UTLs and include the laboratory analytical results with their associated chain of custody and QA/QC documents to support the results in the tables and the written assessment. This request should be submitted through OCD Permitting as a C-137 Non-Fee SWMF Submittal.

Below is OCD's review of ETC's response to OCD's initial review of the facility background demonstration. The review comments regarding Methylene Chloride, Cyanide, and sum of GRO and DRO must be addressed regardless, if ETC pursues the use of calculated 99/95 UTLs or the use of calculated 95/95 UTLs. The review comments regarding Chloride are specific to the ProUCL 99/95 UTL demonstration. Please make the applicable adjusts.

Table 1, Background Sample Analytical Results:

Please remove the "Jb" qualifier indicator associated with Methylene Chloride non-detect results. It is not supported by the laboratory analytical results.

Table 2, Data Summary and Calculated Background Values:

Update the Background Value Method for Cyanide to detection limit to coincide with the reassessment of the 100% non-detect data set. It is no longer non-parametric. Also perform the same task for Methylene Chloride.

OCD is unable to accept the proposed KM Lognormal UTL of 14.39 for Chloride due to the ProUCL output conclusion demonstrating that the data set does not have a lognormal distribution. Please see OCD's review comments for Chloride, under Attachment B, Output from ProUCL, below.

Regarding the proposed background concentration of sum of GRO and DRO, OCD wishes to clarify that the sum of GRO, DRO and MRO for TPH is required for the assessment of the vadose zone samples. The existing permit conditions and the transitional requirements of 19.15.36.20.A NMAC do not require a facility background concentration of the sum of GRO and DRO for the purpose of vadose zone and/or treatment zone monitoring. Please omit.

Attachment B, Output from ProUCL:

Chloride: OCD is unable to accept the proposed KM Lognormal UTL of 14.39 for Chloride due to the ProUCL output conclusions demonstrating that the data set does not have a normal, gamma, or lognormal distribution. The Chloride Background Statistics for Data Sets with Non-Detects bootstrap demonstration outputs conclude the following in red: Data Not Lognormal at 5% Significance Level. The output conclusion under the Nonparametric Distribution Free Background Statistics heading does clarify in the blue recommendation: Data do not follow a Discernible Distribution (0.05). Highlight the appropriate value on the output from ProUCL and update Table 2 accordingly.

If there are any questions regarding this matter, please do not hesitate to email me at brad.a.jones@state.nm.us.

Respectfully,

Brad A. Jones
Environmental Specialist

Cc: Wesley Dyck, GHD
Christine Mathews, GHD

Jones, Brad A., EMNRD

From: Boultinghouse, Stacy <Stacy.Boultinghouse@energytransfer.com>
Sent: Tuesday, January 15, 2019 2:44 PM
To: Jones, Brad A., EMNRD; Griswold, Jim, EMNRD
Cc: Christine.Mathews@ghd.com; Boultinghouse, Stacy; cctofiling@craworld.com
Subject: [EXT] Response to Comments re: April 2018 Determination of Soil Background Values
Attachments: 2018 0627 OCD comments 082148Jones-2 Determination of Soil Background Va....pdf; 082148Jones4-Responses to Comments on Determination of Soil Background V....pdf

Good afternoon.

Please find attached the Response to Comments on the Determination of Soil Background Values dated April 2, 2018 (with comments dated June 27, 2018). A courtesy copy of the referenced document is provided. This additional documentation should suffice to further report the statistical methods & results for the required background concentration calculations.

If you have any questions regarding this response, please do not hesitate to reach out directly to GHD.

Thank you.

"of all the paths you take in life,
make sure a few of them are dirt"

Stacy Boultinghouse, PG(TX4889/LA73)
EH&S Environmental-Sr. Manager
Emergency Response/Remediation/ Waste/Water
Energy Transfer Partners
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January 14, 2019 Reference No. 082148

Mr. Brad Jones
Energy Minerals and Natural Resources Department
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Dear Mr Jones:

Re: Responses to Comments on Determination of Soil Background Values
Landfarm Permit No. NW 02 0019
Lea County, New Mexico

Comment #1 (Page 1, Section 2, end of first paragraph*):* *The approved data set was not utilized for this demonstration*

Response #1: As noted by NMEMNRD, a preliminary data set which included estimated (J-qualified) data was used in the calculations. The statistical assessment has been repeated with the final approved data set.

Comment #2 (Page 1, Section 2, end of second paragraph): *Part 36 identifies TPH as being analyzed by EPA Method 418.1 or an equivalent that represents C6-C36. Please rewrite to clarify the difference between TPH and GRO/DRO combined fraction.*

Response #2: The original text is written as "Additional samples collected from similar locations in 2017 were analyzed for full range TPH by EPA Method 8015 only." Full range TPH includes all fractions of TPH, gasoline range, diesel range, and oil range, which represent C6-C36. Gasoline range, diesel range, and oil range are each reported individually by the laboratory and can be combined as needed to provide concentrations of each or a mix of fractions, for instance GRO and DRO.

Comment #3 (Page 2, top line): *Only 31 of the 33 [20 NMAC 6.2.3103 Subsection A pollutants] were identified and represented on Table 2*

Response #3: As noted, two pollutants were inadvertently omitted from the table. The missing two (PAHs – naphthalene sum; and benzo[a]pyrene) have been added to the revised Table 2.

Comment #4 (Page 2, Section 3, second paragraph): *Please justify the 99/95 UTL based upon a data set of 12 or less (outliers) based upon the consideration expressed in Section 3.12, Confidence Coefficient (CC) and Sample Size, pages 103 and 104 of the ProUCL 5.1 Technical Guide*

GHD
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T 505 884 0672 **F** 505 884 4932 **W** www.ghd.com

Response #4: The confidence coefficient used in the background calculations, as indicated on each ProUCL output, is 95 percent. The ProUCL Technical Guide (last line of page 103) indicates that "In most practical applications, choice of a 95% CC provides a good compromise between confidence and power". Furthermore, this level of confidence is encountered frequently in Federal and State regulations and guidance, for example USEPA 1992; 2002; 2009; and NAVFAC 2002.

Regarding the number of background data available (n=12), this number exceeds minimum requirements for background calculations (e.g., 8-10 observations per USEPA 2009 and 2015; 4 samples per USEPA 1995).

A coverage of 0.99 was selected for UTL calculations. This selection considered the confidence coefficient and the number of comparisons to be conducted on an annual basis. With a confidence coefficient of 95 percent, comparing annual monitoring data for 14 metals at each of 15 cells for both treatment zone and vadose zone locations, a total of 420 statistical contrasts will be made each year. In theory, the site-wide false positive rate (SWFPR) for such a monitoring program could be as high as 1-(1-0.05)^420 ≈ 1 (see the first equation in Section 6.2.2 of USEPA, 2009). This suggests that obtaining false positive results every year is virtually assured. To help reduce the false positive rate while still achieving a sensitive test, verification of initial observations above a UTL with a second sample before concluding an increase above background is recommended. This reduces the potential annual SWFPR to 1-(1-0.05^2)^420 = 0.65 (or 65 percent). Recognizing that this is still a substantial probability for false positives, selecting a coverage of 0.99 provides slightly more protection against false positive results than, for example, using a coverage of 0.95 (another common coverage level).

For perspective, compared to corresponding values with 0.95 coverage, the 0.99 coverage values are typically 10-20 percent higher. To illustrate the effect of using a coverage of 0.99, for the 2014-2018 data exceeding UTLs for parameters with parametric UTLs (i.e., excluding those with non-parametric UTLs, in which cases the 0.95 and 0.99 coverage UTLs are equal), the large majority (81 percent) of cases are above both the 0.95 and 0.99 coverage values, and not between them. Thus, using a coverage of 0.99 will focus efforts on cases where parameter concentrations appear clearly above background conditions, and not on potential false positives occurring marginally over a 0.95 coverage value.

Comment #5 (Page 3, Section 3.1, last line): *The last sentence of this paragraph was not applied or considered [RE: "If, however, a particular data set does not fit one of these distributions, it is noted as not having an identifiable distribution and non-parametric (rank-based) statistical methods are used for subsequent calculations".*]

Response #5: Background data sets that were identified as not following a normal, gamma or lognormal distribution were subjected to additional evaluation (i.e., probability plotting and correlation coefficients, see Sections 9.5 and 10.6 of USEPA, 2009) to determine if an approximate distribution could be used for the purposes of the UTL calculations. For a background sample size of n=12 samples, a non-parametric UTL with 95 percent confidence has a coverage of γ=0.728, or just

under the 73rd percentile of background (see equation 11.13 of Gilbert, 1987). At this level of coverage, it is possible that approximately 1 in 4 samples collected from background areas could be reasonably expected to exceed the non-parametric UTL. Therefore, it is preferable to use a parametric UTL calculation for an approximate data distribution if possible. In calculating a UTL based on an approximate distribution it is possible that the desired population parameter (i.e., coverage) is not obtained (due to underestimation of the mean and standard deviation values used in UTL calculations), and that the calculated UTL is lower than the true percentile of the population, potentially leading to slightly increased rate of identifying conditions as being above background when they may be consistent with the background population. This lack of stated coverage is discussed in the context of upper confidence limit of the population mean calculations for data not following a discernable distribution in Section 2.5.1.4 of USEPA (2015), and the use of higher confidence coefficients (0.975 or 0.99) are recommended for highly-skewed data sets. Nonetheless, a potential low bias in a UTL based on an approximate distribution is preferable to the known low bias to the non-parametric coverage with the available n=12 background samples. This is the reason that non-parametric UTLs were avoided where possible (i.e., except where prevented due to high frequencies – above 50 percent – of non-detect data).

Comment #6 (Page 3, Section 3.2, first line of second paragraph): *The first sentence contradicts the instruction provided in the ProUCL 5.1 Technical Guide. Page 18, Section 1.1, Background Data Sets, states "Since the presence of outliers in a data set tends to yield distorted (poor and misleading) values of the decision making statistics (e.g., UCLs, UPLs and UTLs), elevated outliers should not be included in background data sets and estimation of BTVs. The objective here is to compute background statistics based upon a data set which represents the main background population, and does not accommodate the few low probability high outliers (e.g., coming from extreme tails of the data distribution) that may also be present in the sampled data." This statement is repeated throughout the ProUCL guides. Please follow the programs recommendations.*

Response #6: In the same paragraph of the ProUCL technical guide cited in the comment (Page 18), the following statement is made:

"The proper disposition of outliers, to include or not include them in statistical computations, should be decided by the project team. The project team may want to compute decision statistics with and without the outliers to evaluate the influence of outliers on the decision making statistics."

This approach was followed in the background calculations, as seen in the results tables showing background values with and without apparent outliers included.

Eliminating outliers from background data sets without finding a root cause (e.g., laboratory, sampling or data entry error) is not recommended in USEPA guidance. As examples:

"A data point should not be eliminated from the background data set simply because it is the highest value that was observed. The use of nonparametric hypothesis tests for background comparisons greatly reduces the sensitivity of test results to the presence of outliers." (USEPA 2002, page 4-6)

"The Unified Guidance does not recommend that outliers be removed *solely* on a statistical basis. The outlier tests can provide supportive information, but generally a reasonable rationale needs to be identified for removal of suspect outlier values (usually limited to background data**).**" (USEPA 2009, page 12-1)

"Discarding an outlier from a data set should be done with extreme caution, particularly for environmental data sets, which often contain legitimate extreme values. If an outlier is discarded from the data set, all statistical analysis of the data should be applied to both the full and truncated data set so that the effect of discarding observations may be assessed. If scientific reasoning does not explain the outlier, it should not be discarded from the data set." (USEPA 2006, page 116)

As recommended by the ProUCL Technical Guide and other USEPA guidance, the effect of identified statistical outliers on the calculated background values (UTLs) was assessed by repeating calculation with and without the outliers. Additional scrutiny was given to the data to look for evidence of sampling or laboratory error in the outlier data. The background samples were collected along the perimeter of the landfarm, three samples to the north, south, east, and west, outside of the facility boundary in areas free from impacts and indicative of native soil. . No scientific reason was identified to exclude the apparent outliers from the background data set. There is no supporting evidence to indicate that these points are not valid representatives of the background population (especially in a data set of n=12 background samples), and therefore it is important to consider them in the background calculations.

Comment #7 (Page 3, Section 3.3, first line of second paragraph): *Please provide a reference within the ProUCL 5.1 Guides that supports this position regarding the > 50 percent non-detects assessment. OCD was unable to locate this approach in neither Chapter 4 or 5 of the Technical guide. Please provide.*

Response #7: Recommendations regarding appropriate statistical evaluation for highly-censored data sets (e.g., containing more than 50 percent non-detects) are found in numerous USEPA and environmental statistics texts. The main issue for trying to apply parametric UTL methods to such data sets is that the sample mean, which is a key statistical parameter needed in the calculation, lies in the censored portion of the data set. That is, at lower proportions of censored data, an appropriate mean estimate may be obtained adjusted for the presence of non-detects, but at higher proportions this is not appropriate. Examples of guidance related to this are provided below:

"Most of the common parameters (i.e., mean, median, standard deviation, etc.) can be estimated with tolerable bias and error when no more than 50% of the values are originally non-detect and the superior non-detect fitting techniques used … The guidance generally recommends non-parametric options when non-detect data exceed 50%." (USEPA 2009, page 15-25)

"If more than 50% of the data are below the detection limit but at least 10% of the observations are quantified, then the best option is a test of proportions. Thus, if the parameter of interest is a mean, consider switching the parameter of interest to some percentile greater than the percent of data below the detection limit." (USEPA 2006, page 134)

Where no detected data are present (i.e., the entire data set is censored), then ProUCL appropriately displays a warning message that no statistical calculations have been performed. The output for these data sets was not provided in the background determination letter, but can be provided if desired by NMEMNRD. The detection limit is used for the background value in these data sets, and can be considered as a non-parametric (rank-based) UTL with a coverage of 0.73 (see Response #5 above).

Comment #8 (Page 3, Section 4, last line of first paragraph): *Please provide a reference within the ProUCL 5.1 Guides that supports this position regarding the > 50 percent non-detects assessment. OCD was unable to locate this approach in neither Chapter 4 or 5 of the Technical guide. Please provide.*

Response #8: See Response #7 above.

Comment #9 (Page 3, Section 4, first line of second paragraph: *Please re-write after assessing the approved data set.*

Response #9: See Response #1 above. Since the approved data sets contain only non-detects for cyanide and total mercury, the text in this paragraph is no longer needed and will be removed.

Comment #10 (Page 4, Section 5, end of second line): *Please justify the 99/95 UTL based upon a data set of 12 or less (outliers) based upon the consideration expressed in Section 3.12, Confidence Coefficient (CC) and Sample Size, pages 103 and 104 of the ProUCL 5.1 Technical Guide.*

Response #10: See Response #4.

Comment #11 (Table 1): *Please review the lab reports to confirm and verify all J-flag and JB valuet*

Response #11: See Response #1 above. Using the approved data set, no J or JB-flagged data remain in the calculations. Updated input data for ProUCL and output from ProUCL have been included as attachments to this correspondence.

Comment #12 (Table 2, page 1, arsenic): *Arsenic has 11 NDs (91.67%) ... not 50 %. Requires reassessment of lab data (normality, outliers, GOF Test, UTL)*

Response #12: See Response #1. The data have been reassessed using the approved data set containing 11 non-detects.

Comment #13 (Table 2, page 1, cyanide): *Cyanide has 100 % NDs... not 50 %.. The limit should be the reporting/detection limit*

Response #13: See Response #1. The data have been reassessed using the approved data set containing all non-detects

Comment #14 (Table 2, page 1, fluoride): *Fluoride has 2 NDs (16.67%) ... not 0 %. Requires reassessment of lab data (normality, outliers, GOF Test, UTL)*

Response #14: See Response #1. The data have been reassessed using the approved data set containing 2 non-detects.

Comment #15 (Table 2, page 1, lead): *Lead has 1 NDs (8.33%) ... not 0 %. Requires reassessment of lab data (normality, outliers, GOF Test, UTL)*

Response #15: See Response #1. The data have been reassessed using the approved data set containing 1 non-detect.

Comment #16 (Table 2, page 1, total mercury): *Total Mercury has 100 % NDs... not 50 %.. The limit should be the reporting/detection limit*

Response #16: See Response #1. The data have been reassessed using the approved data set containing all non-detects.

Comment #17 (Table 2, page 1, methylene chloride): *Methylene chloride has 100 % NDs... not 50 %.. The limit should be the reporting/detection limit*

Response #17: See Response #1. The data have been reassessed using the approved data set containing all non-detects.

Comment #18 (Table 2, bottom of page 1): *20.6.2.3103.A NMAC constituents 32 and 33 results and statical demonstrations are not provided in this submittal. Please provide the required background information*

Response #18: See Response #3

Comment #19 (Table 2, page 2, chloride): *Chloride has 1 NDs (8.33%) ... not 0 %. Requires reassessment of lab data (normality, outliers, GOF Test, UTL)*

Response #19: See Response #1. The data have been reassessed using the approved data set containing 1 non-detect.

Comment #20 (Table 2, page 2, manganese): *OCD ia unable to accept any of the proposed values for Manganese due to the ProUCL conclusions demonstrating that the data set does not have a normal distribution (especially lognormal). Please remove the confirmed outliers (as recommended in the Technical guide) and provide a non-parametric assessment*

Response #20: The data have been reassessed using non-parametric methods. Both ProUCL and the Unified Guidance do not provide non-parametric methods for outlier testing. USEPA's Data Quality Guidance (USEPA, 2006) does provide a method (Walsh's Test, see Section 4.4.6 of the Guidance), but it requires very large data sets (i.e., n>220 for 95 percent confidence and n>60 for 90 percent confidence). As such, there is no statistical or other basis for identifying outliers (see Response #6). The resulting non-parametric UTL for manganese is 102 mg/kg.

Comment #21 (Table 2, page 2, pH): *OCD was unable to locate any ProUCL runs to support the calculation of the proposed LTL. Please provide so that OCD can consider the LTL*

Response #21: ProUCL has been developed solely for the purpose of calculating upper statistical limits. Thus, in order to obtain lower limits summary statistics present in the ProUCL output must be used. The formulae for parametric tolerance limits for a normal distribution are found in Box 3-5 of USEPA (2006):

"A 100(1 – α)% upper tolerance limit for (1 – p)% of the population is $X + k1 \cdot s$ and a 100(1 – α)% lower tolerance limit for (1 – p)% of the population is $X - k1 \cdot s$"

Where X is the mean, s is the standard deviation, and k1 is the tolerance coefficient ("kappa" in the ProUCL output).

In order to obtain a LTL, one subtracts kappa times the standard deviation from the mean. Alternatively, by the tolerance limit symmetry, the LTL can be obtained as the mean minus (UTL-mean).

In discussion with NMEMNRD, it was stated that only an upper limit on pH was required. Therefore, Table 2 and the ProUCL output have been revised to only include the UTL calculations, as for the other analytes.

Comment #22 (Table 2, page 2, GRO and DRO): *OCD is seeking proposed limits for the constituents identified within Part 36. OCD is unable to locate a requirement in Part 36 for only GRO or only DRO. Please See 19.15.36.15.F(3)*

Response #22: Per NMEMNRD's request, the individual lines showing background values for GRO and DRO separately have been removed from Table 2.

Comment #23 (Table 2, page 2, TPH C6 through C35, minimum value): *Not supported by the lab data or the OCD approved data set. Not supported by the lab data. Please verify and confirm.*

Response #23: See Response #1. The observed minimum value has been revised to <61.0 mg/kg.

Comment #24 (Table 2, page 2, note †): *t note is not appropriate if the OCD approved data set is utilized. Please remove*

Response #24: See Response #1 and Response #9. This note is no longer needed and has been removed.

Comment #25 (Table 2, page 2, note *): ** note is not supported by the ProUCL guides due to the smaller data set*

Response #25: See Response #21. This note is no longer needed and has been removed.

Comment #26 (Table 2, page 2, note **): *** note is not appropriate if the OCD approved data set is utilized. Please remove*

Response #26: See Response #1 and Response #12. The approved arsenic data set contains 11 non-detects and therefore no outlier testing is appropriate. The note is no longer needed and has been removed

References

Gilbert, R.O., 1987. Statistical methods for environmental pollution monitoring. New York: Van Nostrand Reinhold Co.

NAVFAC, 2002 Guidance for Environmental Background Analysis. Volume I: Soil. Naval Facilities Engineering Command. User's Guide UG-2049-ENV. Washington, DC

USEPA, June 1994. Statistical Methods for Evaluating the Attainment of Cleanup Standards. Volume 3: Reference-Based Standards for Soil and Solid Media. Environmental Statistics and Information Division (2163), Office of Policy, Planning, and Evaluation. EPA 230-R-94-004.

USEPA, December 1995. Determination of Background Concentrations of Inorganics in Soils and Sediments at Hazardous Waste Sites. Office of Solid Waste and Emergency Response (OSWER), United States Environmental Protection Agency, Washington, D.C.

USEPA, September 2002. Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites (OSWER 9285.7-41). Office of Emergency and Remedial Response, United States Environmental Protection Agency, Washington D.C. EPA/540/R-01/003.

USEPA, February 2006. Data Quality Assessment: Statistical Methods for Practitioners (EPA QA/G-9S). Office of Environmental Information, United States Environmental Protection Agency, Washington D.C. EPA/240/B-06/003.

USEPA, March 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. Office of Resource Conservation and Recovery, Program Implementation and Information Division, United States Environmental Protection Agency Washington DC. EPA 530-R-09-007.

USEPA, October 2015. ProUCL Version 5.1.002 Technical Guide. United States Environmental Protection Agency, Office of Research and Development, Washington DC. EPA/600/R-07/041.

Should you have any questions on the above, please do not hesitate to contact us.

Sincerely,

GHD

Wesley Dyck
Environmental Scientist

Christine Mathews
Project Manager

WD/ji/4

Encl.

Tables

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample ID:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,1-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,3-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,3-Trichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,4-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,4-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2-Dibromoethane (Ethylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3,5-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,4-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Butanone (Methyl ethyl ketone)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Chloroethyl vinyl ether	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Hexanone	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Phenylbutane (sec-Butylbenzene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Acetone	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Acrylonitrile	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromodichloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromoform	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromomethane (Methyl bromide)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Carbon disulfide	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Carbon tetrachloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroform (Trichloromethane)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloromethane (Methyl chloride)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Cymene (p-Isopropyltoluene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromochloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dichlorodifluoromethane (CFC-12)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample ID:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds (Continued)																	
Ethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Hexachlorobutadiene	ug/kg	31.4 JB	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Iodomethane	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Isopropyl benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methyl tert butyl ether (MTBE)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methylene chloride	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
m-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Naphthalene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
N-Butylbenzene	ug/kg	6.42 JB	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
N-Propylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
o-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Styrene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
tert-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Tetrachloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Toluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,4-Dichloro-2-butene	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Trichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Trichlorofluoromethane (CFC-11)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Vinyl chloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Semi-volatile Organic Compounds																	
1-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
2-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(b)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(g,h,i)perylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(k)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Chrysene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenz(a,h)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenzofuran	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluorene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Naphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Phenanthrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample ID:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Metals																	
Arsenic	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Barium	mg/kg	44.1	-	-	-	44.6	-	-	-	54.3	-	-	-	95.6	-	-	-
Cadmium	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Chromium	mg/kg	4.56	-	-	-	5.38	-	-	-	6.26	-	-	-	4.20	-	-	-
Copper	mg/kg	1.11	-	-	-	1.56	-	-	-	2.18	-	-	-	1.13	-	-	-
Iron	mg/kg	4730	-	-	-	6240	-	-	-	7030	-	-	-	4530	-	-	-
Lead	mg/kg	2.25	-	-	-	3.08	-	-	-	2.66	-	-	-	1.22	-	-	-
Manganese	mg/kg	54.1	-	-	-	55.7	-	-	-	81.7	-	-	-	55.0	-	-	-
Mercury	mg/kg	< 0.0250	-	-	-	< 0.0250	-	-	-	< 0.0250	-	-	-	< 0.0250	-	-	-
Selenium	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Silver	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Uranium	mg/kg	21.6	-	-	-	25.8	-	-	-	28.2	-	-	-	21.3	-	-	-
Zinc	mg/kg	12.5	-	-	-	14.6	-	-	-	16.5	-	-	-	11.5	-	-	-
PCBs																	
Aroclor-1016 (PCB-1016)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1221 (PCB-1221)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1232 (PCB-1232)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1242 (PCB-1242)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1248 (PCB-1248)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1254 (PCB-1254)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1260 (PCB-1260)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Petroleum Products																	
Total Petroleum Hydrocarbons - Gasoline Range Organics	mg/kg	< 4.00	-	-	<4.9	< 4.00	-	-	<5.0	< 4.00	-	-	<4.8	< 4.00	-	-	<4.6
Total Petroleum Hydrocarbons - Diesel Range Organics	mg/kg	< 50.0	-	-	<9.7	< 50.0	-	-	<9.9	< 50.0	-	-	<9.3	< 50.0	-	-	<9.4
Total Petroleum Hydrocarbons - Motor Oil Range Organics	mg/kg	-	-	-	<47	-	-	-	<49	-	-	-	<47	-	-	-	<47
TPH (C6 through C35)	mg/kg	-	-	-	<61.2	-	-	-	<63.9	-	-	-	< 61.1	-	-	-	<61.0
Radiochemistry																	
Radium-226	pCi/g	-	0.666 +/- 0.192	-	-	-	0.338 +/- 0.137	-	-	-	0.492 +/- 0.137	-	-	-	0.470 +/- 0.107	-	-
Radium-228	pCi/g	-	0.394 +/- 0.208	-	-	-	0.348 +/- 0.170	-	-	-	0.248 +/- 0.197	-	-	-	0.163 +/- 0.165	-	-
Radium 226 and 228	pCi/g	-	1.060 +/- 0.400	-	-	-	0.686 +/- 0.307	-	-	-	0.740 +/- 0.334	-	-	-	0.633 +/- 0.272	-	-
General Chemistry																	
Chloride	mg/kg	3.27	-	-	-	6.16	-	-	-	2.75	-	-	-	3.65	-	-	-
Cyanide (total)	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Fluoride	mg/kg	0.516	-	-	-	< 0.500	-	-	-	0.748	-	-	-	1.24	-	-	-
Nitrate (as N)	mg/kg	2.55	-	-	-	15.0	-	-	-	1.16	-	-	-	7.33	-	-	-
pH	s.u.	8.81	-	-	-	8.55	-	-	-	8.77	-	-	-	8.55	-	-	-
Phenolics (total)	mg/kg	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-
Sulfate	mg/kg	10.2	-	-	-	35.3	-	-	-	8.49	-	-	-	14.8	-	-	-
Total dissolved solids (TDS)	mg/kg	41.00	-	-	-	39.00	-	-	-	61.00	-	-	-	52.00	-	-	-

Notes:

J - Estimated value
B - Analyte detected in the corresponding method blank above the method detection limit

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample ID:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,1-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,3-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,3-Trichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,4-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,4-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2-Dibromoethane (Ethylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3,5-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,4-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Butanone (Methyl ethyl ketone)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Chloroethyl vinyl ether	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Hexanone	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Phenylbutane (sec-Butylbenzene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Acetone	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Acrylonitrile	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromodichloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromoform	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromomethane (Methyl bromide)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Carbon disulfide	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Carbon tetrachloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroform (Trichloromethane)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloromethane (Methyl chloride)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Cymene (p-Isopropyltoluene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromochloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dichlorodifluoromethane (CFC-12)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample ID:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds (Continu																	
Ethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Hexachlorobutadiene	ug/kg	< 100	-	-	-	33.7 JB	-	-	-	18.3 JB	-	-	-	< 100	-	-	-
Iodomethane	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Isopropyl benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methyl tert butyl ether (MTBE)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methylene chloride	ug/kg	< 100	-	-	-	< 100 Jb	-	-	-	< 100	-	-	-	< 100	-	-	-
m-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Naphthalene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
N-Butylbenzene	ug/kg	< 20.0	-	-	-	7.01 JB	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
N-Propylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
o-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Styrene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
tert-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Tetrachloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Toluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,4-Dichloro-2-butene	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Trichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Trichlorofluoromethane (CFC-11)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Vinyl chloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Semi-volatile Organic Compounds																	
1-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
2-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(b)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(g,h,i)perylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(k)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Chrysene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenz(a,h)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenzofuran	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluorene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Naphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Phenanthrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample ID:		**BG-5**	**BG-5**	**BG-5**	**B-5**	**BG-6**	**BG-6**	**BG-6**	**B-6**	**BG-7**	**BG-7**	**BG-7**	**B-7**	**BG-8**	**BG-8**	**BG-8**	**B-8**
Sample Date:		**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**	**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**	**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**	**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**
Parameters	**Units**																
Metals																	
Arsenic	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Barium	mg/kg	67.8	-	-	-	59.5	-	-	-	74.7	-	-	-	44.6	-	-	-
Cadmium	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Chromium	mg/kg	4.19	-	-	-	4.73	-	-	-	4.85	-	-	-	3.80	-	-	-
Copper	mg/kg	0.659	-	-	-	1.31	-	-	-	1.14	-	-	-	0.713	-	-	-
Iron	mg/kg	4540	-	-	-	5680	-	-	-	5270	-	-	-	7370	-	-	-
Lead	mg/kg	1.60	-	-	-	2.17	-	-	-	1.97	-	-	-	1.52	-	-	-
Manganese	mg/kg	43.7	-	-	-	56.1	-	-	-	56.8	-	-	-	47.1	-	-	-
Mercury	mg/kg	< 0.0250	-	-	-	< 0.0250	-	-	-	< 0.0250	-	-	-	< 0.0250	-	-	-
Selenium	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Silver	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Uranium	mg/kg	20.1	-	-	-	24.4	-	-	-	22.5	-	-	-	18.0	-	-	-
Zinc	mg/kg	10.9	-	-	-	13.1	-	-	-	11.1	-	-	-	10.4	-	-	-
PCBs																	
Aroclor-1016 (PCB-1016)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1221 (PCB-1221)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1232 (PCB-1232)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1242 (PCB-1242)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1248 (PCB-1248)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1254 (PCB-1254)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1260 (PCB-1260)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Petroleum Products																	
Total Petroleum Hydrocarbons - Gasoline Range Organics	mg/kg	< 4.00	-	-	<4.9	< 4.00	-	-	<4.7	< 4.00	-	-	<4.6	< 4.00	-	-	<4.9
Total Petroleum Hydrocarbons - Diesel Range Organics	mg/kg	< 50.0	-	-	<9.8	< 50.0	-	-	<9.6	< 50.0	-	-	<9.6	< 50.0	-	-	<9.3
Total Petroleum Hydrocarbons - Motor Oil Range Organics	mg/kg	-	-	-	<49	-	-	-	<48	-	-	-	<48	-	-	-	<47
TPH (C6 through C35)	mg/kg	-	-	-	<63.7	-	-	-	<62.3	-	-	-	<62.2	-	-	-	<61.2
Radiochemistry																	
Radium-226	pCi/g	-	0.507 +/- 0.123	-	-	-	0.493 +/- 0.139	-	-	-	0.579 +/- 0.172	-	-	-	0.421 +/- 0.106	-	-
Radium-228	pCi/g	-	0.296 +/- 0.187	-	-	-	0.460 +/- 0.181	-	-	-	0.334 +/- 0.234	-	-	-	0.252 +/- 0.173	-	-
Radium 226 and 228	pCi/g	-	0.803 +/- 0.310	-	-	-	0.953 +/- 0.320	-	-	-	0.913 +/- 0.406	-	-	-	0.673 +/- 0.279	-	-
General Chemistry																	
Chloride	mg/kg	3.62	-	-	-	2.95	-	-	-	4.00	-	-	-	2.76	-	-	-
Cyanide (total)	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Fluoride	mg/kg	1.19	-	-	-	0.853	-	-	-	1.08	-	-	-	0.746	-	-	-
Nitrate (as N)	mg/kg	3.04	-	-	-	4.41	-	-	-	9.34	-	-	-	2.05	-	-	-
pH	s.u.	8.82	-	-	-	8.58	-	-	-	9.05	-	-	-	8.87	-	-	-
Phenolics (total)	mg/kg	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-
Sulfate	mg/kg	17.4	-	-	-	5.14	-	-	-	12.9	-	-	-	6.26	-	-	-
Total dissolved solids (TDS)	mg/kg	40.00	-	-	-	45.00	-	-	-	32.00	-	-	-	57.00	-	-	-

Notes:

J - Estimated value
B - Analyte detected in the corresponding metho

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample ID:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,1-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,3-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,3-Trichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,4-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,4-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2-Dibromoethane (Ethylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3,5-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,4-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Butanone (Methyl ethyl ketone)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Chloroethyl vinyl ether	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Hexanone	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Phenylbutane (sec-Butylbenzene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Acetone	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Acrylonitrile	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromodichloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromoform	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromomethane (Methyl bromide)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Carbon disulfide	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Carbon tetrachloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroform (Trichloromethane)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloromethane (Methyl chloride)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Cymene (p-Isopropyltoluene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromochloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dichlorodifluoromethane (CFC-12)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample ID:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds (Continu																	
Ethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Hexachlorobutadiene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Iodomethane	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Isopropyl benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methyl tert butyl ether (MTBE)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methylene chloride	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100 Jb	-	-	-	< 100 Jb	-	-	-
m-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Naphthalene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
N-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
N-Propylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
o-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Styrene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
tert-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Tetrachloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Toluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,4-Dichloro-2-butene	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Trichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Trichlorofluoromethane (CFC-11)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Vinyl chloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Semi-volatile Organic Compounds																	
1-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
2-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(b)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(g,h,i)perylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(k)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Chrysene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenz(a,h)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenzofuran	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluorene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Naphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Phenanthrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample ID:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Metals																	
Arsenic	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	4.03	-	-	-
Barium	mg/kg	90.0	-	-	-	26.2	-	-	-	49.3	-	-	-	111	-	-	-
Cadmium	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Chromium	mg/kg	6.36	-	-	-	3.76	-	-	-	4.58	-	-	-	7.04	-	-	-
Copper	mg/kg	3.44	-	-	-	0.590	-	-	-	0.977	-	-	-	1.54	-	-	-
Iron	mg/kg	7370	-	-	-	3520	-	-	-	4530	-	-	-	7650	-	-	-
Lead	mg/kg	2.96	-	-	-	< 1.00	-	-	-	1.87	-	-	-	2.77	-	-	-
Manganese	mg/kg	102	-	-	-	43.0	-	-	-	48.7	-	-	-	54.5	-	-	-
Mercury	mg/kg	< 0.0250	-	-	-	< 0.0250	-	-	-	< 0.0250	-	-	-	< 0.0250	-	-	-
Selenium	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Silver	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Uranium	mg/kg	28.9	-	-	-	17.4	-	-	-	20.4	-	-	-	32.9	-	-	-
Zinc	mg/kg	18.6	-	-	-	9.94	-	-	-	11.9	-	-	-	17.0	-	-	-
PCBs																	
Aroclor-1016 (PCB-1016)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1221 (PCB-1221)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1232 (PCB-1232)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1242 (PCB-1242)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1248 (PCB-1248)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1254 (PCB-1254)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1260 (PCB-1260)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Petroleum Products																	
Total Petroleum Hydrocarbons - Gasoline Range Organics	mg/kg	< 4.00	-	-	<4.9	< 4.00	-	-	<4.8	< 4.00	-	-	<4.8	< 4.00	-	-	<4.9
Total Petroleum Hydrocarbons - Diesel Range Organics	mg/kg	< 50.0	-	-	<9.3	< 50.0	-	-	<9.5	< 50.0	-	-	<9.4	< 50.0	-	-	<9.8
Total Petroleum Hydrocarbons - Motor Oil Range Organics	mg/kg	-	-	-	<47	-	-	-	<47	-	-	-	<47	-	-	-	<49
TPH (C6 through C35)	mg/kg	-	-	-	< 61.3	-	-	-	< 63.6	-	-	-	<61.2	-	-	-	<63.7
Radiochemistry																	
Radium-226	pCi/g	-	0.509 +/- 0.177	-	-	-	0.246 +/- 0.106	-	-	-	0.443 +/- 0.152	-	-	-	0.307 +/- 0.114	-	-
Radium-228	pCi/g	-	0.135 +/- 0.171	-	-	-	0.379 +/- 0.172	-	-	-	0.673 +/- 0.208	-	-	-	0.689 +/- 0.227	-	-
Radium 226 and 228	pCi/g	-	0.644 +/- 0.348	-	-	-	0.625 +/- 0.278	-	-	-	1.116 +/- 0.360	-	-	-	0.996 +/- 0.341	-	-
General Chemistry																	
Chloride	mg/kg	9.32	-	-	-	2.64	-	-	-	< 2.50	-	-	-	3.46	-	-	-
Cyanide (total)	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Fluoride	mg/kg	< 0.500	-	-	-	0.554	-	-	-	0.806	-	-	-	3.01	-	-	-
Nitrate (as N)	mg/kg	9.33	-	-	-	4.67	-	-	-	1.79	-	-	-	6.80	-	-	-
pH	s.u.	8.53	-	-	-	8.59	-	-	-	8.67	-	-	-	8.66	-	-	-
Phenolics (total)	mg/kg	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-
Sulfate	mg/kg	11.8	-	-	-	10.4	-	-	-	22.0	-	-	-	24.0	-	-	-
Total dissolved solids (TDS)	mg/kg	36.00	-	-	-	43.00	-	-	-	43.00	-	-	-	69.00	-	-	-

Notes:

J - Estimated value
B - Analyte detected in the corresponding metho

Table 2

Data Summary and Calculated Background Values
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Analyte	Unit	Number of Samples	Percent Non-Detect	Minimum	Maximum	Data Distribution	Outliers	Background Value		Background Value excluding outliers	
								Method	Value	Method	Value
Subsection A											
(1) Arsenic (As)	mg/kg	12	92%	< 2.00	4.03	--	--	Nonparametric	4.03	--	--
(2) Barium (Ba)	mg/kg	12	0%	26.2	111	Normal	0	Normal UTL	157.4	--	--
(3) Cadmium (Cd)	mg/kg	12	100%	< 0.500	< 0.500	--	--	Detection Limit	< 0.500	--	--
(4) Chromium (Cr)	mg/kg	12	0%	3.76	7.04	Normal	0	Normal UTL	8.966	--	--
(5) Cyanide (CN)	mg/kg	12	100%	< 2.00	< 2.00	--	--	Nonparametric	< 2.00	--	--
(6) Fluoride (F)	mg/kg	12	17%	< 0.500	3.01	Gamma	3 (<0.5, <0.5, 3.01)	KM WH Approx. Gamma UTL	3.766	Normal UTL	1.938
(7) Lead (Pb)	mg/kg	12	8%	< 1.00	3.08	Normal	0	KM Normal UTL	4.539	--	--
(8) Total Mercury (Hg)	mg/kg	12	100%	< 0.0250	< 0.0250	--	--	Detection Limit	<0.0250	--	--
(9) Nitrate (NO_3 as N)	mg/kg	12	0%	1.16	15	Normal	0	Normal UTL	21.02	--	--
(10) Selenium (Se)	mg/kg	12	100%	< 2.00	< 2.00	--	--	Detection Limit	< 2.00	--	--
(11) Silver (Ag)	mg/kg	12	100%	< 0.500	< 0.500	--	--	Detection Limit	< 0.500	--	--
(12) Uranium (U)	mg/kg	12	0%	17.4	32.9	Normal	0	Normal UTL	41.1	--	--
(13) Radioactivity: Combined Radium-226 & Radium-228	pCi/g	12	0%	0.625	1.116	Normal	0	Normal UTL	1.491	--	--
(14) Benzene	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(15) Polychlorinated biphenyls (PCBs)	ug/kg	12	100%	<119	<147	--	--	Detection Limit	<147	--	--
(16) Toluene	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(17) Carbon tetrachloride	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(18) 1,2-Dichoroethane (EDC)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(19) 1,1-Dichloroethene (1,1-DCE)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(20) 1,1,2,2-Tetrachloroethene (PCE)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(21) 1,1,2-Trichloroethene (TCE)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(22) Ethylbenzene	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(23) Total Xylenes	ug/kg	12	100%	<40.0	<40.0	--	--	Detection Limit	<40.0	--	--
(24) Methylene chloride	ug/kg	12	100%	< 100	< 100	--	--	Nonparametric	< 100	--	--
(25) Chloroform	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(26) 1,1-Dichloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(27) Ethylene dibromide (EDB)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(28) 1,1,1-Trichloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(29) 1,1,2-Trichloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(30) 1,1,2,2-Tetrachloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(31) Vinyl chloride	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(32) PAHs (naphthalene sum)‡	ug/kg	12	100%	< 510	< 510	--	--	Detection Limit	< 510	--	--
(33) Benzo[a]pyrene	ug/kg	12	100%	<170	<170	--	--	Detection Limit	<170	--	--

Table 2

Data Summary and Calculated Background Values
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

	Analyte	Unit	Number of Samples	Percent Non-Detect	Minimum	Maximum	Data Distribution	Outliers	Background Value Method	Background Value Value	Background Value excluding outliers Method	Background Value excluding outliers Value
Subsection B												
(1)	Chloride (Cl)	mg/kg	12	8%	< 2.50	9.32	Lognormal	3 (<2.5, 9.32, 6.16)	KM Lognormal UTL	14.39	Normal UTL	5.228
(2)	Copper (Cu)	mg/kg	12	0%	0.59	3.44	~ Normal	1 (3.44)	Normal UTL	4.327	Normal UTL	2.971
(3)	Iron (Fe)	mg/kg	12	0%	3520	7650	Normal	0	Normal UTL	10932	--	--
(4)	Manganese (Mn)	mg/kg	12	0%	43	102	Unknown	--	Nonparametric UTL	102	--	--
(6)	Phenols	mg/kg	12	100%	< 0.130	< 0.130	--	--	Detection Limit	< 0.130	--	--
(7)	Sulfate (SO_4)	mg/kg	12	0%	5.14	35.3	Normal	0	Normal UTL	47.29	--	--
(8)	Total dissolved solids (TDS)	mg/kg	12	0%	32	69	Normal	0	Normal UTL	87.75	--	--
(9)	Zinc (Zn)	mg/kg	12	0%	9.94	18.6	Normal	0	Normal UTL	23.87	--	--
(10)	pH	s.u.	12	0%	8.53	9.05	Normal	0	Normal UTL	9.308	--	--
Total Petroleum Hydrocarbons (TPH)												
(--)	TPH - GRO + DRO †	mg/kg	24	100%	< 14.0	< 54.0	--	--	Detection Limit	< 54.0	--	--
(--)	TPH (C6 through C35)	mg/kg	12	100%	< 61.0	< 63.9	--	--	Detection Limit	< 63.9	--	--

Notes:

Background Values are statistical Upper Tolerance Limit (UTL) values on the 99th percentile of background, with 95 percent confidence.
~ -- Denotes an approximate data distribution
Normal UTL -- Background value calculated using a UTL for normally-distributed data
WH Approx. Gamma UTL -- Background value calculated using a Wilson-Hilferty approximate gamma UTL for gamma-distributed data
Lognormal UTL -- Background value calculated using a UTL for lognormally-distributed data
KM Normal UTL --Background value calculated using a UTL for normally-distributed data, applying the Kaplan-Meier method for non-detects
KM Lognormal UTL -- Background value calculated using a UTL for lognormally-distributed data, applying the Kaplan-Meier method for non-detects
‡ PAHs are naphthalene + 1-methylnaphthalene + 2-methylnaphthalene (per 20 NMAC 6.2.3103.A(32))
† GRO = Gasoline Range Organics; DRO = Diesel Range Organics

Attachment A
Input Data Submitted to ProUCL

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT
1	Sample Location:	Barium	Chromium	Copper	Ln_Copper	Copper excl 1 outlier	Iron	Lead	D_Lead	Manganese	Ln_Manganese	Ln_Manganese excl 1 outlier	Ln_Manganese excl 2 outliers	Manganese excl 2 outliers	Uranium	Zinc	Radium 226 and 228	Radium-precision	Chloride	D_Chloride	Ln_Chloride	D_Ln_Chloride	Ln_Chloride excl 1 outlier	D_Ln_Chloride excl 1 outlier	Ln_Chloride excl 2 outliers	D_Ln_Chloride excl 2 outliers	Ln_Chloride excl 3 outliers	D_Ln_Chloride excl 3 outliers	Chloride excluding 3 outliers	D_Chloride excluding 3 outliers	Fluoride	D_Fluoride	Gamma_Fluoride	D_Gamma_Fluoride	Gamma_Fluoride excl 1 outlier	D_Gamma_Fluoride excl 1 outlier	Gamma_Fluoride excl 2 outliers	D_Gamma_Fluoride excl 2 outliers	Gamma_Fluoride excl 3 outliers	D_Gamma_Fluoride excl 3 outliers	Fluoride excluding 3 outliers	D_Fluoride excluding 3 outliers	Nitrate (as N)	pH	Sulfate	Total dissolved solids (TDS)
2	**BG-1/B-1**	44.1	4.56	1.11	0.1	1.11	4730	2.25	1	54.1	3.991	3.991	3.991	54.1	21.6	12.5	1.06	+/- 0.400	3.27	1	1.18	1	1.18	1	1.18	1	1.18	1	3.27	1	0.516	1	0.802	1	0.802	1	0.802	1	0.802	1	0.516	1	2.55	8.81	10.2	41
3	**BG-2/B-2**	44.6	5.38	1.56	0.44	1.56	6240	3.08	1	55.7	4.02	4.02	4.02	55.7	25.8	14.6	0.686	+/- 0.307	6.16	1	1.82	1	1.82	1	1.82	1					0.5	0	0.794	0									15	8.55	35.3	39
4	**BG-3/B-3**	54.3	6.26	2.18	0.78	2.18	7030	2.66	1	81.7	4.403	4.403			28.2	16.5	0.74	+/- 0.334	2.75	1	1.01	1	1.01	1	1.01	1	1.01	1	2.75	1	0.748	1	0.908	1	0.908	1	0.908	1	0.908	1	0.748	1	1.16	8.77	8.49	61
5	**BG-4/B-4**	95.6	4.2	1.13	0.12	1.13	4530	1.22	1	55	4.007	4.007	4.007	55	21.3	11.5	0.633	+/- 0.272	3.65	1	1.29	1	1.29	1	1.29	1	1.29	1	3.65	1	1.24	1	1.074	1	1.074	1	1.074	1	1.074	1	1.24	1	7.33	8.55	14.8	52
6	**BG-5/B-5**	67.8	4.19	0.659	-0.4	0.659	4540	1.6	1	43.7	3.777	3.777	3.777	43.7	20.1	10.9	0.803	+/- 0.310	3.62	1	1.29	1	1.29	1	1.29	1	1.29	1	3.62	1	1.19	1	1.06	1	1.06	1	1.06	1	1.06	1	1.19	1	3.04	8.82	17.4	40
7	**BG-6/B-6**	59.5	4.73	1.31	0.27	1.31	5680	2.17	1	56.1	4.027	4.027	4.027	56.1	24.4	13.1	0.953	+/- 0.320	2.95	1	1.08	1	1.08	1	1.08	1	1.08	1	2.95	1	0.853	1	0.948	1	0.948	1	0.948	1	0.948	1	0.853	1	4.41	8.58	5.14	45
8	**BG-7/B-7**	74.7	4.85	1.14	0.13	1.14	5270	1.97	1	56.8	4.04	4.04	4.04	56.8	22.5	11.1	0.913	+/- 0.406	4	1	1.39	1	1.39	1	1.39	1	1.39	1	4	1	1.08	1	1.026	1	1.026	1	1.026	1	1.026	1	1.08	1	9.34	9.05	12.9	32
9	**BG-8/B-8**	44.6	3.8	0.713	-0.3	0.713	7370	1.52	1	47.1	3.852	3.852	3.852	47.1	18	10.4	0.673	+/- 0.279	2.76	1	1.02	1	1.02	1	1.02	1	1.02	1	2.76	1	0.746	1	0.907	1	0.907	1	0.907	1	0.907	1	0.746	1	2.05	8.87	6.26	57
10	**BG-9/B-9**	90	6.36	3.44	1.24		7370	2.96	1	102	4.625				28.9	18.6	0.644	+/- 0.348	9.32	1	2.23	1									0.5	0	0.794	0	0.794	0							9.33	8.53	11.8	36
11	**BG-10/B-10**	26.2	3.76	0.59	-0.5	0.59	3520	1	0	43	3.761	3.761	3.761	43	17.4	9.94	0.625	+/- 0.278	2.64	1	0.97	1	0.97	1	0.97	1	0.97	1	2.64	1	0.554	1	0.821	1	0.821	1	0.821	1	0.821	1	0.554	1	4.67	8.59	10.4	43
12	**BG-11/B-11**	49.3	4.58	0.977	-0	0.977	4530	1.87	1	48.7	3.886	3.886	3.886	48.7	20.4	11.9	1.116	+/- 0.360	2.5	0	0.92	0	0.92	0							0.806	1	0.931	1	0.931	1	0.931	1	0.931	1	0.806	1	1.79	8.67	22	43
13	**BG-12/B-12**	111	7.04	1.54	0.43	1.54	7650	2.77	1	54.5	3.998	3.998	3.998	54.5	32.9	17	0.996	+/- 0.341	3.46	1	1.24	1	1.24	1	1.24	1	1.24	1	3.46	1	3.01	1	1.444	1	1.444	1	1.444	1					6.8	8.66	24	69

Notes:

1) Highlighted values indicate changes from previous submission

2) Arsenic, Mercury, Cyanide and Methylene Chloride were removed (due few or no detected values in corrected data sets)

Attachment B
Output from ProUCL

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Barium

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	11
Minimum	26.2
Maximum	111
Mean of Raw Data	63.48
Standard Deviation of Raw Data	25.08
Khat	6.964
Theta hat	9.114
Kstar	5.279
Theta star	12.02
Mean of Log Transformed Data	4.077
Standard Deviation of Log Transformed Data	0.407

Normal GOF Test Results

Correlation Coefficient R	0.974
Shapiro Wilk Test Statistic	0.945
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.557
Lilliefors Test Statistic	0.146
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.987
A-D Test Statistic	0.256
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.136
K-S Critical(0.05) Value	0.246

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.981
Shapiro Wilk Test Statistic	0.964
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.782
Lilliefors Test Statistic	0.154
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Chromium

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	3.76
Maximum	7.04
Mean of Raw Data	4.976
Standard Deviation of Raw Data	1.065
Khat	25.43
Theta hat	0.196
Kstar	19.13
Theta star	0.26
Mean of Log Transformed Data	1.585
Standard Deviation of Log Transformed Data	0.205

Normal GOF Test Results

Correlation Coefficient R	0.954
Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.188
Lilliefors Test Statistic	0.214
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.97
A-D Test Statistic	0.449
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.192
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.97
Shapiro Wilk Test Statistic	0.928
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.428
Lilliefors Test Statistic	0.178
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Nitrate (as N)

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	1.16
Maximum	15
Mean of Raw Data	5.623
Standard Deviation of Raw Data	4.108
Khat	2.077
Theta hat	2.707
Kstar	1.613
Theta star	3.485
Mean of Log Transformed Data	1.467
Standard Deviation of Log Transformed Data	0.78

Normal GOF Test Results

Correlation Coefficient R	0.948
Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.146
Lilliefors Test Statistic	0.175
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.99
A-D Test Statistic	0.221
A-D Critical (0.05) Value	0.741
K-S Test Statistic	0.129
K-S Critical(0.05) Value	0.248

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.99
Shapiro Wilk Test Statistic	0.972
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.942
Lilliefors Test Statistic	0.135
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Uranium

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	17.4
Maximum	32.9
Mean of Raw Data	23.46
Standard Deviation of Raw Data	4.708
Khat	28.32
Theta hat	0.828
Kstar	21.3
Theta star	1.102
Mean of Log Transformed Data	3.137
Standard Deviation of Log Transformed Data	0.195

Normal GOF Test Results

Correlation Coefficient R	0.975
Shapiro Wilk Test Statistic	0.945
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.588
Lilliefors Test Statistic	0.164
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.987
A-D Test Statistic	0.244
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.146
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.988
Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.892
Lilliefors Test Statistic	0.132
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Radium 226 and 228

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.625
Maximum	1.116
Mean of Raw Data	0.82
Standard Deviation of Raw Data	0.179
Khat	23.52
Theta hat	0.0349
Kstar	17.7
Theta star	0.0463
Mean of Log Transformed Data	-0.22
Standard Deviation of Log Transformed Data	0.215

Normal GOF Test Results

Correlation Coefficient R	0.956
Shapiro Wilk Test Statistic	0.891
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.18
Lilliefors Test Statistic	0.19
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.964
A-D Test Statistic	0.548
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.196
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.96
Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.22
Lilliefors Test Statistic	0.184
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Copper

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.59
Maximum	3.44
Mean of Raw Data	1.362
Standard Deviation of Raw Data	0.791
Khat	4.164
Theta hat	0.327
Kstar	3.178
Theta star	0.429
Mean of Log Transformed Data	0.184
Standard Deviation of Log Transformed Data	0.504

Normal GOF Test Results

Correlation Coefficient R	0.896
Shapiro Wilk Test Statistic	0.818
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.0104
Lilliefors Test Statistic	0.235
Lilliefors Critical (0.05) Value	0.243

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.961
A-D Test Statistic	0.374
A-D Critical (0.05) Value	0.735
K-S Test Statistic	0.161
K-S Critical(0.05) Value	0.246

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.977
Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.678
Lilliefors Test Statistic	0.136
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Iron

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	10
Minimum	3520
Maximum	7650
Mean of Raw Data	5705
Standard Deviation of Raw Data	1395
Khat	17.83
Theta hat	320
Kstar	13.43
Theta star	424.9
Mean of Log Transformed Data	8.621
Standard Deviation of Log Transformed Data	0.251

Normal GOF Test Results

Correlation Coefficient R	0.964
Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.298
Lilliefors Test Statistic	0.174
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.958
A-D Test Statistic	0.473
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.173
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.966
Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.345
Lilliefors Test Statistic	0.161
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Manganese

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	43
Maximum	102
Mean of Raw Data	58.2
Standard Deviation of Raw Data	17
Khat	15.99
Theta hat	3.639
Kstar	12.05
Theta star	4.83
Mean of Log Transformed Data	4.032
Standard Deviation of Log Transformed Data	0.25

Normal GOF Test Results

Correlation Coefficient R	0.852
Shapiro Wilk Test Statistic	0.742
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.00122
Lilliefors Test Statistic	0.366
Lilliefors Critical (0.05) Value	0.243

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.895
A-D Test Statistic	1.092
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.339
K-S Critical(0.05) Value	0.245

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.901
Shapiro Wilk Test Statistic	0.822
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.0127
Lilliefors Test Statistic	0.322
Lilliefors Critical (0.05) Value	0.243

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Sulfate

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	5.14
Maximum	35.3
Mean of Raw Data	14.89
Standard Deviation of Raw Data	8.648
Khat	3.636
Theta hat	4.095
Kstar	2.783
Theta star	5.351
Mean of Log Transformed Data	2.557
Standard Deviation of Log Transformed Data	0.56

Normal GOF Test Results

Correlation Coefficient R	0.945
Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.13
Lilliefors Test Statistic	0.174
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.991
A-D Test Statistic	0.181
A-D Critical (0.05) Value	0.737
K-S Test Statistic	0.119
K-S Critical(0.05) Value	0.247

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.996
Shapiro Wilk Test Statistic	0.988
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.998
Lilliefors Test Statistic	0.0876
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Total dissolved solids (TDS)

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	11
Minimum	32
Maximum	69
Mean of Raw Data	46.5
Standard Deviation of Raw Data	11.01
Khat	20.87
Theta hat	2.228
Kstar	15.71
Theta star	2.961
Mean of Log Transformed Data	3.815
Standard Deviation of Log Transformed Data	0.226

Normal GOF Test Results

Correlation Coefficient R	0.961
Shapiro Wilk Test Statistic	0.922
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.304
Lilliefors Test Statistic	0.221
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.979
A-D Test Statistic	0.37
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.197
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.98
Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.737
Lilliefors Test Statistic	0.182
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Zinc

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	9.94
Maximum	18.6
Mean of Raw Data	13.17
Standard Deviation of Raw Data	2.855
Khat	24.83
Theta hat	0.53
Kstar	18.68
Theta star	0.705
Mean of Log Transformed Data	2.558
Standard Deviation of Log Transformed Data	0.207

Normal GOF Test Results

Correlation Coefficient R	0.954
Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.178
Lilliefors Test Statistic	0.176
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.97
A-D Test Statistic	0.471
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.166
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.969
Shapiro Wilk Test Statistic	0.924
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.399
Lilliefors Test Statistic	0.152
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 12:39:41 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

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pH

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	11
Minimum	8.53
Maximum	9.05
Mean of Raw Data	8.704
Standard Deviation of Raw Data	0.161
Khat	3212
Theta hat	0.00271
Kstar	2409
Theta star	0.00361
Mean of Log Transformed Data	2.164
Standard Deviation of Log Transformed Data	0.0184

Normal GOF Test Results

Correlation Coefficient R	0.954
Shapiro Wilk Test Statistic	0.903
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.191
Lilliefors Test Statistic	0.177
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.955
A-D Test Statistic	0.527
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.193
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.955
Shapiro Wilk Test Statistic	0.906
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.207
Lilliefors Test Statistic	0.178
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 1:18:03 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Fluoride

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	10	2	16.67%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	2	0.5	0.5	0.5	0.5	0
Statistics (Non-Detects Only)	10	0.516	3.01	1.074	0.83	0.723
Statistics (All: NDs treated as DL value)	12	0.5	3.01	0.979	0.777	0.691
Statistics (All: NDs treated as DL/2 value)	12	0.25	3.01	0.937	0.777	0.729
Statistics (Normal ROS Imputed Data)	12	-0.576	3.01	0.827	0.777	0.876
Statistics (Gamma ROS Imputed Data)	12	0.01	3.01	0.897	0.777	0.774
Statistics (Lognormal ROS Imputed Data)	12	0.255	3.01	0.944	0.777	0.721

	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV
Statistics (Non-Detects Only)	3.838	2.753	0.28	-0.0642	0.504	-7.843
Statistics (NDs = DL)	3.55	2.718	0.276	-0.169	0.517	-3.06
Statistics (NDs = DL/2)	2.432	1.88	0.385	-0.285	0.687	-2.415
Statistics (Gamma ROS Estimates)	0.829	0.678	1.081	-0.821	1.825	-2.223
Statistics (Lognormal ROS Estimates)	--	--	--	-0.26	0.647	-2.493

Normal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.811	0.803	0.852	0.918

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.684	0.842	Data Not Normal
Shapiro-Wilk (NDs = DL)	0.668	0.859	Data Not Normal
Shapiro-Wilk (NDs = DL/2)	0.751	0.859	Data Not Normal
Shapiro-Wilk (Normal ROS Estimates)	0.871	0.859	Data Appear Normal
Lilliefors (Detects Only)	0.309	0.262	Data Not Normal
Lilliefors (NDs = DL)	0.269	0.243	Data Not Normal
Lilliefors (NDs = DL/2)	0.255	0.243	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.235	0.243	Data Appear Normal

Gamma GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.9	0.899	0.935	0.948

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.691	0.73	
Kolmogorov-Smirnov (Detects Only)	0.224	0.268	Detected Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	0.761	0.737	
Kolmogorov-Smirnov (NDs = DL)	0.196	0.247	Detected Data appear Approximate Gamma Distri
Anderson-Darling (NDs = DL/2)	0.413	0.74	
Kolmogorov-Smirnov (NDs = DL/2)	0.168	0.248	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	1.153	0.763	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.302	0.254	Data Not Gamma Distributed

Lognormal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.935	0.93	0.966	0.975

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.888	0.842	Data Appear Lognormal
Shapiro-Wilk (NDs = DL)	0.871	0.859	Data Appear Lognormal
Shapiro-Wilk (NDs = DL/2)	0.941	0.859	Data Appear Lognormal
Shapiro-Wilk (Lognormal ROS Estimates)	0.964	0.859	Data Appear Lognormal
Lilliefors (Detects Only)	0.19	0.262	Data Appear Lognormal
Lilliefors (NDs = DL)	0.159	0.243	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.162	0.243	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.148	0.243	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 1:18:03 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Lead

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	11	1	8.33%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	1	1	1	1	1	N/A
Statistics (Non-Detects Only)	11	1.22	3.08	2.188	2.17	0.619
Statistics (All: NDs treated as DL value)	12	1	3.08	2.089	2.07	0.683
Statistics (All: NDs treated as DL/2 value)	12	0.5	3.08	2.048	2.07	0.766
Statistics (Normal ROS Imputed Data)	12	0.659	3.08	2.061	2.07	0.737
Statistics (Gamma ROS Imputed Data)	12	0.901	3.08	2.081	2.07	0.698
Statistics (Lognormal ROS Imputed Data)	12	1.015	3.08	2.09	2.07	0.681

	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV
Statistics (Non-Detects Only)	12.98	9.498	0.169	0.744	0.299	0.402
Statistics (NDs = DL)	9.3	7.031	0.225	0.682	0.357	0.523
Statistics (NDs = DL/2)	5.576	4.238	0.367	0.624	0.503	0.806
Statistics (Gamma ROS Estimates)	8.577	6.488	0.243	0.673	0.376	0.558
Statistics (Lognormal ROS Estimates)	--	--	--	0.683	0.354	0.518

Normal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.987	0.989	0.984	0.988

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.957	0.85	Data Appear Normal
Shapiro-Wilk (NDs = DL)	0.961	0.859	Data Appear Normal
Shapiro-Wilk (NDs = DL/2)	0.964	0.859	Data Appear Normal
Shapiro-Wilk (Normal ROS Estimates)	0.969	0.859	Data Appear Normal
Lilliefors (Detects Only)	0.141	0.251	Data Appear Normal
Lilliefors (NDs = DL)	0.132	0.243	Data Appear Normal
Lilliefors (NDs = DL/2)	0.121	0.243	Data Appear Normal
Lilliefors (Normal ROS Estimates)	0.125	0.243	Data Appear Normal

Gamma GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.977	0.974	0.944	0.971

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.229	0.729	
Kolmogorov-Smirnov (Detects Only)	0.157	0.255	Detected Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	0.226	0.731	
Kolmogorov-Smirnov (NDs = DL)	0.143	0.245	Data Appear Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.418	0.732	
Kolmogorov-Smirnov (NDs = DL/2)	0.139	0.246	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.227	0.731	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.139	0.246	Data Appear Gamma Distributed

Lognormal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.983	0.979	0.91	0.98

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.954	0.85	Data Appear Lognormal
Shapiro-Wilk (NDs = DL)	0.947	0.859	Data Appear Lognormal
Shapiro-Wilk (NDs = DL/2)	0.842	0.859	Data Not Lognormal
Shapiro-Wilk (Lognormal ROS Estimates)	0.947	0.859	Data Appear Lognormal
Lilliefors (Detects Only)	0.147	0.251	Data Appear Lognormal
Lilliefors (NDs = DL)	0.13	0.243	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.175	0.243	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.131	0.243	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 1:18:03 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	0.95

Chloride

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	11	1	8.33%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	1	2.5	2.5	2.5	2.5	N/A
Statistics (Non-Detects Only)	11	2.64	9.32	4.053	3.46	2.002
Statistics (All: NDs treated as DL value)	12	2.5	9.32	3.923	3.365	1.961
Statistics (All: NDs treated as DL/2 value)	12	1.25	9.32	3.819	3.365	2.073
Statistics (Normal ROS Imputed Data)	12	-0.143	9.32	3.703	3.365	2.261
Statistics (Gamma ROS Imputed Data)	12	0.585	9.32	3.764	3.365	2.155
Statistics (Lognormal ROS Imputed Data)	12	1.561	9.32	3.845	3.365	2.04

	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV
Statistics (Non-Detects Only)	6.483	4.776	0.625	1.32	0.384	0.291
Statistics (NDs = DL)	6.387	4.846	0.614	1.287	0.385	0.299
Statistics (NDs = DL/2)	4.658	3.549	0.82	1.229	0.484	0.394
Statistics (Gamma ROS Estimates)	3.284	2.519	1.146	1.166	0.649	0.557
Statistics (Lognormal ROS Estimates)	--	--	--	1.247	0.445	0.357

Normal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.823	0.821	0.871	0.895

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.695	0.85	Data Not Normal
Shapiro-Wilk (NDs = DL)	0.691	0.859	Data Not Normal
Shapiro-Wilk (NDs = DL/2)	0.785	0.859	Data Not Normal
Shapiro-Wilk (Normal ROS Estimates)	0.835	0.859	Data Not Normal
Lilliefors (Detects Only)	0.329	0.251	Data Not Normal
Lilliefors (NDs = DL)	0.318	0.243	Data Not Normal
Lilliefors (NDs = DL/2)	0.299	0.243	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.281	0.243	Data Not Normal

Gamma GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.9	0.898	0.933	0.941

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	1.049	0.731	
Kolmogorov-Smirnov (Detects Only)	0.279	0.256	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	1.082	0.732	
Kolmogorov-Smirnov (NDs = DL)	0.269	0.246	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.704	0.733	
Kolmogorov-Smirnov (NDs = DL/2)	0.233	0.246	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.813	0.738	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.255	0.247	Data Not Gamma Distributed

Lognormal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.897	0.901	0.94	0.945

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.812	0.85	Data Not Lognormal
Shapiro-Wilk (NDs = DL)	0.82	0.859	Data Not Lognormal
Shapiro-Wilk (NDs = DL/2)	0.912	0.859	Data Appear Lognormal
Shapiro-Wilk (Lognormal ROS Estimates)	0.916	0.859	Data Appear Lognormal
Lilliefors (Detects Only)	0.254	0.251	Data Not Lognormal
Lilliefors (NDs = DL)	0.242	0.243	Data Appear Lognormal
Lilliefors (NDs = DL/2)	0.214	0.243	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.211	0.243	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:08:28 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Barium

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 111 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.314

For 10% significance level, 111 is not an outlier.

For 5% significance level, 111 is not an outlier.

For 1% significance level, 111 is not an outlier.

2. Observation Value 26.2 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.265

For 10% significance level, 26.2 is not an outlier.

For 5% significance level, 26.2 is not an outlier.

For 1% significance level, 26.2 is not an outlier.

Dixon's Outlier Test for Chromium

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 7.04 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.241

For 10% significance level, 7.04 is not an outlier.

For 5% significance level, 7.04 is not an outlier.

For 1% significance level, 7.04 is not an outlier.

2. Observation Value 3.76 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.165

For 10% significance level, 3.76 is not an outlier.

For 5% significance level, 3.76 is not an outlier.

For 1% significance level, 3.76 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:08:28 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Nitrate (as N)

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 15 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.429

For 10% significance level, 15 is not an outlier.

For 5% significance level, 15 is not an outlier.

For 1% significance level, 15 is not an outlier.

2. Observation Value 1.16 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.109

For 10% significance level, 1.16 is not an outlier.

For 5% significance level, 1.16 is not an outlier.

For 1% significance level, 1.16 is not an outlier.

Dixon's Outlier Test for Uranium

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 32.9 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.315

For 10% significance level, 32.9 is not an outlier.

For 5% significance level, 32.9 is not an outlier.

For 1% significance level, 32.9 is not an outlier.

2. Observation Value 17.4 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.235

For 10% significance level, 17.4 is not an outlier.

For 5% significance level, 17.4 is not an outlier.

For 1% significance level, 17.4 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:08:28 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Radium 226 and 228

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 1.116 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.248

For 10% significance level, 1.116 is not an outlier.

For 5% significance level, 1.116 is not an outlier.

For 1% significance level, 1.116 is not an outlier.

2. Observation Value 0.625 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.044

For 10% significance level, 0.625 is not an outlier.

For 5% significance level, 0.625 is not an outlier.

For 1% significance level, 0.625 is not an outlier.

Dixon's Outlier Test for Copper

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 3.44 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.676

For 10% significance level, 3.44 is an outlier.

For 5% significance level, 3.44 is an outlier.

For 1% significance level, 3.44 is an outlier.

2. Observation Value 0.59 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.077

For 10% significance level, 0.59 is not an outlier.

For 5% significance level, 0.59 is not an outlier.

For 1% significance level, 0.59 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:08:28 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Iron

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 7650 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.090

For 10% significance level, 7650 is not an outlier.

For 5% significance level, 7650 is not an outlier.

For 1% significance level, 7650 is not an outlier.

2. Observation Value 3520 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.262

For 10% significance level, 3520 is not an outlier.

For 5% significance level, 3520 is not an outlier.

For 1% significance level, 3520 is not an outlier.

Dixon's Outlier Test for Sulfate

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 35.3 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.458

For 10% significance level, 35.3 is not an outlier.

For 5% significance level, 35.3 is not an outlier.

For 1% significance level, 35.3 is not an outlier.

2. Observation Value 5.14 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.178

For 10% significance level, 5.14 is not an outlier.

For 5% significance level, 5.14 is not an outlier.

For 1% significance level, 5.14 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:08:28 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Total dissolved solids (TDS)

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 69 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.364

For 10% significance level, 69 is not an outlier.

For 5% significance level, 69 is not an outlier.

For 1% significance level, 69 is not an outlier.

2. Observation Value 32 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.241

For 10% significance level, 32 is not an outlier.

For 5% significance level, 32 is not an outlier.

For 1% significance level, 32 is not an outlier.

Dixon's Outlier Test for Zinc

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 18.6 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.256

For 10% significance level, 18.6 is not an outlier.

For 5% significance level, 18.6 is not an outlier.

For 1% significance level, 18.6 is not an outlier.

2. Observation Value 9.94 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.136

For 10% significance level, 9.94 is not an outlier.

For 5% significance level, 9.94 is not an outlier.

For 1% significance level, 9.94 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:08:28 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for pH

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 9.05 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.460

For 10% significance level, 9.05 is not an outlier.

For 5% significance level, 9.05 is not an outlier.

For 1% significance level, 9.05 is not an outlier.

2. Observation Value 8.53 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.059

For 10% significance level, 8.53 is not an outlier.

For 5% significance level, 8.53 is not an outlier.

For 1% significance level, 8.53 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:17:05 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Copper excl 1 outlier

Number of Observations = 11

10% critical value: 0.517

5% critical value: 0.576

1% critical value: 0.679

1. Observation Value 2.18 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.421

For 10% significance level, 2.18 is not an outlier.

For 5% significance level, 2.18 is not an outlier.

For 1% significance level, 2.18 is not an outlier.

2. Observation Value 0.59 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.127

For 10% significance level, 0.59 is not an outlier.

For 5% significance level, 0.59 is not an outlier.

For 1% significance level, 0.59 is not an outlier.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:26:54 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Gamma_Fluoride

Total N = 12

Number NDs = 2

Number Detects = 10

Number Data (n) = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1.44385029256496 is a Potential Outlier (Upper Tail)? [3.01 in original units]

Test Statistic: 0.367

For 10% significance level, 1.44385029256496 is not an outlier.

For 5% significance level, 1.44385029256496 is not an outlier.

For 1% significance level, 1.44385029256496 is not an outlier.

2. Data Value 0.39685026299205 is a Potential Outlier (Lower Tail)? [< 0.5 in original units]

Test Statistic: 0.598

For 10% significance level, 0.39685026299205 is an outlier.

For 5% significance level, 0.39685026299205 is an outlier.

For 1% significance level, 0.39685026299205 is not an outlier.

Dixon's Outlier Test for Lead

Total N = 12

Number NDs = 1

Number Detects = 11

Number Data (n) = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 3.08 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.167

For 10% significance level, 3.08 is not an outlier.

For 5% significance level, 3.08 is not an outlier.

For 1% significance level, 3.08 is not an outlier.

2. Data Value 0.5 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.415

For 10% significance level, 0.5 is not an outlier.

For 5% significance level, 0.5 is not an outlier.

For 1% significance level, 0.5 is not an outlier.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:26:54 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Ln_Chloride

Total N = 12

Number NDs = 1

Number Detects = 11

Number Data (n) = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 2.2321626286975 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.671

For 10% significance level, 2.2321626286975 is an outlier.

For 5% significance level, 2.2321626286975 is an outlier. **[9.32 in original units]**

For 1% significance level, 2.2321626286975 is an outlier.

2. Data Value 0.458145365937078 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.407

For 10% significance level, 0.458145365937078 is not an outlier.

For 5% significance level, 0.458145365937078 is not an outlier. **[< 2.5 in original units]**

For 1% significance level, 0.458145365937078 is not an outlier.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:44:16 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Gamma_Fluoride excl 1 outlier

Total N = 11

Number NDs = 1

Number Detects = 10

Number Data (n) = 11

10% critical value: 0.517

5% critical value: 0.576

1% critical value: 0.679

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1.44385029256496 is a Potential Outlier (Upper Tail)? [3.01 in original units]

Test Statistic: 0.599

For 10% significance level, 1.44385029256496 is an outlier.

For 5% significance level, 1.44385029256496 is an outlier.

For 1% significance level, 1.44385029256496 is not an outlier.

2. Data Value 0.39685026299205 is a Potential Outlier (Lower Tail)? [< 0.5 in original units]

Test Statistic: 0.627

For 10% significance level, 0.39685026299205 is an outlier.

For 5% significance level, 0.39685026299205 is an outlier.

For 1% significance level, 0.39685026299205 is not an outlier.

Dixon's Outlier Test for Ln_Chloride excl 1 outlier

Total N = 11

Number NDs = 1

Number Detects = 10

Number Data (n) = 11

10% critical value: 0.517

5% critical value: 0.576

1% critical value: 0.679

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1.81807677754543 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.618

For 10% significance level, 1.81807677754543 is an outlier.

For 5% significance level, 1.81807677754543 is an outlier. [6.16 in original units]

For 1% significance level, 1.81807677754543 is not an outlier.

2. Data Value 0.458145365937078 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.596

For 10% significance level, 0.458145365937078 is an outlier.

For 5% significance level, 0.458145365937078 is an outlier. [< 2.5 in original units]

For 1% significance level, 0.458145365937078 is not an outlier.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation ProUCL 5.17/27/2018 3:53:37 PM

From File 082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls

Full Precision OFF

Dixon's Outlier Test for Gamma_Fluoride excl 3 outliers

Total N = 9

Number NDs = 0

Number Detects = 9

Number Data (n) = 9

10% critical value: 0.441

5% critical value: 0.512

1% critical value: 0.635

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1.07433707098897 is a Potential Outlier (Upper Tail)? [1.24 in original units]

Test Statistic: 0.058

For 10% significance level, 1.07433707098897 is not an outlier.

For 5% significance level, 1.07433707098897 is not an outlier.

For 1% significance level, 1.07433707098897 is not an outlier.

2. Data Value 0.80207793141168 is a Potential Outlier (Lower Tail)? [0.516 in original units]

Test Statistic: 0.075

For 10% significance level, 0.80207793141168 is not an outlier.

For 5% significance level, 0.80207793141168 is not an outlier.

For 1% significance level, 0.80207793141168 is not an outlier.

Dixon's Outlier Test for Ln_Chloride excl 3 outliers

Total N = 9

Number NDs = 0

Number Detects = 9

Number Data (n) = 9

10% critical value: 0.441

5% critical value: 0.512

1% critical value: 0.635

Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1.38629436111989 is a Potential Outlier (Upper Tail)? [4.0 in original units]

Test Statistic: 0.244

For 10% significance level, 1.38629436111989 is not an outlier.

For 5% significance level, 1.38629436111989 is not an outlier.

For 1% significance level, 1.38629436111989 is not an outlier.

2. Data Value 0.970778917158225 is a Potential Outlier (Lower Tail)? [2.64 in original units]

Test Statistic: 0.126

For 10% significance level, 0.970778917158225 is not an outlier.

For 5% significance level, 0.970778917158225 is not an outlier.

For 1% significance level, 0.970778917158225 is not an outlier.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Barium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Minimum	26.2	First Quartile	44.6
Second Largest	95.6	Median	56.9
Maximum	111	Third Quartile	78.53
Mean	63.48	SD	25.08
Coefficient of Variation	0.395	Skewness	0.584
Mean of logged Data	4.077	SD of logged Data	0.407

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.146	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	157.4	90% Percentile (z)	95.61
95% UPL (t)	110.3	95% Percentile (z)	104.7
95% USL	120.8	99% Percentile (z)	121.8

Gamma GOF Test

A-D Test Statistic	0.256	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.136	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.964	k star (bias corrected MLE)	5.279
Theta hat (MLE)	9.114	Theta star (bias corrected MLE)	12.02
nu hat (MLE)	167.1	nu star (bias corrected)	126.7
MLE Mean (bias corrected)	63.48	MLE Sd (bias corrected)	27.63

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	118.3	90% Percentile	100.4
95% Hawkins Wixley (HW) Approx. Gamma UPL	119.9	95% Percentile	114.7
95% WH Approx. Gamma UTL with 99% Coverage	205.2	99% Percentile	144.6
95% HW Approx. Gamma UTL with 99% Coverage	216.7		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	134.9	95% HW USL	137.8

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.154	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	271.4	90% Percentile (z)		99.4
	95% UPL (t)	126.3	95% Percentile (z)		115.3
	95% USL	149.6	99% Percentile (z)		152.1

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	111
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	111	95% BCA Bootstrap UTL with	99% Coverage	111
	95% UPL	111		90% Percentile	95.04
	90% Chebyshev UPL	141.8		95% Percentile	102.5
	95% Chebyshev UPL	177.2		99% Percentile	109.3
	95% USL	111			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Chromium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	3.76	First Quartile	4.198
Second Largest	6.36	Median	4.655
Maximum	7.04	Third Quartile	5.6
Mean	4.976	SD	1.065
Coefficient of Variation	0.214	Skewness	0.822
Mean of logged Data	1.585	SD of logged Data	0.205

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	8.966	90% Percentile (z)	6.341
95% UPL (t)	6.966	95% Percentile (z)	6.728
95% USL	7.409	99% Percentile (z)	7.453

Gamma GOF Test

A-D Test Statistic	0.449	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.192	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	25.43	k star (bias corrected MLE)	19.13
Theta hat (MLE)	0.196	Theta star (bias corrected MLE)	0.26
nu hat (MLE)	610.3	nu star (bias corrected)	459.1
MLE Mean (bias corrected)	4.976	MLE Sd (bias corrected)	1.138

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	7.078	90% Percentile	6.478
95% Hawkins Wixley (HW) Approx. Gamma UPL	7.096	95% Percentile	6.983
95% WH Approx. Gamma UTL with 99% Coverage	9.82	99% Percentile	7.997
95% HW Approx. Gamma UTL with 99% Coverage	9.97		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	7.634	95% HW USL	7.67

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	10.51	90% Percentile (z)		6.343
	95% UPL (t)	7.155	95% Percentile (z)		6.834
	95% USL	7.792	99% Percentile (z)		7.858

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	7.04
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	7.04	95% BCA Bootstrap UTL with	99% Coverage	7.04
	95% UPL	7.04		90% Percentile	6.35
	90% Chebyshev UPL	8.301		95% Percentile	6.666
	95% Chebyshev UPL	9.807		99% Percentile	6.965
	95% USL	7.04			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Nitrate (as N)

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	1.16	First Quartile	2.425
Second Largest	9.34	Median	4.54
Maximum	15	Third Quartile	7.83
Mean	5.623	SD	4.108
Coefficient of Variation	0.731	Skewness	1.092
Mean of logged Data	1.467	SD of logged Data	0.78

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.175	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	21.02	90% Percentile (z)	10.89
95% UPL (t)	13.3	95% Percentile (z)	12.38
95% USL	15.01	99% Percentile (z)	15.18

Gamma GOF Test

A-D Test Statistic	0.221	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.248	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.077	k star (bias corrected MLE)	1.613
Theta hat (MLE)	2.707	Theta star (bias corrected MLE)	3.485
nu hat (MLE)	49.85	nu star (bias corrected)	38.72
MLE Mean (bias corrected)	5.623	MLE Sd (bias corrected)	4.426

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	15.33	90% Percentile	11.51
95% Hawkins Wixley (HW) Approx. Gamma UPL	15.89	95% Percentile	14.3
95% WH Approx. Gamma UTL with 99% Coverage	35.64	99% Percentile	20.55
95% HW Approx. Gamma UTL with 99% Coverage	40.82		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	18.88	95% HW USL	19.98

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.135	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	80.59	90% Percentile (z)		11.78
	95% UPL (t)	18.63	95% Percentile (z)		15.64
	95% USL	25.77	99% Percentile (z)		26.61

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	15
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	15	95% BCA Bootstrap UTL with	99% Coverage	15
	95% UPL	15		90% Percentile	9.339
	90% Chebyshev UPL	18.45		95% Percentile	11.89
	95% Chebyshev UPL	24.26		99% Percentile	14.38
	95% USL	15			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Uranium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	17.4	First Quartile	20.33
Second Largest	28.9	Median	22.05
Maximum	32.9	Third Quartile	26.4
Mean	23.46	SD	4.708
Coefficient of Variation	0.201	Skewness	0.684
Mean of logged Data	3.137	SD of logged Data	0.195

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	41.1	90% Percentile (z)	29.49
95% UPL (t)	32.26	95% Percentile (z)	31.2
95% USL	34.21	99% Percentile (z)	34.41

Gamma GOF Test

A-D Test Statistic	0.244	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.146	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	28.32	k star (bias corrected MLE)	21.3
Theta hat (MLE)	0.828	Theta star (bias corrected MLE)	1.102
nu hat (MLE)	679.7	nu star (bias corrected)	511.1
MLE Mean (bias corrected)	23.46	MLE Sd (bias corrected)	5.083

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	32.81	90% Percentile	30.16
95% Hawkins Wixley (HW) Approx. Gamma UPL	32.9	95% Percentile	32.4
95% WH Approx. Gamma UTL with 99% Coverage	44.86	99% Percentile	36.87
95% HW Approx. Gamma UTL with 99% Coverage	45.52		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	35.27	95% HW USL	35.43

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	47.9	90% Percentile (z)	29.6
	95% UPL (t)	33.2	95% Percentile (z)	31.77
	95% USL	36	99% Percentile (z)	36.29

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	32.9
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	32.9	95% BCA Bootstrap UTL with	99% Coverage	32.9
	95% UPL	32.9		90% Percentile	28.83
	90% Chebyshev UPL	38.16		95% Percentile	30.7
	95% Chebyshev UPL	44.82		99% Percentile	32.46
	95% USL	32.9			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Radium 226 and 228

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	0.625	First Quartile	0.666
Second Largest	1.06	Median	0.772
Maximum	1.116	Third Quartile	0.964
Mean	0.82	SD	0.179
Coefficient of Variation	0.218	Skewness	0.431
Mean of logged Data	-0.22	SD of logged Data	0.215

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	1.491	90% Percentile (z)	1.05
95% UPL (t)	1.155	95% Percentile (z)	1.115
95% USL	1.229	99% Percentile (z)	1.237

Gamma GOF Test

A-D Test Statistic	0.548	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.196	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	23.52	k star (bias corrected MLE)	17.7
Theta hat (MLE)	0.0349	Theta star (bias corrected MLE)	0.0463
nu hat (MLE)	564.5	nu star (bias corrected)	424.7
MLE Mean (bias corrected)	0.82	MLE Sd (bias corrected)	0.195

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	1.182	90% Percentile	1.078
95% Hawkins Wixley (HW) Approx. Gamma UPL	1.186	95% Percentile	1.165
95% WH Approx. Gamma UTL with 99% Coverage	1.658	99% Percentile	1.34
95% HW Approx. Gamma UTL with 99% Coverage	1.688		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	1.278	95% HW USL	1.286

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.184	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	1.797	90% Percentile (z)		1.057
	95% UPL (t)	1.2	95% Percentile (z)		1.143
	95% USL	1.312	99% Percentile (z)		1.324

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	1.116
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	1.116	95% BCA Bootstrap UTL with	99% Coverage	1.116
	95% UPL	1.116		90% Percentile	1.054
	90% Chebyshev UPL	1.379		95% Percentile	1.085
	95% Chebyshev UPL	1.633		99% Percentile	1.11
	95% USL	1.116			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Copper

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	0.59	First Quartile	0.911
Second Largest	2.18	Median	1.135
Maximum	3.44	Third Quartile	1.545
Mean	1.362	SD	0.791
Coefficient of Variation	0.581	Skewness	1.838
Mean of logged Data	0.184	SD of logged Data	0.504

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.818	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	4.327	90% Percentile (z)	2.376
95% UPL (t)	2.841	95% Percentile (z)	2.664
95% USL	3.17	99% Percentile (z)	3.203

Gamma GOF Test

A-D Test Statistic	0.374	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.161	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.164	k star (bias corrected MLE)	3.178
Theta hat (MLE)	0.327	Theta star (bias corrected MLE)	0.429
nu hat (MLE)	99.93	nu star (bias corrected)	76.28
MLE Mean (bias corrected)	1.362	MLE Sd (bias corrected)	0.764

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.93	90% Percentile	2.387
95% Hawkins Wixley (HW) Approx. Gamma UPL	2.958	95% Percentile	2.813
95% WH Approx. Gamma UTL with 99% Coverage	5.696	99% Percentile	3.732
95% HW Approx. Gamma UTL with 99% Coverage	6.062		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	3.44	95% HW USL	3.507

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.136	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	7.945	90% Percentile (z)		2.294
	95% UPL (t)	3.084	95% Percentile (z)		2.755
	95% USL	3.803	99% Percentile (z)		3.883

Nonparametric Distribution Free Background Statistics

Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	3.44
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	3.44	95% BCA Bootstrap UTL with	99% Coverage	3.44
	95% UPL	3.44		90% Percentile	2.118
	90% Chebyshev UPL	3.833		95% Percentile	2.747
	95% Chebyshev UPL	4.952		99% Percentile	3.301
	95% USL	3.44			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Iron

General Statistics

Total Number of Observations	12	Number of Distinct Observations	10
Minimum	3520	First Quartile	4538
Second Largest	7370	Median	5475
Maximum	7650	Third Quartile	7115
Mean	5705	SD	1395
Coefficient of Variation	0.245	Skewness	0.113
Mean of logged Data	8.621	SD of logged Data	0.251

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.174	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	10932	90% Percentile (z)	7493
95% UPL (t)	8312	95% Percentile (z)	7999
95% USL	8892	99% Percentile (z)	8950

Gamma GOF Test

A-D Test Statistic	0.473	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.173	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	17.83	k star (bias corrected MLE)	13.43
Theta hat (MLE)	320	Theta star (bias corrected MLE)	424.9
nu hat (MLE)	427.9	nu star (bias corrected)	322.3
MLE Mean (bias corrected)	5705	MLE Sd (bias corrected)	1557

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	8631	90% Percentile	7769
95% Hawkins Wixley (HW) Approx. Gamma UPL	8683	95% Percentile	8484
95% WH Approx. Gamma UTL with 99% Coverage	12618	99% Percentile	9936
95% HW Approx. Gamma UTL with 99% Coverage	12942		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	9428	95% HW USL	9519

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.161	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	14198	90% Percentile (z)	7649
95% UPL (t)	8864	95% Percentile (z)	8379
95% USL	9839	99% Percentile (z)	9941

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	7650
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	7650	95% BCA Bootstrap UTL with 99% Coverage	7650
95% UPL	7650	90% Percentile	7370
90% Chebyshev UPL	10061	95% Percentile	7496
95% Chebyshev UPL	12033	99% Percentile	7619
95% USL	7650		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Manganese

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	43	First Quartile	48.3
Second Largest	81.7	Median	54.75
Maximum	102	Third Quartile	56.28
Mean	58.2	SD	17
Coefficient of Variation	0.292	Skewness	1.955
Mean of logged Data	4.032	SD of logged Data	0.25

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.742	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.366	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	121.9	90% Percentile (z)	79.99
95% UPL (t)	89.98	95% Percentile (z)	86.16
95% USL	97.04	99% Percentile (z)	97.75

Gamma GOF Test

A-D Test Statistic	1.092	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.339	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	15.99	k star (bias corrected MLE)	12.05
Theta hat (MLE)	3.639	Theta star (bias corrected MLE)	4.83
nu hat (MLE)	383.8	nu star (bias corrected)	289.2
MLE Mean (bias corrected)	58.2	MLE Sd (bias corrected)	16.77

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	89.78	90% Percentile	80.45
95% Hawkins Wixley (HW) Approx. Gamma UPL	89.79	95% Percentile	88.24
95% WH Approx. Gamma UTL with 99% Coverage	133.5	99% Percentile	104.1
95% HW Approx. Gamma UTL with 99% Coverage	135.6		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	98.47	95% HW USL	98.75

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.822	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.322	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	143.6	90% Percentile (z)		77.64
	95% UPL (t)	89.9	95% Percentile (z)		85.01
	95% USL	99.73	99% Percentile (z)		100.8

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	102
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	102	95% BCA Bootstrap UTL with	99% Coverage	102
	95% UPL	102		90% Percentile	79.21
	90% Chebyshev UPL	111.3		95% Percentile	90.84
	95% Chebyshev UPL	135.3		99% Percentile	99.77
	95% USL	102			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Sulfate

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	5.14	First Quartile	9.773
Second Largest	24	Median	12.35
Maximum	35.3	Third Quartile	18.55
Mean	14.89	SD	8.648
Coefficient of Variation	0.581	Skewness	1.277
Mean of logged Data	2.557	SD of logged Data	0.56

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.174	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	47.29	90% Percentile (z)	25.97
95% UPL (t)	31.06	95% Percentile (z)	29.11
95% USL	34.65	99% Percentile (z)	35.01

Gamma GOF Test

A-D Test Statistic	0.181	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.119	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.247	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.636	k star (bias corrected MLE)	2.783
Theta hat (MLE)	4.095	Theta star (bias corrected MLE)	5.351
nu hat (MLE)	87.27	nu star (bias corrected)	66.78
MLE Mean (bias corrected)	14.89	MLE Sd (bias corrected)	8.927

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	33.48	90% Percentile	26.86
95% Hawkins Wixley (HW) Approx. Gamma UPL	34.08	95% Percentile	31.94
95% WH Approx. Gamma UTL with 99% Coverage	67.25	99% Percentile	43
95% HW Approx. Gamma UTL with 99% Coverage	72.95		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	39.64	95% HW USL	40.86

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0876	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	105	90% Percentile (z)		26.42
	95% UPL (t)	36.72	95% Percentile (z)		32.38
	95% USL	46.34	99% Percentile (z)		47.42

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	35.3
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	35.3	95% BCA Bootstrap UTL with	99% Coverage	35.3
	95% UPL	35.3		90% Percentile	23.8
	90% Chebyshev UPL	41.89		95% Percentile	29.09
	95% Chebyshev UPL	54.12		99% Percentile	34.06
	95% USL	35.3			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Total dissolved solids (TDS)

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Minimum	32	First Quartile	39.75
Second Largest	61	Median	43
Maximum	69	Third Quartile	53.25
Mean	46.5	SD	11.01
Coefficient of Variation	0.237	Skewness	0.867
Mean of logged Data	3.815	SD of logged Data	0.226

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	87.75	90% Percentile (z)	60.61
95% UPL (t)	67.08	95% Percentile (z)	64.61
95% USL	71.65	99% Percentile (z)	72.11

Gamma GOF Test

A-D Test Statistic	0.37	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.197	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	20.87	k star (bias corrected MLE)	15.71
Theta hat (MLE)	2.228	Theta star (bias corrected MLE)	2.961
nu hat (MLE)	500.8	nu star (bias corrected)	377
MLE Mean (bias corrected)	46.5	MLE Sd (bias corrected)	11.73

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	68.37	90% Percentile	62.03
95% Hawkins Wixley (HW) Approx. Gamma UPL	68.58	95% Percentile	67.33
95% WH Approx. Gamma UTL with 99% Coverage	97.58	99% Percentile	78.05
95% HW Approx. Gamma UTL with 99% Coverage	99.37		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	74.25	95% HW USL	74.68

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	106.1	90% Percentile (z)		60.68
	95% UPL (t)	69.32	95% Percentile (z)		65.88
	95% USL	76.16	99% Percentile (z)		76.88

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	69
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	69	95% BCA Bootstrap UTL with	99% Coverage	69
	95% UPL	69		90% Percentile	60.6
	90% Chebyshev UPL	80.87		95% Percentile	64.6
	95% Chebyshev UPL	96.44		99% Percentile	68.12
	95% USL	69			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Zinc

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	9.94	First Quartile	11.05
Second Largest	17	Median	12.2
Maximum	18.6	Third Quartile	15.08
Mean	13.17	SD	2.855
Coefficient of Variation	0.217	Skewness	0.813
Mean of logged Data	2.558	SD of logged Data	0.207

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	23.87	90% Percentile (z)	16.83
95% UPL (t)	18.51	95% Percentile (z)	17.87
95% USL	19.69	99% Percentile (z)	19.81

Gamma GOF Test

A-D Test Statistic	0.471	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.166	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	24.83	k star (bias corrected MLE)	18.68
Theta hat (MLE)	0.53	Theta star (bias corrected MLE)	0.705
nu hat (MLE)	596	nu star (bias corrected)	448.3
MLE Mean (bias corrected)	13.17	MLE Sd (bias corrected)	3.047

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	18.81	90% Percentile	17.19
95% Hawkins Wixley (HW) Approx. Gamma UPL	18.85	95% Percentile	18.55
95% WH Approx. Gamma UTL with 99% Coverage	26.18	99% Percentile	21.27
95% HW Approx. Gamma UTL with 99% Coverage	26.58		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	20.3	95% HW USL	20.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.924	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.152	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	28.05	90% Percentile (z)		16.83
	95% UPL (t)	19.01	95% Percentile (z)		18.15
	95% USL	20.72	99% Percentile (z)		20.9

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	18.6
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	18.6	95% BCA Bootstrap UTL with	99% Coverage	18.6
	95% UPL	18.6		90% Percentile	16.95
	90% Chebyshev UPL	22.09		95% Percentile	17.72
	95% Chebyshev UPL	26.12		99% Percentile	18.42
	95% USL	18.6			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

pH

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Minimum	8.53	First Quartile	8.573
Second Largest	8.87	Median	8.665
Maximum	9.05	Third Quartile	8.813
Mean	8.704	SD	0.161
Coefficient of Variation	0.0185	Skewness	0.856
Mean of logged Data	2.164	SD of logged Data	0.0184

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	9.308	90% Percentile (z)	8.911
95% UPL (t)	9.005	95% Percentile (z)	8.969
95% USL	9.072	99% Percentile (z)	9.079

Gamma GOF Test

A-D Test Statistic	0.527	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3212	k star (bias corrected MLE)	2409
Theta hat (MLE)	0.00271	Theta star (bias corrected MLE)	0.00361
nu hat (MLE)	77080	nu star (bias corrected)	57811
MLE Mean (bias corrected)	8.704	MLE Sd (bias corrected)	0.177

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	9.007	90% Percentile	8.932
95% Hawkins Wixley (HW) Approx. Gamma UPL	9.007	95% Percentile	8.998
95% WH Approx. Gamma UTL with 99% Coverage	9.318	99% Percentile	9.122
95% HW Approx. Gamma UTL with 99% Coverage	9.32		

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:03:33 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% WH USL	9.075	95% HW USL	9.075

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	9.324	90% Percentile (z)		8.91
	95% UPL (t)	9.007	95% Percentile (z)		8.97
	95% USL	9.076	99% Percentile (z)		9.083

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r		12	95% UTL with	99% Coverage	9.05
Approx, f used to compute achieved CC		0.121	Approximate Actual Confidence Coefficient achieved by UTL		0.114
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	9.05	95% BCA Bootstrap UTL with	99% Coverage	9.05
	95% UPL	9.05		90% Percentile	8.865
	90% Chebyshev UPL	9.207		95% Percentile	8.951
	95% Chebyshev UPL	9.435		99% Percentile	9.03
	95% USL	9.05			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Fluoride

General Statistics

Total Number of Observations	12	Number of Missing Observations	0
Number of Distinct Observations	11		
Number of Detects	10	Number of Non-Detects	2
Number of Distinct Detects	10	Number of Distinct Non-Detects	1
Minimum Detect	0.516	Minimum Non-Detect	0.5
Maximum Detect	3.01	Maximum Non-Detect	0.5
Variance Detected	0.523	Percent Non-Detects	16.67%
Mean Detected	1.074	SD Detected	0.723
Mean of Detected Logged Data	-0.0642	SD of Detected Logged Data	0.504

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.684	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.309	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.979	KM SD	0.662
95% UTL99% Coverage	3.458	95% KM UPL (t)	2.216
90% KM Percentile (z)	1.827	95% KM Percentile (z)	2.067
99% KM Percentile (z)	2.518	95% KM USL	2.491

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.937	SD	0.729
95% UTL99% Coverage	3.667	95% UPL (t)	2.299
90% Percentile (z)	1.871	95% Percentile (z)	2.135
99% Percentile (z)	2.632	95% USL	2.602

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.691	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.224	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

k hat (MLE)	3.838	k star (bias corrected MLE)	2.753
Theta hat (MLE)	0.28	Theta star (bias corrected MLE)	0.39
nu hat (MLE)	76.76	nu star (bias corrected)	55.06
MLE Mean (bias corrected)	1.074		
MLE Sd (bias corrected)	0.647	95% Percentile of Chisquare (2kstar)	11.85

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	0.897
Maximum	3.01	Median	0.777
SD	0.774	CV	0.863
k hat (MLE)	0.829	k star (bias corrected MLE)	0.678
Theta hat (MLE)	1.081	Theta star (bias corrected MLE)	1.324
nu hat (MLE)	19.9	nu star (bias corrected)	16.26
MLE Mean (bias corrected)	0.897	MLE Sd (bias corrected)	1.09
95% Percentile of Chisquare (2kstar)	4.667	90% Percentile	2.269
95% Percentile	3.089	99% Percentile	5.052

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	9.999	14.86	95% Approx. Gamma UPL	3.423	4.065
95% Gamma USL	4.495	5.628			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.979	SD (KM)	0.662
Variance (KM)	0.438	SE of Mean (KM)	0.201
k hat (KM)	2.187	k star (KM)	1.696
nu hat (KM)	52.48	nu star (KM)	40.69
theta hat (KM)	0.448	theta star (KM)	0.577
80% gamma percentile (KM)	1.493	90% gamma percentile (KM)	1.979
95% gamma percentile (KM)	2.448	99% gamma percentile (KM)	3.497

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	3.766	3.906	95% Approx. Gamma UPL	2.127	2.124
95% KM Gamma Percentile	1.939	1.928	95% Gamma USL	2.509	2.527

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.888	**Shapiro Wilk GOF Test**	

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.944	Mean in Log Scale	-0.26
SD in Original Scale	0.721	SD in Log Scale	0.647
95% UTL99% Coverage	8.718	95% BCA UTL99% Coverage	3.01
95% Bootstrap (%) UTL99% Coverage	3.01	95% UPL (t)	2.586
90% Percentile (z)	1.768	95% Percentile (z)	2.237
99% Percentile (z)	3.476	95% USL	3.384

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-0.169	95% KM UTL (Lognormal)99% Coverage	5.401
KM SD of Logged Data	0.495	95% KM UPL (Lognormal)	2.131
95% KM Percentile Lognormal (z)	1.907	95% KM USL (Lognormal)	2.618

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.937	Mean in Log Scale	-0.285
SD in Original Scale	0.729	SD in Log Scale	0.687
95% UTL99% Coverage	9.884	95% UPL (t)	2.719
90% Percentile (z)	1.815	95% Percentile (z)	2.33
99% Percentile (z)	3.723	95% USL	3.618

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	12	95% UTL with99% Coverage	3.01
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
Approximate Sample Size needed to achieve specified CC	299	95% UPL	3.01
95% USL	3.01	95% KM Chebyshev UPL	3.981

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Lead

General Statistics

Total Number of Observations	12	Number of Missing Observations	0
Number of Distinct Observations	12		
Number of Detects	11	Number of Non-Detects	1
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	1.22	Minimum Non-Detect	1
Maximum Detect	3.08	Maximum Non-Detect	1
Variance Detected	0.383	Percent Non-Detects	8.333%
Mean Detected	2.188	SD Detected	0.619
Mean of Detected Logged Data	0.744	SD of Detected Logged Data	0.299

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	2.089	KM SD	0.654
95% UTL99% Coverage	4.539	95% KM UPL (t)	3.311
90% KM Percentile (z)	2.927	95% KM Percentile (z)	3.165
99% KM Percentile (z)	3.61	95% KM USL	3.583

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	2.048	SD	0.766
95% UTL99% Coverage	4.916	95% UPL (t)	3.479
90% Percentile (z)	3.029	95% Percentile (z)	3.307
99% Percentile (z)	3.829	95% USL	3.797

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.229	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.729	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.157	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.255	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

k hat (MLE)	12.98	k star (bias corrected MLE)	9.498
Theta hat (MLE)	0.169	Theta star (bias corrected MLE)	0.23
nu hat (MLE)	285.5	nu star (bias corrected)	209
MLE Mean (bias corrected)	2.188		
MLE Sd (bias corrected)	0.71	95% Percentile of Chisquare (2kstar)	30.14

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.901	Mean	2.081
Maximum	3.08	Median	2.07
SD	0.698	CV	0.335
k hat (MLE)	8.577	k star (bias corrected MLE)	6.488
Theta hat (MLE)	0.243	Theta star (bias corrected MLE)	0.321
nu hat (MLE)	205.8	nu star (bias corrected)	155.7
MLE Mean (bias corrected)	2.081	MLE Sd (bias corrected)	0.817
95% Percentile of Chisquare (2kstar)	22.33	90% Percentile	3.172
95% Percentile	3.581	99% Percentile	4.435

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	6.121	6.457	95% Approx. Gamma UPL	3.682	3.739
95% Gamma USL	4.152	4.248			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	2.089	SD (KM)	0.654
Variance (KM)	0.427	SE of Mean (KM)	0.198
k hat (KM)	10.21	k star (KM)	7.714
nu hat (KM)	245.1	nu star (KM)	185.1
theta hat (KM)	0.205	theta star (KM)	0.271
80% gamma percentile (KM)	2.682	90% gamma percentile (KM)	3.092
95% gamma percentile (KM)	3.46	99% gamma percentile (KM)	4.223

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	5.268	5.473	95% Approx. Gamma UPL	3.544	3.587
95% KM Gamma Percentile	3.33	3.36	95% Gamma USL	3.965	4.038

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

5% Shapiro Wilk Critical Value	0.85	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.147	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	2.09	Mean in Log Scale	0.683
SD in Original Scale	0.681	SD in Log Scale	0.354
95% UTL99% Coverage	7.469	95% BCA UTL99% Coverage	3.08
95% Bootstrap (%) UTL99% Coverage	3.08	95% UPL (t)	3.84
90% Percentile (z)	3.118	95% Percentile (z)	3.547
99% Percentile (z)	4.515	95% USL	4.45

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	0.682	95% KM UTL (Lognormal)99% Coverage	7.117
KM SD of Logged Data	0.342	95% KM UPL (Lognormal)	3.746
95% KM Percentile Lognormal (z)	3.47	95% KM USL (Lognormal)	4.318

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	2.048	Mean in Log Scale	0.624
SD in Original Scale	0.766	SD in Log Scale	0.503
95% UTL99% Coverage	12.31	95% UPL (t)	4.784
90% Percentile (z)	3.559	95% Percentile (z)	4.273
99% Percentile (z)	6.021	95% USL	5.897

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	12	95% UTL with99% Coverage	3.08
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
Approximate Sample Size needed to achieve specified CC	299	95% UPL	3.08
95% USL	3.08	95% KM Chebyshev UPL	5.055

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Chloride

General Statistics

Total Number of Observations	12	Number of Missing Observations	0
Number of Distinct Observations	12		
Number of Detects	11	Number of Non-Detects	1
Number of Distinct Detects	11	Number of Distinct Non-Detects	1
Minimum Detect	2.64	Minimum Non-Detect	2.5
Maximum Detect	9.32	Maximum Non-Detect	2.5
Variance Detected	4.008	Percent Non-Detects	8.333%
Mean Detected	4.053	SD Detected	2.002
Mean of Detected Logged Data	1.32	SD of Detected Logged Data	0.384

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.695	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.329	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	3.923	KM SD	1.877
95% UTL99% Coverage	10.96	95% KM UPL (t)	7.432
90% KM Percentile (z)	6.329	95% KM Percentile (z)	7.011
99% KM Percentile (z)	8.291	95% KM USL	8.213

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	3.819	SD	2.073
95% UTL99% Coverage	11.59	95% UPL (t)	7.695
90% Percentile (z)	6.476	95% Percentile (z)	7.229
99% Percentile (z)	8.642	95% USL	8.556

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.049	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.731	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.279	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.256	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

k hat (MLE)	6.483	k star (bias corrected MLE)	4.776
Theta hat (MLE)	0.625	Theta star (bias corrected MLE)	0.849
nu hat (MLE)	142.6	nu star (bias corrected)	105.1
MLE Mean (bias corrected)	4.053		
MLE Sd (bias corrected)	1.854	95% Percentile of Chisquare (2kstar)	17.69

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)

For such situations, GROS method may yield incorrect values of UCLs and BTVs

This is especially true when the sample size is small.

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.585	Mean	3.764
Maximum	9.32	Median	3.365
SD	2.155	CV	0.573
k hat (MLE)	3.284	k star (bias corrected MLE)	2.519
Theta hat (MLE)	1.146	Theta star (bias corrected MLE)	1.494
nu hat (MLE)	78.83	nu star (bias corrected)	60.45
MLE Mean (bias corrected)	3.764	MLE Sd (bias corrected)	2.371
95% Percentile of Chisquare (2kstar)	11.13	90% Percentile	6.941
95% Percentile	8.314	99% Percentile	11.32

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	17.87	20.06	95% Approx. Gamma UPL	8.718	9.042
95% Gamma USL	10.38	10.94			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	3.923	SD (KM)	1.877
Variance (KM)	3.524	SE of Mean (KM)	0.568
k hat (KM)	4.368	k star (KM)	3.331
nu hat (KM)	104.8	nu star (KM)	79.95
theta hat (KM)	0.898	theta star (KM)	1.178
80% gamma percentile (KM)	5.527	90% gamma percentile (KM)	6.806
95% gamma percentile (KM)	7.993	99% gamma percentile (KM)	10.55

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	11.48	11.73	95% Approx. Gamma UPL	7.257	7.241
95% KM Gamma Percentile	6.746	6.716	95% Gamma USL	8.272	8.295

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.812	**Shapiro Wilk GOF Test**	

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:24:56 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

5% Shapiro Wilk Critical Value	0.85	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.254	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	3.845	Mean in Log Scale	1.247
SD in Original Scale	2.04	SD in Log Scale	0.445
95% UTL99% Coverage	18.45	95% BCA UTL99% Coverage	9.32
95% Bootstrap (%) UTL99% Coverage	9.32	95% UPL (t)	8
90% Percentile (z)	6.158	95% Percentile (z)	7.239
99% Percentile (z)	9.805	95% USL	9.626

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	1.287	95% KM UTL (Lognormal)99% Coverage	14.39
KM SD of Logged Data	0.368	95% KM UPL (Lognormal)	7.206
95% KM Percentile Lognormal (z)	6.635	95% KM USL (Lognormal)	8.398

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	3.819	Mean in Log Scale	1.229
SD in Original Scale	2.073	SD in Log Scale	0.484
95% UTL99% Coverage	20.99	95% UPL (t)	8.451
90% Percentile (z)	6.357	95% Percentile (z)	7.581
99% Percentile (z)	10.55	95% USL	10.34

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	12	95% UTL with99% Coverage	9.32
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
Approximate Sample Size needed to achieve specified CC	299	95% UPL	9.32
95% USL	9.32	95% KM Chebyshev UPL	12.44

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:34:17 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Copper excl 1 outlier

General Statistics

Total Number of Observations	11	Number of Distinct Observations	11
		Number of Missing Observations	1
Minimum	0.59	First Quartile	0.845
Second Largest	1.56	Median	1.13
Maximum	2.18	Third Quartile	1.425
Mean	1.174	SD	0.467
Coefficient of Variation	0.398	Skewness	0.828
Mean of logged Data	0.0888	SD of logged Data	0.398

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.852	d2max (for USL)	2.234

Normal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	2.971	90% Percentile (z)	1.772
95% UPL (t)	2.057	95% Percentile (z)	1.941
95% USL	2.216	99% Percentile (z)	2.259

Gamma GOF Test

A-D Test Statistic	0.249	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.138	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.256	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.186	k star (bias corrected MLE)	5.287
Theta hat (MLE)	0.163	Theta star (bias corrected MLE)	0.222
nu hat (MLE)	158.1	nu star (bias corrected)	116.3
MLE Mean (bias corrected)	1.174	MLE Sd (bias corrected)	0.51

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.191	90% Percentile	1.857

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:34:17 PM
From File	I:\EAMGROUP\82148 (JAL Landfarm)\2018-06 (Comments on Background)\082148 Background Data for ProUC
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

95% Hawkins Wixley (HW) Approx. Gamma UPL	2.219	95% Percentile	2.119
95% WH Approx. Gamma UTL with 99% Coverage	3.859	99% Percentile	2.673
95% HW Approx. Gamma UTL with 99% Coverage	4.072		
95% WH USL	2.438	95% HW USL	2.483

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.152	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.251	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	5.072	90% Percentile (z)	1.821
95% UPL (t)	2.324	95% Percentile (z)	2.105
95% USL	2.662	99% Percentile (z)	2.762

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	11	95% UTL with 99% Coverage	2.18
Approx, f used to compute achieved CC	0.111	Approximate Actual Confidence Coefficient achieved by UTL	0.105
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	2.18	95% BCA Bootstrap UTL with 99% Coverage	2.18
95% UPL	2.18	90% Percentile	1.56
90% Chebyshev UPL	2.636	95% Percentile	1.87
95% Chebyshev UPL	3.298	99% Percentile	2.118
95% USL	2.18		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:37:49 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Fluoride excluding 3 outliers

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	2
Minimum	0.516	First Quartile	0.746
Second Largest	1.19	Median	0.806
Maximum	1.24	Third Quartile	1.08
Mean	0.859	SD	0.26
Coefficient of Variation	0.303	Skewness	0.276
Mean of logged Data	-0.194	SD of logged Data	0.311

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	4.143	d2max (for USL)	2.11

Normal GOF Test

Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	1.938	90% Percentile (z)	1.193
95% UPL (t)	1.37	95% Percentile (z)	1.287
95% USL	1.408	99% Percentile (z)	1.465

Gamma GOF Test

A-D Test Statistic	0.312	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.722	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.154	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	12.05	k star (bias corrected MLE)	8.105
Theta hat (MLE)	0.0713	Theta star (bias corrected MLE)	0.106
nu hat (MLE)	216.8	nu star (bias corrected)	145.9
MLE Mean (bias corrected)	0.859	MLE Sd (bias corrected)	0.302

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	1.45	90% Percentile	1.262

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:37:49 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

95% Hawkins Wixley (HW) Approx. Gamma UPL	1.464	95% Percentile	1.408
95% WH Approx. Gamma UTL with 99% Coverage	2.425	99% Percentile	1.712
95% HW Approx. Gamma UTL with 99% Coverage	2.53		
95% WH USL	1.506	95% HW USL	1.524

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.934	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	2.986	90% Percentile (z)	1.227
95% UPL (t)	1.515	95% Percentile (z)	1.374
95% USL	1.587	99% Percentile (z)	1.698

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	9	95% UTL with 99% Coverage	1.24
Approx, f used to compute achieved CC	0.0909	Approximate Actual Confidence Coefficient achieved by UTL	0.0865
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	1.24	95% BCA Bootstrap UTL with 99% Coverage	1.24
95% UPL	1.24	90% Percentile	1.2
90% Chebyshev UPL	1.682	95% Percentile	1.22
95% Chebyshev UPL	2.055	99% Percentile	1.236
95% USL	1.24		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:37:49 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Chloride excluding 3 outliers

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
		Number of Missing Observations	3
Minimum	2.64	First Quartile	2.76
Second Largest	3.65	Median	3.27
Maximum	4	Third Quartile	3.62
Mean	3.233	SD	0.481
Coefficient of Variation	0.149	Skewness	0.204
Mean of logged Data	1.164	SD of logged Data	0.149

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	4.143	d2max (for USL)	2.11

Normal GOF Test

Shapiro Wilk Test Statistic	0.927	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.171	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	5.228	90% Percentile (z)	3.85
95% UPL (t)	4.177	95% Percentile (z)	4.025
95% USL	4.249	99% Percentile (z)	4.353

Gamma GOF Test

A-D Test Statistic	0.372	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.721	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.187	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.279	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	50.93	k star (bias corrected MLE)	34.02
Theta hat (MLE)	0.0635	Theta star (bias corrected MLE)	0.095
nu hat (MLE)	916.7	nu star (bias corrected)	612.4
MLE Mean (bias corrected)	3.233	MLE Sd (bias corrected)	0.554

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	4.245	90% Percentile	3.961

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.17/27/2018 4:37:49 PM
From File	082148 Background Data for ProUCL (detected analytes) rev 2018-06.xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

95% Hawkins Wixley (HW) Approx. Gamma UPL	4.255	95% Percentile	4.196
95% WH Approx. Gamma UTL with 99% Coverage	5.631	99% Percentile	4.661
95% HW Approx. Gamma UTL with 99% Coverage	5.698		
95% WH USL	4.331	95% HW USL	4.343

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.829	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.174	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.274	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	5.933	90% Percentile (z)	3.875
95% UPL (t)	4.287	95% Percentile (z)	4.09
95% USL	4.383	99% Percentile (z)	4.527

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	9	95% UTL with 99% Coverage	4
Approx, f used to compute achieved CC	0.0909	Approximate Actual Confidence Coefficient achieved by UTL	0.0865
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	4	95% BCA Bootstrap UTL with 99% Coverage	4
95% UPL	4	90% Percentile	3.72
90% Chebyshev UPL	4.756	95% Percentile	3.86
95% Chebyshev UPL	5.445	99% Percentile	3.972
95% USL	4		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Attachment C
Determination of Soil Background Values, April 3, 2018 Submittal

April 3, 2018 Reference No. 082148

Mr. Brad Jones
Energy Minerals and Natural Resources Department
Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Dear Mr. Jones:

Re: Determination of Soil Background Values
Landfarm Permit No. NW 02 0019
Lea County, New Mexico

1. Introduction

In a letter dated November 14, 2016, the State of New Mexico Energy, Minerals and Natural Resources Department (EMNRD) New Mexico Oil Conservation Division (NMOCD) approved a request to calculate statistically-based background concentrations using analytical results from samples collected near a facility operated under Landfarm Permit No NW-02-0019 located in Lea County, New Mexico (Site). These background values are to be used for the assessment of treatment zone performance standards under Subsection F of 19.15.36.15 NMAC.

This letter reports the statistical methods and results for the required background concentration calculations.

2. Scope of Data

Background soil samples were collected from 12 locations during 2014 and 2017, which were submitted for laboratory analysis for a variety of analytes. The tabulated laboratory analytical data and reports containing this data was submitted to the NMOCD on November 28, 2017 and again on February 22, 2018. The data was verbally approved for submittal on February 22, 1018.

The samples collected in 2014 were analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals, polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH), radiochemistry (radium-226+228) and general chemistry parameters. Additional samples collected from similar locations in 2017 were analyzed for full range TPH by EPA Method 8015 only. Thus, either 12 or 24 observations are available for each analyte based on soil background sampling efforts conducted for the Site.

New Mexico regulations (20 NMAC 6.2.3103) specify human health standards protective of ground water, which are relevant to landfarm closure efforts at the Site. Of specific interest are the analytes listed in

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Subsections A (33 pollutants) and B (9 constituents considered for domestic water supply[1]). As well, TPH is of interest as a potential site-specific pollutant that is included in 19 NMAC 15.36.15 B.

Although not all of these analytes are naturally occurring, their occurrence in background areas (i.e., unrelated to Site activities) is an important component for assessing potential environmental quality impacts from the Site. Therefore, background value determination was considered for all Subsection A and B analytes, as well as for TPH. The available background data are listed in Table 1.

3. Statistical Methods

Guidance for determining background values is available in the Technical Guide for the United States Environmental Protection Agency's (USEPA's) ProUCL software (USEPA, 2015). The general approach in USEPA (2015) for determining background values is to estimate an upper bound on the background population using a method appropriate for the observed data distribution (i.e., normal, gamma-distributed, lognormal or none of these), considering the potential occurrence of statistical outliers and the presence of censored data (non-detects). Statistical limits such as upper tolerance limits (UTLs) or upper prediction limit (UPLs) may be used. Such values take into consideration sampling variability (both in background sampling and in on-site sampling), and provide background values which are expected to rarely be exceeded in samples collected from areas on a site that are consistent with background conditions (e.g., no more frequently than 1 in 100 samples, if a 99 percent value is selected). For further discussion of specific background value calculation methodologies, please refer to Chapter 5 of the Technical Guide (USEPA, 2015).

The selected statistic for the present background value calculations is a statistical 95 percent confidence UTL on the 99th percentile of background (99/95UTL). This calculation provides an upper limit on constituent concentrations in background soils near the Site such that there is 95 percent confidence that no more than 1 in 100 samples collected from soils consistent with background conditions will have an analyte concentration exceeding the UTL.

Statistical calculations were computed using USEPA's statistical software ProUCL (version 5.1.002). Chapter 5 of USEPA (2015) describes statistical methodologies for calculating BTVs. The selection of an appropriate method varies by characteristics of individual data, in particular (i) the observed data distribution, (ii) the percentage of non-detect values present, and (iii) the presence of statistical outliers. Methods for assessing these characteristics are provided in ProUCL.

A number of assumptions for background data set must be statistically assessed before the BTV calculations are performed, which are discussed below.

[1] Note that although Subsection B has analytes numbered from (1) to (10), there is no (5), thus resulting in 9 entries

3.1 Data Distribution Testing

ProUCL assesses each data set for the following distribution patterns (in priority order): normal, gamma-distributed, and lognormal. If a data set is found to fit one of these distributions, then a background value calculation method for the observed data distribution is used. If, however, a particular data set does not fit one of these distributions, it is noted as not having an identifiable distribution and non-parametric (rank-based) statistical methods are used for subsequent calculations.

3.2 Outlier Testing

Once a data distribution has been established for a data set, an assessment of statistical outliers (extreme low or high values appearing atypical of the remaining data) is carried out considering the observed data distribution. In the current evaluation, any suspected statistical outliers were tested using Dixon's test (for up to 25 observations). Details of this method are found in Section 7.3.1 of USEPA (2015).

In background data sets, any identified statistical outliers need to be retained in the background value calculations unless a reason for the outlier is found (e.g., a lab or data transcription error). However, in such cases it is customary to assess the impact of outlier presence on the background value by repeating calculations with and without the outlier(s).

3.3 Censored Data (Non-Detects) in the Background Data Set

The calculation of background values when non-detect data are present is considered in Chapter 5 of USEPA (2015). In particular, the Kaplan-Meier (KM) method for estimation of sample means and standard deviations when single or multiple detection limits are present is recommended (USEPA, 2015; Helsel, 2005). The KM method is described in Section 5.3 of USEPA (2015).

Where a given background data set consists entirely of non-detect results, statistical calculations are not appropriate. In such cases, the detection limit may be used as the background value. For background data sets with few detected values (i.e., >50 percent non-detects), a data distribution and outliers may not be meaningfully tested, and non-parametric background value calculations are recommended.

4. Calculated Background Values

As discussed above, background values for 20 NMAC 6.2.3103 Subsection A and B parameters, as well as for TPH, were generated using USEPA's ProUCL (version 5.1.002) software. Calculations were performed for background data sets containing up to 50 percent non-detect values. Background values for undetected analytes and rarely-detected analytes (having more than 50 percent non-detects) were established by the detection limit and/or maximum detected concentrations in these cases.

It was noted that in two cases (for cyanide and total mercury), the calculated UTL was below the reported detection limit from the laboratory. This occurred due to the presence of J-qualified (estimated) data between the method/instrument detection limit and the reporting detection limit. In these cases, the

reporting detection limit should be used as the appropriate background value, to ensure that site samples may be meaningfully compared to the background value.

The input data submitted to ProUCL are shown in Attachment A. Output from ProUCL is provided in Attachment B. A summary of the background value calculation process and results is given in Table 2.

5. Conclusions

The calculated soil background values presented in Table 2 are appropriate for point-by-point comparisons of on-Site data. No more than 1 in 100 samples consistent with background conditions are expected to exceed the respective background value, with 95 percent confidence.

6. References

Helsel, D. R. 2005. Nondetects and Data Analysis. Statistics for Censored Environmental Data. John Wiley and Sons, N.Y.

USEPA, October 2015. ProUCL Version 5.1.002 Technical Guide. United States Environmental Protection Agency, Office of Research and Development, Washington DC. EPA/600/R-07/041.

If you have any questions, please don't hesitate to contact us.

Sincerely,

GHD

Wesley Dyck
Environmental Scientist

Bernard Bockisch
Sr. Project Manager

BB/ji/1

Encl.

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample ID:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,1-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,3-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,3-Trichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,4-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,4-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2-Dibromoethane (Ethylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3,5-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,4-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Butanone (Methyl ethyl ketone)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Chloroethyl vinyl ether	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Hexanone	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Phenylbutane (sec-Butylbenzene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Acetone	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Acrylonitrile	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromodichloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromoform	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromomethane (Methyl bromide)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Carbon disulfide	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Carbon tetrachloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroform (Trichloromethane)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloromethane (Methyl chloride)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Cymene (p-Isopropyltoluene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromochloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dichlorodifluoromethane (CFC-12)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample ID:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds (Continued)																	
Ethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Hexachlorobutadiene	ug/kg	31.4 JB	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Iodomethane	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Isopropyl benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methyl tert butyl ether (MTBE)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methylene chloride	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
m-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Naphthalene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
N-Butylbenzene	ug/kg	6.42 JB	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
N-Propylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
o-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Styrene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
tert-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Tetrachloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Toluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,4-Dichloro-2-butene	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Trichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Trichlorofluoromethane (CFC-11)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Vinyl chloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Semi-volatile Organic Compounds																	
1-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
2-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(b)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(g,h,i)perylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(k)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Chrysene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenz(a,h)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenzofuran	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluorene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Naphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Phenanthrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample ID:		BG-1	BG-1	BG-1	B-1	BG-2	BG-2	BG-2	B-2	BG-3	BG-3	BG-3	B-3	BG-4	BG-4	BG-4	B-4
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/30/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Metals																	
Arsenic	mg/kg	< 2.00	-	-	-	1.79 J	-	-	-	1.15 J	-	-	-	1.48 J	-	-	-
Barium	mg/kg	44.1	-	-	-	44.6	-	-	-	54.3	-	-	-	95.6	-	-	-
Cadmium	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Chromium	mg/kg	4.56	-	-	-	5.38	-	-	-	6.26	-	-	-	4.20	-	-	-
Copper	mg/kg	1.11	-	-	-	1.56	-	-	-	2.18	-	-	-	1.13	-	-	-
Iron	mg/kg	4730	-	-	-	6240	-	-	-	7030	-	-	-	4530	-	-	-
Lead	mg/kg	2.25	-	-	-	3.08	-	-	-	2.66	-	-	-	1.22	-	-	-
Manganese	mg/kg	54.1	-	-	-	55.7	-	-	-	81.7	-	-	-	55.0	-	-	-
Mercury	mg/kg	0.00812 J	-	-	-	0.00846 J	-	-	-	0.00807 J	-	-	-	0.00649 J	-	-	-
Selenium	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Silver	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Uranium	mg/kg	21.6	-	-	-	25.8	-	-	-	28.2	-	-	-	21.3	-	-	-
Zinc	mg/kg	12.5	-	-	-	14.6	-	-	-	16.5	-	-	-	11.5	-	-	-
PCBs																	
Aroclor-1016 (PCB-1016)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1221 (PCB-1221)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1232 (PCB-1232)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1242 (PCB-1242)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1248 (PCB-1248)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1254 (PCB-1254)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1260 (PCB-1260)	ug/kg	-	-	< 18	-	-	-	< 17	-	-	-	< 20	-	-	-	< 17	-
Petroleum Products																	
Total Petroleum Hydrocarbons - Gasoline Range Organics	mg/kg	< 4.00	-	-	<4.9	< 4.00	-	-	<5.0	< 4.00	-	-	<4.8	< 4.00	-	-	<4.6
Total Petroleum Hydrocarbons - Diesel Range Organics	mg/kg	< 50.0	-	-	<9.7	< 50.0	-	-	<9.9	< 50.0	-	-	<9.3	< 50.0	-	-	<9.4
Total Petroleum Hydrocarbons - Motor Oil Range Organics	mg/kg	-	-	-	<47	-	-	-	<49	-	-	-	<47	-	-	-	<47
TPH (C6 through C35)	mg/kg	-	-	-	<61.2	-	-	-	<63.9	-	-	-	<31.1	-	-	-	<61
Radiochemistry																	
Radium-226	pCi/g	-	0.666 +/- 0.192	-	-	-	0.338 +/- 0.137	-	-	-	0.492 +/- 0.137	-	-	-	0.470 +/- 0.107	-	-
Radium-228	pCi/g	-	0.394 +/- 0.208	-	-	-	0.348 +/- 0.170	-	-	-	0.248 +/- 0.197	-	-	-	0.163 +/- 0.165	-	-
Radium 226 and 228	pCi/g	-	1.060 +/- 0.400	-	-	-	0.686 +/- 0.307	-	-	-	0.740 +/- 0.334	-	-	-	0.633 +/- 0.272	-	-
General Chemistry																	
Chloride	mg/kg	3.27	-	-	-	6.16	-	-	-	2.75	-	-	-	3.65	-	-	-
Cyanide (total)	mg/kg	0.220 J	-	-	-	0.330 J	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Fluoride	mg/kg	0.516	-	-	-	0.434 J	-	-	-	0.748	-	-	-	1.24	-	-	-
Nitrate (as N)	mg/kg	2.55	-	-	-	15.0	-	-	-	1.16	-	-	-	7.33	-	-	-
pH	s.u.	8.81	-	-	-	8.55	-	-	-	8.77	-	-	-	8.55	-	-	-
Phenolics (total)	mg/kg	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-
Sulfate	mg/kg	10.2	-	-	-	35.3	-	-	-	8.49	-	-	-	14.8	-	-	-
Total dissolved solids (TDS)	mg/kg	41.00	-	-	-	39.00	-	-	-	61.00	-	-	-	52.00	-	-	-

Notes:

J - Estimated value
B - Analyte detected in the corresponding method blank above the method detection limit

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample ID:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,1-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,3-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,3-Trichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,4-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,4-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2-Dibromoethane (Ethylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3,5-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,4-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Butanone (Methyl ethyl ketone)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Chloroethyl vinyl ether	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Hexanone	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Phenylbutane (sec-Butylbenzene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Acetone	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Acrylonitrile	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromodichloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromoform	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromomethane (Methyl bromide)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Carbon disulfide	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Carbon tetrachloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroform (Trichloromethane)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloromethane (Methyl chloride)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Cymene (p-Isopropyltoluene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromochloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dichlorodifluoromethane (CFC-12)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample ID:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds (Continu																	
Ethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Hexachlorobutadiene	ug/kg	< 100	-	-	-	33.7 JB	-	-	-	18.3 JB	-	-	-	< 100	-	-	-
Iodomethane	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Isopropyl benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methyl tert butyl ether (MTBE)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methylene chloride	ug/kg	< 100	-	-	-	14.5 JB	-	-	-	< 100	-	-	-	< 100	-	-	-
m-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Naphthalene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
N-Butylbenzene	ug/kg	< 20.0	-	-	-	7.01 JB	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
N-Propylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
o-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Styrene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
tert-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Tetrachloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Toluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,4-Dichloro-2-butene	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Trichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Trichlorofluoromethane (CFC-11)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Vinyl chloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Semi-volatile Organic Compounds																	
1-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
2-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(b)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(g,h,i)perylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(k)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Chrysene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenz(a,h)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenzofuran	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluorene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Naphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Phenanthrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample ID:		BG-5	BG-5	BG-5	B-5	BG-6	BG-6	BG-6	B-6	BG-7	BG-7	BG-7	B-7	BG-8	BG-8	BG-8	B-8
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Metals																	
Arsenic	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Barium	mg/kg	67.8	-	-	-	59.5	-	-	-	74.7	-	-	-	44.6	-	-	-
Cadmium	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Chromium	mg/kg	4.19	-	-	-	4.73	-	-	-	4.85	-	-	-	3.80	-	-	-
Copper	mg/kg	0.659	-	-	-	1.31	-	-	-	1.14	-	-	-	0.713	-	-	-
Iron	mg/kg	4540	-	-	-	5680	-	-	-	5270	-	-	-	7370	-	-	-
Lead	mg/kg	1.60	-	-	-	2.17	-	-	-	1.97	-	-	-	1.52	-	-	-
Manganese	mg/kg	43.7	-	-	-	56.1	-	-	-	56.8	-	-	-	47.1	-	-	-
Mercury	mg/kg	0.00610 J	-	-	-	0.00613 J	-	-	-	0.00739 J	-	-	-	< 0.0250	-	-	-
Selenium	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Silver	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Uranium	mg/kg	20.1	-	-	-	24.4	-	-	-	22.5	-	-	-	18.0	-	-	-
Zinc	mg/kg	10.9	-	-	-	13.1	-	-	-	11.1	-	-	-	10.4	-	-	-
PCBs																	
Aroclor-1016 (PCB-1016)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1221 (PCB-1221)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1232 (PCB-1232)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1242 (PCB-1242)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1248 (PCB-1248)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1254 (PCB-1254)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Aroclor-1260 (PCB-1260)	ug/kg	-	-	< 17	-	-	-	< 17	-	-	-	< 19	-	-	-	< 18	-
Petroleum Products																	
Total Petroleum Hydrocarbons - Gasoline Range Organics	mg/kg	< 4.00	-	-	<4.9	< 4.00	-	-	<4.7	< 4.00	-	-	<4.6	< 4.00	-	-	<4.9
Total Petroleum Hydrocarbons - Diesel Range Organics	mg/kg	< 50.0	-	-	<9.8	< 50.0	-	-	<9.6	< 50.0	-	-	<9.6	< 50.0	-	-	<9.3
Total Petroleum Hydrocarbons - Motor Oil Range Organics	mg/kg	-	-	-	<49	-	-	-	<48	-	-	-	<48	-	-	-	<47
TPH (C6 through C35)	mg/kg	-	-	-	<63.7	-	-	-	<62.3	-	-	-	<62.2	-	-	-	<61.2
Radiochemistry																	
Radium-226	pCi/g	-	0.507 +/- 0.123	-	-	-	0.493 +/- 0.139	-	-	-	0.579 +/- 0.172	-	-	-	0.421 +/- 0.106	-	-
Radium-228	pCi/g	-	0.296 +/- 0.187	-	-	-	0.460 +/- 0.181	-	-	-	0.334 +/- 0.234	-	-	-	0.252 +/- 0.173	-	-
Radium 226 and 228	pCi/g	-	0.803 +/- 0.310	-	-	-	0.953 +/- 0.320	-	-	-	0.913 +/- 0.406	-	-	-	0.673 +/- 0.279	-	-
General Chemistry																	
Chloride	mg/kg	3.62	-	-	-	2.95	-	-	-	4.00	-	-	-	2.76	-	-	-
Cyanide (total)	mg/kg	0.340 J	-	-	-	0.220 J	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Fluoride	mg/kg	1.19	-	-	-	0.853	-	-	-	1.08	-	-	-	0.746	-	-	-
Nitrate (as N)	mg/kg	3.04	-	-	-	4.41	-	-	-	9.34	-	-	-	2.05	-	-	-
pH	s.u.	8.82	-	-	-	8.58	-	-	-	9.05	-	-	-	8.87	-	-	-
Phenolics (total)	mg/kg	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-
Sulfate	mg/kg	17.4	-	-	-	5.14	-	-	-	12.9	-	-	-	6.26	-	-	-
Total dissolved solids (TDS)	mg/kg	40.00	-	-	-	45.00	-	-	-	32.00	-	-	-	57.00	-	-	-

Notes:

J - Estimated value
B - Analyte detected in the corresponding metho

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample ID:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds																	
1,1,1,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,1-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2,2-Tetrachloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1,2-Trichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,1-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,3-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,3-Trichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2,4-Trichlorobenzene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2,4-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dibromo-3-chloropropane (DBCP)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
1,2-Dibromoethane (Ethylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3,5-Trimethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,3-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
1,4-Dichlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2,2-Dichloropropane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Butanone (Methyl ethyl ketone)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Chloroethyl vinyl ether	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
2-Hexanone	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
2-Phenylbutane (sec-Butylbenzene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Chlorotoluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
4-Methyl-2-pentanone (Methyl isobutyl ketone) (MIBK)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Acetone	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Acrylonitrile	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromodichloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromoform	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Bromomethane (Methyl bromide)	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Carbon disulfide	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Carbon tetrachloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chlorobromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloroform (Trichloromethane)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Chloromethane (Methyl chloride)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
cis-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Cymene (p-Isopropyltoluene)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromochloromethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dibromomethane	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Dichlorodifluoromethane (CFC-12)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample ID:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample Date:		8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17	8/5/2014	8/7/2014	8/19/2014	5/31/17
Parameters	**Units**																
Volatile Organic Compounds (Continu																	
Ethylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Hexachlorobutadiene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Iodomethane	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
Isopropyl benzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methyl tert butyl ether (MTBE)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Methylene chloride	ug/kg	< 100	-	-	-	< 100	-	-	-	11.5 JB	-	-	-	12.6 JB	-	-	-
m-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Naphthalene	ug/kg	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-	< 100	-	-	-
N-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
N-Propylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
o-Xylene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Styrene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
tert-Butylbenzene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Tetrachloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Toluene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,2-Dichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,3-Dichloropropene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
trans-1,4-Dichloro-2-butene	ug/kg	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-	< 200	-	-	-
Trichloroethene	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Trichlorofluoromethane (CFC-11)	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Vinyl chloride	ug/kg	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-	< 20.0	-	-	-
Semi-volatile Organic Compounds																	
1-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
2-Methylnaphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Acenaphthylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(a)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(b)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(g,h,i)perylene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Benzo(k)fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Chrysene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenz(a,h)anthracene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Dibenzofuran	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluoranthene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Fluorene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Naphthalene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Phenanthrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-
Pyrene	mg/kg	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-	< 0.170	-	-	-

Table 1

Background Sample Analytical Results
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Sample Location:		BG-9	BG-9	BG-9	B-9	BG-10	BG-10	BG-10	B-10	BG-11	BG-11	BG-11	B-11	BG-12	BG-12	BG-12	B-12
Sample ID:		**BG-9**	**BG-9**	**BG-9**	**B-9**	**BG-10**	**BG-10**	**BG-10**	**B-10**	**BG-11**	**BG-11**	**BG-11**	**B-11**	**BG-12**	**BG-12**	**BG-12**	**B-12**
Sample Date:		**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**	**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**	**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**	**8/5/2014**	**8/7/2014**	**8/19/2014**	**5/31/17**
Parameters	**Units**																
Metals																	
Arsenic	mg/kg	< 2.00	-	-	-	1.42 J	-	-	-	0.921 J	-	-	-	4.03	-	-	-
Barium	mg/kg	90.0	-	-	-	26.2	-	-	-	49.3	-	-	-	111	-	-	-
Cadmium	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Chromium	mg/kg	6.36	-	-	-	3.76	-	-	-	4.58	-	-	-	7.04	-	-	-
Copper	mg/kg	3.44	-	-	-	0.590	-	-	-	0.977	-	-	-	1.54	-	-	-
Iron	mg/kg	7370	-	-	-	3520	-	-	-	4530	-	-	-	7650	-	-	-
Lead	mg/kg	2.96	-	-	-	0.928 J	-	-	-	1.87	-	-	-	2.77	-	-	-
Manganese	mg/kg	102	-	-	-	43.0	-	-	-	48.7	-	-	-	54.5	-	-	-
Mercury	mg/kg	0.00847 J	-	-	-	< 0.0250	-	-	-	0.00660 J	-	-	-	0.00995 J	-	-	-
Selenium	mg/kg	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-	< 2.00	-	-	-
Silver	mg/kg	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-	< 0.500	-	-	-
Uranium	mg/kg	28.9	-	-	-	17.4	-	-	-	20.4	-	-	-	32.9	-	-	-
Zinc	mg/kg	18.6	-	-	-	9.94	-	-	-	11.9	-	-	-	17.0	-	-	-
PCBs																	
Aroclor-1016 (PCB-1016)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1221 (PCB-1221)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1232 (PCB-1232)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1242 (PCB-1242)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1248 (PCB-1248)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1254 (PCB-1254)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Aroclor-1260 (PCB-1260)	ug/kg	-	-	< 20	-	-	-	< 21	-	-	-	< 20	-	-	-	< 17	-
Petroleum Products																	
Total Petroleum Hydrocarbons - Gasoline Range Organics	mg/kg	< 4.00	-	-	<4.9	< 4.00	-	-	<4.8	< 4.00	-	-	<4.8	< 4.00	-	-	<4.9
Total Petroleum Hydrocarbons - Diesel Range Organics	mg/kg	< 50.0	-	-	<9.3	< 50.0	-	-	<9.5	< 50.0	-	-	<9.4	< 50.0	-	-	<9.8
Total Petroleum Hydrocarbons - Motor Oil Range Organics	mg/kg	-	-	-	<47	-	-	-	<47	-	-	-	<47	-	-	-	<49
TPH (C6 through C35)	mg/kg	-	-	-	<61.2	-	-	-	<61.3	-	-	-	<61.2	-	-	-	<63.7
Radiochemistry																	
Radium-226	pCi/g	-	0.509 +/- 0.177	-	-	-	0.246 +/- 0.106	-	-	-	0.443 +/- 0.152	-	-	-	0.307 +/- 0.114	-	-
Radium-228	pCi/g	-	0.135 +/- 0.171	-	-	-	0.379 +/- 0.172	-	-	-	0.673 +/- 0.208	-	-	-	0.689 +/- 0.227	-	-
Radium 226 and 228	pCi/g	-	0.644 +/- 0.348	-	-	-	0.625 +/- 0.278	-	-	-	1.116 +/- 0.360	-	-	-	0.996 +/- 0.341	-	-
General Chemistry																	
Chloride	mg/kg	9.32	-	-	-	2.64	-	-	-	2.45 J	-	-	-	3.46	-	-	-
Cyanide (total)	mg/kg	< 2.00	-	-	-	0.290 J	-	-	-	0.220 J	-	-	-	< 2.00	-	-	-
Fluoride	mg/kg	0.443 J	-	-	-	0.554	-	-	-	0.806	-	-	-	3.01	-	-	-
Nitrate (as N)	mg/kg	9.33	-	-	-	4.67	-	-	-	1.79	-	-	-	6.80	-	-	-
pH	s.u.	8.53	-	-	-	8.59	-	-	-	8.67	-	-	-	8.66	-	-	-
Phenolics (total)	mg/kg	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-	< 0.130	-	-	-
Sulfate	mg/kg	11.8	-	-	-	10.4	-	-	-	22.0	-	-	-	24.0	-	-	-
Total dissolved solids (TDS)	mg/kg	36.00	-	-	-	43.00	-	-	-	43.00	-	-	-	69.00	-	-	-

Notes:

J - Estimated value
B - Analyte detected in the corresponding metho

Table 2

Data Summary and Calculated Background Values
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Analyte	Unit	Number of Samples	Percent Non-Detect	Minimum	Maximum	Data Distribution	Outliers	Background Value		Background Value excluding outliers	
								Method	Value	Method	Value
Subsection A											
(1) Arsenic (As)	mg/kg	12	50%	0.921 J	4.03	~ Lognormal	**	KM Lognormal UTL	5.968	--	--
(2) Barium (Ba)	mg/kg	12	0%	26.2	111	Normal	0	Normal UTL	157.4	--	--
(3) Cadmium (Cd)	mg/kg	12	100%	< 0.500	< 0.500	--	--	Detection Limit	< 0.500	--	--
(4) Chromium (Cr)	mg/kg	12	0%	3.76	7.04	Normal	0	Normal UTL	8.966	--	--
(5) Cyanide (CN)	mg/kg	12	50%	0.220 J	< 2.00	~ Normal	0	Detection Limit †	< 2.00	--	--
(6) Fluoride (F)	mg/kg	12	0%	0.434 J	3.01	Gamma	1 (3.01)	WH Approx. Gamma UTL	4.579	Normal UTL	1.894
(7) Lead (Pb)	mg/kg	12	0%	0.928 J	3.08	Normal	0	Normal UTL	4.682	--	--
(8) Total Mercury (Hg)	mg/kg	12	17%	0.00610 J	< 0.0250	Normal	0	Detection Limit †	<0.0250	--	--
(9) Nitrate (NO_3 as N)	mg/kg	12	0%	1.16	15	Normal	0	Normal UTL	21.02	--	--
(10) Selenium (Se)	mg/kg	12	100%	< 2.00	< 2.00	--	--	Detection Limit	< 2.00	--	--
(11) Silver (Ag)	mg/kg	12	100%	< 0.500	< 0.500	--	--	Detection Limit	< 0.500	--	--
(12) Uranium (U)	mg/kg	12	0%	17.4	32.9	Normal	0	Normal UTL	41.1	--	--
(13) Radioactivity: Combined Radium-226 & Radium-228	pCi/g	12	0%	0.625	1.116	Normal	0	Normal UTL	1.491	--	--
(14) Benzene	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(15) Polychlorinated biphenyls (PCBs)	ug/kg	12	100%	<119	<147	--	--	Detection Limit	<147	--	--
(16) Toluene	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(17) Carbon tetrachloride	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(18) 1,2-Dichoroethane (EDC)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(19) 1,1-Dichloroethene (1,1-DCE)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(20) 1,1,2,2-Tetrachloroethene (PCE)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(21) 1,1,2-Trichloroethene (TCE)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(22) Ethylbenzene	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(23) Total Xylenes	ug/kg	12	100%	<40.0	<40.0	--	--	Detection Limit	<40.0	--	--
(24) Methylene chloride	ug/kg	12	75%	11.5 Jb	< 100	--	--	Nonparametric	< 100	--	--
(25) Chloroform	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(26) 1,1-Dichloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(27) Ethylene dibromide (EDB)	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(28) 1,1,1-Trichloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(29) 1,1,2-Trichloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(30) 1,1,2,2-Tetrachloroethane	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--
(31) Vinyl chloride	ug/kg	12	100%	< 20.0	< 20.0	--	--	Detection Limit	< 20.0	--	--

Data Summary and Calculated Background Values
Soil Background Determination
Landfarm Permit No. NW-02-019
Lea County, New Mexico

Analyte		Unit	Number of Samples	Percent Non-Detect	Minimum	Maximum	Data Distribution	Outliers	Background Value		Background Value excluding outliers	
									Method	Value	Method	Value
Subsection B												
(1)	Chloride (Cl)	mg/kg	12	0%	2.45 J	9.32	~ Lognormal	2 (9.32, 6.16)	Lognormal UTL	15.38	Normal UTL	5.213
(2)	Copper (Cu)	mg/kg	12	0%	0.59	3.44	~ Normal	1 (3.44)	Normal UTL	4.327	Normal UTL	2.971
(3)	Iron (Fe)	mg/kg	12	0%	3520	7650	Normal	0	Normal UTL	10932	--	--
(4)	Manganese (Mn)	mg/kg	12	0%	43	102	~ Lognormal	2 (102, 81.7)	Lognormal UTL	143.6	Lognormal UTL	8.7[illegible]
(6)	Phenols	mg/kg	12	100%	< 0.130	< 0.130	--	--	Detection Limit	< 0.130	--	--
(7)	Sulfate (SO_4)	mg/kg	12	0%	5.14	35.3	Normal	0	Normal UTL	47.29	--	--
(8)	Total dissolved solids (TDS)	mg/kg	12	0%	32	69	Normal	0	Normal UTL	87.75	--	--
(9)	Zinc (Zn)	mg/kg	12	0%	9.94	18.6	Normal	0	Normal UTL	23.87	--	--
(10)	pH	s.u.	12	0%	8.53	9.05	Normal	0	Norma[illegible] - UTL *	8.10 - 9.31	--	--
Total Petroleum Hydrocarbons (TPH)												
(--)	TPH - Gasoline Range Organics	mg/kg	24	100%	< 4.00	<5.0	--	--	Detection Limit	<5.0	--	--
(--)	TPH - Diesel Range Organics	mg/kg	24	100%	<9.3	< 50.0	--	--	Detection Limit	< 50.0	--	--
(--)	TPH - Motor Oil Range Organics	mg/kg	12	100%	<47	<49	--	--	Detection Limit	<49	--	--
(--)	TPH (C6 through C35)	mg/kg	12	100%	<3[illegible]	<63.9	--	--	Detection Limit	<63.9	--	--

Notes:

Background Values are statistical Upper Tolerance Limit (UTL) values on the 99th percentile of background, with 95 percent confidence.
~ -- Denotes an approximate data distribution
Normal UTL -- Background value calculated using a UTL for normally-distributed data
WH Approx. Gamma UTL -- Background value calculated using a Wilson-Hilferty approximate gamma UTL for gamma-distributed data
Lognormal UTL -- Background value calculated using a UTL for lognormally-distributed data
KM Normal UTL --Background value calculated using a UTL for normally-distributed data, applying the Kaplan-Meier method for non-detects
KM Lognormal UTL -- Background value calculated using a UTL for lognormally-distributed data, applying the Kaplan-Meier method for non-detects
† The calculated UTL was below the detection limit (due to estimated values -- J-qualified -- below the DL), and the detection limit is therefore the background value
* -- For pH, lower and upper limits are calculated: 95 percent confidence lower tolerance limit (LTL) on the 1st percentile; and UTL on the 99th percentile of background
** -- Iteratively applying Dixon's test identified over half the observations to be outliers, which is inconsistent with the definition of outlers being "rare" observations.

Attachment A
Input Data Submitted to ProUCL

	A	B	C	D	E	F	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1	Sample Location:	Radium 226 and 228	Radium-precision	Barium	Chromium	Copper	Copper excl 1 outlier	Iron	Lead	Manganese	Ln_Manganese	Ln_Manganese excl 1 outlier	Ln_Manganese excl 2 outliers	Manganese excl 2 outliers	Uranium	Zinc	Chloride	Ln_Chloride	Ln_Chloride excl 1 outlier	Ln_Chloride excl 2 outliers	Chloride excl 2 outliers	Fluoride	Gamma_Fluoride excl 1 outlier	Fluoride excl 1 outlier	Gamma_Fluoride	Nitrate (as N)	pH	Sulfate	Total dissolved solids (TDS)	Mercury	D_Mercury	Arsenic	D_Arsenic	Ln_Arsenic	D_Ln_Arsenic	Ln_Arsenic excl 1 high 1 low outlier	D_Ln_Arsenic excl 1 high 1 low outlier	Ln_Arsenic excl 2 low 2 high outliers	D_Ln_Arsenic excl 2 low 2 high outliers	Ln_Arsenic excl 3 high 3 low outliers	D_Ln_Arsenic excl 3 high 3 low outliers	Cyanide (total)	D_Cyanide (total)	Methylene chloride	D_Methylene chloride
2	**BG-1/B-1**	1.06	+/- 0.400	44.1	4.56	1.11	1.11	4730	2.25	54.1	3.991	3.991	3.991	54.1	21.6	12.5	3.27	1.185	1.185	1.1848	3.27	0.516	0.802	0.516	0.802	2.55	8.81	10.2	41	0.00812	1	2	0	0.693	0	0.693	0					0.22	1	100	0
3	**BG-2/B-2**	0.686	+/- 0.307	44.6	5.38	1.56	1.56	6240	3.08	55.7	4.02	4.02	4.02	55.7	25.8	14.6	6.16	1.818	1.818			0.434	0.757	0.434	0.757	15	8.55	35.3	39	0.00846	1	1.79	1	0.582	1	0.582	1					0.33	1	100	0
4	**BG-3/B-3**	0.74	+/- 0.334	54.3	6.26	2.18	2.18	7030	2.66	81.7	4.403	4.403			28.2	16.5	2.75	1.012	1.012	1.0116	2.75	0.748	0.908	0.748	0.908	1.16	8.77	8.49	61	0.00807	1	1.15	1	0.14	1	0.14	1	0.14	1	0.14	1	2	0	100	0
5	**BG-4/B-4**	0.633	+/- 0.272	95.6	4.2	1.13	1.13	4530	1.22	55	4.007	4.007	4.007	55	21.3	11.5	3.65	1.295	1.295	1.2947	3.65	1.24	1.074	1.24	1.074	7.33	8.55	14.8	52	0.00649	1	1.48	1	0.392	1	0.392	1	0.392	1			2	0	100	0
6	**BG-5/B-5**	0.803	+/- 0.310	67.8	4.19	0.659	0.659	4540	1.6	43.7	3.777	3.777	3.777	43.7	20.1	10.9	3.62	1.286	1.286	1.2865	3.62	1.19	1.06	1.19	1.06	3.04	8.82	17.4	40	0.0061	1	2	0	0.693	0	0.693	0	0.693	0	0.693	0	0.34	1	100	0
7	**BG-6/B-6**	0.953	+/- 0.320	59.5	4.73	1.31	1.31	5680	2.17	56.1	4.027	4.027	4.027	56.1	24.4	13.1	2.95	1.082	1.082	1.0818	2.95	0.853	0.948	0.853	0.948	4.41	8.58	5.14	45	0.00613	1	2	0	0.693	0	0.693	0	0.693	0	0.693	0	0.22	1	14.5	1
8	**BG-7/B-7**	0.913	+/- 0.406	74.7	4.85	1.14	1.14	5270	1.97	56.8	4.04	4.04	4.04	56.8	22.5	11.1	4	1.386	1.386	1.3863	4	1.08	1.026	1.08	1.026	9.34	9.05	12.9	32	0.00739	1	2	0	0.693	0	0.693	0	0.693	0	0.693	0	2	0	100	0
9	**BG-8/B-8**	0.673	+/- 0.279	44.6	3.8	0.713	0.713	7370	1.52	47.1	3.852	3.852	3.852	47.1	18	10.4	2.76	1.015	1.015	1.0152	2.76	0.746	0.907	0.746	0.907	2.05	8.87	6.26	57	0.025	0	2	0	0.693	0	0.693	0	0.693	0	0.693	0	2	0	100	0
10	**BG-9/B-9**	0.644	+/- 0.348	90	6.36	3.44		7370	2.96	102	4.625				28.9	18.6	9.32	2.232				0.443	0.762	0.443	0.762	9.33	8.53	11.8	36	0.00847	1	2	0	0.693	0	0.693	0	0.693	0					2	0	100	0
11	**BG-10/B-10**	0.625	+/- 0.278	26.2	3.76	0.59	0.59	3520	0.928	43	3.761	3.761	3.761	43	17.4	9.94	2.64	0.971	0.971	0.9708	2.64	0.554	0.821	0.554	0.821	4.67	8.59	10.4	43	0.025	0	1.42	1	0.351	1	0.351	1	0.351	1			0.29	1	100	0
12	**BG-11/B-11**	1.116	+/- 0.360	49.3	4.58	0.977	0.977	4530	1.87	48.7	3.886	3.886	3.886	48.7	20.4	11.9	2.45	0.896	0.896	0.8961	2.45	0.806	0.931	0.806	0.931	1.79	8.67	22	43	0.0066	1	0.921	1	-0.08	1							0.22	1	11.5	1
13	**BG-12/B-12**	0.996	+/- 0.341	111	7.04	1.54	1.54	7650	2.77	54.5	3.998	3.998	3.998	54.5	32.9	17	3.46	1.241	1.241	1.2413	3.46	3.01			1.444	6.8	8.66	24	69	0.00995	1	4.03	1	1.394	1							2	0	12.6	1

Attachment B
Output from ProUCL

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Radium 226 and 228

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.625
Maximum	1.116
Mean of Raw Data	0.82
Standard Deviation of Raw Data	0.179
Khat	23.52
Theta hat	0.0349
Kstar	17.7
Theta star	0.0463
Mean of Log Transformed Data	-0.22
Standard Deviation of Log Transformed Data	0.215

Normal GOF Test Results

Correlation Coefficient R	0.956
Shapiro Wilk Test Statistic	0.891
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.18
Lilliefors Test Statistic	0.19
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.964
A-D Test Statistic	0.548
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.196
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.96
Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.22
Lilliefors Test Statistic	0.184
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Barium

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	11
Minimum	26.2
Maximum	111
Mean of Raw Data	63.48
Standard Deviation of Raw Data	25.08
Khat	6.964
Theta hat	9.114
Kstar	5.279
Theta star	12.02
Mean of Log Transformed Data	4.077
Standard Deviation of Log Transformed Data	0.407

Normal GOF Test Results

Correlation Coefficient R	0.974
Shapiro Wilk Test Statistic	0.945
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.557
Lilliefors Test Statistic	0.146
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.987
A-D Test Statistic	0.256
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.136
K-S Critical(0.05) Value	0.246

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.981
Shapiro Wilk Test Statistic	0.964
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.782
Lilliefors Test Statistic	0.154
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Chromium

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	3.76
Maximum	7.04
Mean of Raw Data	4.976
Standard Deviation of Raw Data	1.065
Khat	25.43
Theta hat	0.196
Kstar	19.13
Theta star	0.26
Mean of Log Transformed Data	1.585
Standard Deviation of Log Transformed Data	0.205

Normal GOF Test Results

Correlation Coefficient R	0.954
Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.188
Lilliefors Test Statistic	0.214
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.97
A-D Test Statistic	0.449
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.192
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.97
Shapiro Wilk Test Statistic	0.928
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.428
Lilliefors Test Statistic	0.178
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Copper

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.59
Maximum	3.44
Mean of Raw Data	1.362
Standard Deviation of Raw Data	0.791
Khat	4.164
Theta hat	0.327
Kstar	3.178
Theta star	0.429
Mean of Log Transformed Data	0.184
Standard Deviation of Log Transformed Data	0.504

Normal GOF Test Results

Correlation Coefficient R	0.896
Shapiro Wilk Test Statistic	0.818
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.0104
Lilliefors Test Statistic	0.235
Lilliefors Critical (0.05) Value	0.243

Data appear Approximate Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.961
A-D Test Statistic	0.374
A-D Critical (0.05) Value	0.735
K-S Test Statistic	0.161
K-S Critical(0.05) Value	0.246

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.977
Shapiro Wilk Test Statistic	0.957
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.678
Lilliefors Test Statistic	0.136
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Iron

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	10
Minimum	3520
Maximum	7650
Mean of Raw Data	5705
Standard Deviation of Raw Data	1395
Khat	17.83
Theta hat	320
Kstar	13.43
Theta star	424.9
Mean of Log Transformed Data	8.621
Standard Deviation of Log Transformed Data	0.251

Normal GOF Test Results

Correlation Coefficient R	0.964
Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.298
Lilliefors Test Statistic	0.174
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.958
A-D Test Statistic	0.473
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.173
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.966
Shapiro Wilk Test Statistic	0.92
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.345
Lilliefors Test Statistic	0.161
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Lead

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.928
Maximum	3.08
Mean of Raw Data	2.083
Standard Deviation of Raw Data	0.694
Khat	8.773
Theta hat	0.237
Kstar	6.635
Theta star	0.314
Mean of Log Transformed Data	0.676
Standard Deviation of Log Transformed Data	0.37

Normal GOF Test Results

Correlation Coefficient R	0.99
Shapiro Wilk Test Statistic	0.965
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.911
Lilliefors Test Statistic	0.131
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.972
A-D Test Statistic	0.225
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.14
K-S Critical(0.05) Value	0.246

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.975
Shapiro Wilk Test Statistic	0.944
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.578
Lilliefors Test Statistic	0.126
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Manganese

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	43
Maximum	102
Mean of Raw Data	58.2
Standard Deviation of Raw Data	17
Khat	15.99
Theta hat	3.639
Kstar	12.05
Theta star	4.83
Mean of Log Transformed Data	4.032
Standard Deviation of Log Transformed Data	0.25

Normal GOF Test Results

Correlation Coefficient R	0.852
Shapiro Wilk Test Statistic	0.742
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.00122
Lilliefors Test Statistic	0.366
Lilliefors Critical (0.05) Value	0.243

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.895
A-D Test Statistic	1.092
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.339
K-S Critical(0.05) Value	0.245

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.901
Shapiro Wilk Test Statistic	0.822
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.0127
Lilliefors Test Statistic	0.322
Lilliefors Critical (0.05) Value	0.243

Data not Lognormal at (0.05) Significance Level

Non-parametric GOF Test Results

Data do not follow a discernible distribution at (0.05) Level of Significance

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Uranium

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	17.4
Maximum	32.9
Mean of Raw Data	23.46
Standard Deviation of Raw Data	4.708
Khat	28.32
Theta hat	0.828
Kstar	21.3
Theta star	1.102
Mean of Log Transformed Data	3.137
Standard Deviation of Log Transformed Data	0.195

Normal GOF Test Results

Correlation Coefficient R	0.975
Shapiro Wilk Test Statistic	0.945
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.588
Lilliefors Test Statistic	0.164
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.987
A-D Test Statistic	0.244
A-D Critical (0.05) Value	0.731
K-S Test Statistic	0.146
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.988
Shapiro Wilk Test Statistic	0.967
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.892
Lilliefors Test Statistic	0.132
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Zinc

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	9.94
Maximum	18.6
Mean of Raw Data	13.17
Standard Deviation of Raw Data	2.855
Khat	24.83
Theta hat	0.53
Kstar	18.68
Theta star	0.705
Mean of Log Transformed Data	2.558
Standard Deviation of Log Transformed Data	0.207

Normal GOF Test Results

Correlation Coefficient R	0.954
Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.178
Lilliefors Test Statistic	0.176
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.97
A-D Test Statistic	0.471
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.166
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.969
Shapiro Wilk Test Statistic	0.924
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.399
Lilliefors Test Statistic	0.152
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Chloride

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	2.45
Maximum	9.32
Mean of Raw Data	3.919
Standard Deviation of Raw Data	1.964
Khat	6.34
Theta hat	0.618
Kstar	4.81
Theta star	0.815
Mean of Log Transformed Data	1.285
Standard Deviation of Log Transformed Data	0.386

Normal GOF Test Results

Correlation Coefficient R	0.823
Shapiro Wilk Test Statistic	0.696
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	3.4741E-4
Lilliefors Test Statistic	0.317
Lilliefors Critical (0.05) Value	0.243

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.9
A-D Test Statistic	1.054
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.267
K-S Critical(0.05) Value	0.246

Data not Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.905
Shapiro Wilk Test Statistic	0.828
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.0155
Lilliefors Test Statistic	0.24
Lilliefors Critical (0.05) Value	0.243

Data appear Approximate_Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Fluoride

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	0.434
Maximum	3.01
Mean of Raw Data	0.968
Standard Deviation of Raw Data	0.699
Khat	3.307
Theta hat	0.293
Kstar	2.536
Theta star	0.382
Mean of Log Transformed Data	-0.191
Standard Deviation of Log Transformed Data	0.543

Normal GOF Test Results

Correlation Coefficient R	0.817
Shapiro Wilk Test Statistic	0.691
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	2.8682E-4
Lilliefors Test Statistic	0.265
Lilliefors Critical (0.05) Value	0.243

Data not Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.909
A-D Test Statistic	0.612
A-D Critical (0.05) Value	0.738
K-S Test Statistic	0.182
K-S Critical(0.05) Value	0.247

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.951
Shapiro Wilk Test Statistic	0.91
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.186
Lilliefors Test Statistic	0.144
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Nitrate (as N)

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	1.16
Maximum	15
Mean of Raw Data	5.623
Standard Deviation of Raw Data	4.108
Khat	2.077
Theta hat	2.707
Kstar	1.613
Theta star	3.485
Mean of Log Transformed Data	1.467
Standard Deviation of Log Transformed Data	0.78

Normal GOF Test Results

Correlation Coefficient R	0.948
Shapiro Wilk Test Statistic	0.898
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.146
Lilliefors Test Statistic	0.175
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.99
A-D Test Statistic	0.221
A-D Critical (0.05) Value	0.741
K-S Test Statistic	0.129
K-S Critical(0.05) Value	0.248

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.99
Shapiro Wilk Test Statistic	0.972
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.942
Lilliefors Test Statistic	0.135
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

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pH

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	11
Minimum	8.53
Maximum	9.05
Mean of Raw Data	8.704
Standard Deviation of Raw Data	0.161
Khat	3212
Theta hat	0.00271
Kstar	2409
Theta star	0.00361
Mean of Log Transformed Data	2.164
Standard Deviation of Log Transformed Data	0.0184

Normal GOF Test Results

Correlation Coefficient R	0.954
Shapiro Wilk Test Statistic	0.903
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.191
Lilliefors Test Statistic	0.177
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Sulfate

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	12
Minimum	5.14
Maximum	35.3
Mean of Raw Data	14.89
Standard Deviation of Raw Data	8.648
Khat	3.636
Theta hat	4.095
Kstar	2.783
Theta star	5.351
Mean of Log Transformed Data	2.557
Standard Deviation of Log Transformed Data	0.56

Normal GOF Test Results

Correlation Coefficient R	0.945
Shapiro Wilk Test Statistic	0.897
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.13
Lilliefors Test Statistic	0.174
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.991
A-D Test Statistic	0.181
A-D Critical (0.05) Value	0.737
K-S Test Statistic	0.119
K-S Critical(0.05) Value	0.247

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.996
Shapiro Wilk Test Statistic	0.988
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.998
Lilliefors Test Statistic	0.0876
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Uncensored Full Data Sets without Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:21:39 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Total dissolved solids (TDS)

Raw Statistics

Number of Valid Observations	12
Number of Distinct Observations	11
Minimum	32
Maximum	69
Mean of Raw Data	46.5
Standard Deviation of Raw Data	11.01
Khat	20.87
Theta hat	2.228
Kstar	15.71
Theta star	2.961
Mean of Log Transformed Data	3.815
Standard Deviation of Log Transformed Data	0.226

Normal GOF Test Results

Correlation Coefficient R	0.961
Shapiro Wilk Test Statistic	0.922
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.304
Lilliefors Test Statistic	0.221
Lilliefors Critical (0.05) Value	0.243

Data appear Normal at (0.05) Significance Level

Gamma GOF Test Results

Correlation Coefficient R	0.979
A-D Test Statistic	0.37
A-D Critical (0.05) Value	0.732
K-S Test Statistic	0.197
K-S Critical(0.05) Value	0.245

Data appear Gamma Distributed at (0.05) Significance Level

Lognormal GOF Test Results

Correlation Coefficient R	0.98
Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical (0.05) Value	0.859
Approximate Shapiro Wilk P Value	0.737
Lilliefors Test Statistic	0.182
Lilliefors Critical (0.05) Value	0.243

Data appear Lognormal at (0.05) Significance Level

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:22:47 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Mercury

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	10	2	16.67%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	2	0.025	0.025	0.025	0.025	0
Statistics (Non-Detects Only)	10	0.0061	0.00995	0.00758	0.00773	0.00126
Statistics (All: NDs treated as DL value)	12	0.0061	0.025	0.0105	0.0081	0.00688
Statistics (All: NDs treated as DL/2 value)	12	0.0061	0.0125	0.0084	0.0081	0.00223
Statistics (Normal ROS Imputed Data)	12	0.0061	0.00995	0.00758	0.00773	0.00117
Statistics (Gamma ROS Imputed Data)	12	0.0061	0.01	0.00798	0.0081	0.00148
Statistics (Lognormal ROS Imputed Data)	12	0.0061	0.00995	0.00757	0.00773	0.00117

	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV
Statistics (Non-Detects Only)	41.28	28.96	1.8358E-4	-4.895	0.164	-0.0335
Statistics (NDs = DL)	3.847	2.941	0.00272	-4.694	0.492	-0.105
Statistics (NDs = DL/2)	17.11	12.89	4.9081E-4	-4.809	0.249	-0.0517
Statistics (Gamma ROS Estimates)	31.79	23.9	2.5106E-4	-4.846	0.186	-0.0384
Statistics (Lognormal ROS Estimates)	--	--	--	-4.895	0.152	-0.0311

Normal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.964	0.782	0.932	0.967

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.921	0.842	Data Appear Normal
Shapiro-Wilk (NDs = DL)	0.611	0.859	Data Not Normal
Shapiro-Wilk (NDs = DL/2)	0.855	0.859	Data Not Normal
Shapiro-Wilk (Normal ROS Estimates)	0.929	0.859	Data Appear Normal
Lilliefors (Detects Only)	0.182	0.262	Data Appear Normal
Lilliefors (NDs = DL)	0.365	0.243	Data Not Normal
Lilliefors (NDs = DL/2)	0.237	0.243	Data Appear Normal
Lilliefors (Normal ROS Estimates)	0.163	0.243	Data Appear Normal

Gamma GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.97	0.866	0.953	0.957

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.393	0.724	
Kolmogorov-Smirnov (Detects Only)	0.193	0.266	Detected Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	1.725	0.736	
Kolmogorov-Smirnov (NDs = DL)	0.341	0.247	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	0.533	0.731	
Kolmogorov-Smirnov (NDs = DL/2)	0.204	0.245	Data Appear Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.475	0.731	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.169	0.245	Data Appear Gamma Distributed

Lognormal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.968	0.855	0.958	0.971

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.925	0.842	Data Appear Lognormal
Shapiro-Wilk (NDs = DL)	0.727	0.859	Data Not Lognormal
Shapiro-Wilk (NDs = DL/2)	0.9	0.859	Data Appear Lognormal
Shapiro-Wilk (Lognormal ROS Estimates)	0.934	0.859	Data Appear Lognormal
Lilliefors (Detects Only)	0.179	0.262	Data Appear Lognormal
Lilliefors (NDs = DL)	0.313	0.243	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.189	0.243	Data Appear Lognormal
Lilliefors (Lognormal ROS Estimates)	0.189	0.243	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:22:47 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Arsenic

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	6	6	50.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	6	2	2	2	2	0
Statistics (Non-Detects Only)	6	0.921	4.03	1.799	1.45	1.133
Statistics (All: NDs treated as DL value)	12	0.921	4.03	1.899	2	0.771
Statistics (All: NDs treated as DL/2 value)	12	0.921	4.03	1.399	1	0.87
Statistics (Normal ROS Imputed Data)	12	0.405	4.03	1.631	1.45	0.93
Statistics (Gamma ROS Imputed Data)	12	0.587	4.03	1.611	1.45	0.901
Statistics (Lognormal ROS Imputed Data)	12	0.815	4.03	1.612	1.45	0.856

	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV
Statistics (Non-Detects Only)	4.183	2.203	0.43	0.463	0.51	1.102
Statistics (NDs = DL)	8.032	6.08	0.236	0.578	0.364	0.63
Statistics (NDs = DL/2)	4.941	3.761	0.283	0.231	0.42	1.816
Statistics (Gamma ROS Estimates)	4.395	3.352	0.366	0.359	0.496	1.383
Statistics (Lognormal ROS Estimates)	--	--	--	0.383	0.428	1.118

Normal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.85	0.851	0.73	0.925

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.744	0.788	Data Not Normal
Shapiro-Wilk (NDs = DL)	0.756	0.859	Data Not Normal
Shapiro-Wilk (NDs = DL/2)	0.559	0.859	Data Not Normal
Shapiro-Wilk (Normal ROS Estimates)	0.877	0.859	Data Appear Normal
Lilliefors (Detects Only)	0.336	0.325	Data Not Normal
Lilliefors (NDs = DL)	0.365	0.243	Data Not Normal
Lilliefors (NDs = DL/2)	0.296	0.243	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.182	0.243	Data Appear Normal

Gamma GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.93	0.884	0.834	0.958

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.54	0.7	
Kolmogorov-Smirnov (Detects Only)	0.272	0.333	Detected Data Appear Gamma Distributed
Anderson-Darling (NDs = DL)	0.893	0.731	
Kolmogorov-Smirnov (NDs = DL)	0.312	0.246	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	1.715	0.732	
Kolmogorov-Smirnov (NDs = DL/2)	0.293	0.246	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.291	0.734	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.14	0.246	Data Appear Gamma Distributed

Lognormal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.936	0.921	0.823	0.961

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.892	0.788	Data Appear Lognormal
Shapiro-Wilk (NDs = DL)	0.876	0.859	Data Appear Lognormal
Shapiro-Wilk (NDs = DL/2)	0.695	0.859	Data Not Lognormal
Shapiro-Wilk (Lognormal ROS Estimates)	0.936	0.859	Data Appear Lognormal
Lilliefors (Detects Only)	0.241	0.325	Data Appear Lognormal
Lilliefors (NDs = DL)	0.293	0.243	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.292	0.243	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.154	0.243	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Goodness-of-Fit Test Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:22:47 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	0.95

Cyanide (total)

	Num Obs	Num Miss	Num Valid	Detects	NDs	% NDs
Raw Statistics	12	0	12	6	6	50.00%

	Number	Minimum	Maximum	Mean	Median	SD
Statistics (Non-Detects Only)	6	2	2	2	2	0
Statistics (Non-Detects Only)	6	0.22	0.34	0.27	0.255	0.0573
Statistics (All: NDs treated as DL value)	12	0.22	2	1.135	1.17	0.904
Statistics (All: NDs treated as DL/2 value)	12	0.22	1	0.635	0.67	0.383
Statistics (Normal ROS Imputed Data)	12	0.197	0.343	0.27	0.27	0.0524
Statistics (Gamma ROS Imputed Data)	12	0.2	0.346	0.27	0.268	0.0526
Statistics (Lognormal ROS Imputed Data)	12	0.203	0.346	0.27	0.265	0.052

	K hat	K Star	Theta hat	Log Mean	Log Stdv	Log CV
Statistics (Non-Detects Only)	27.02	13.62	0.00999	-1.328	0.211	-0.159
Statistics (NDs = DL)	1.267	1.006	0.896	-0.317	1.065	-3.355
Statistics (NDs = DL/2)	2.537	1.958	0.25	-0.664	0.708	-1.066
Statistics (Gamma ROS Estimates)	28.84	21.68	0.00936	-1.327	0.195	-0.147
Statistics (Lognormal ROS Estimates)	--	--	--	-1.328	0.193	-0.145

Normal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Normal ROS
Correlation Coefficient R	0.91	0.839	0.856	0.964

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.795	0.788	Data Appear Normal
Shapiro-Wilk (NDs = DL)	0.673	0.859	Data Not Normal
Shapiro-Wilk (NDs = DL/2)	0.701	0.859	Data Not Normal
Shapiro-Wilk (Normal ROS Estimates)	0.906	0.859	Data Appear Normal
Lilliefors (Detects Only)	0.309	0.325	Data Appear Normal
Lilliefors (NDs = DL)	0.331	0.243	Data Not Normal
Lilliefors (NDs = DL/2)	0.33	0.243	Data Not Normal
Lilliefors (Normal ROS Estimates)	0.185	0.243	Data Appear Normal

Gamma GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Gamma ROS
Correlation Coefficient R	0.916	0.756	0.802	0.963

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Anderson-Darling (Detects Only)	0.708	0.697	
Kolmogorov-Smirnov (Detects Only)	0.333	0.332	Data Not Gamma Distributed
Anderson-Darling (NDs = DL)	1.78	0.751	
Kolmogorov-Smirnov (NDs = DL)	0.339	0.251	Data Not Gamma Distributed
Anderson-Darling (NDs = DL/2)	1.59	0.74	
Kolmogorov-Smirnov (NDs = DL/2)	0.338	0.248	Data Not Gamma Distributed
Anderson-Darling (Gamma ROS Estimates)	0.499	0.731	
Kolmogorov-Smirnov (Gamma ROS Est.)	0.194	0.245	Data Appear Gamma Distributed

Lognormal GOF Test Results

	No NDs	NDs = DL	NDs = DL/2	Log ROS
Correlation Coefficient R	0.906	0.864	0.879	0.963

	Test value	Crit. (0.05)	Conclusion with Alpha(0.05)
Shapiro-Wilk (Detects Only)	0.786	0.788	Data Not Lognormal
Shapiro-Wilk (NDs = DL)	0.715	0.859	Data Not Lognormal
Shapiro-Wilk (NDs = DL/2)	0.739	0.859	Data Not Lognormal
Shapiro-Wilk (Lognormal ROS Estimates)	0.904	0.859	Data Appear Lognormal
Lilliefors (Detects Only)	0.311	0.325	Data Appear Lognormal
Lilliefors (NDs = DL)	0.329	0.243	Data Not Lognormal
Lilliefors (NDs = DL/2)	0.326	0.243	Data Not Lognormal
Lilliefors (Lognormal ROS Estimates)	0.185	0.243	Data Appear Lognormal

Note: Substitution methods such as DL or DL/2 are not recommended.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Radium 226 and 228

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 1.116 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.248

For 10% significance level, 1.116 is not an outlier.

For 5% significance level, 1.116 is not an outlier.

For 1% significance level, 1.116 is not an outlier.

2. Observation Value 0.625 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.044

For 10% significance level, 0.625 is not an outlier.

For 5% significance level, 0.625 is not an outlier.

For 1% significance level, 0.625 is not an outlier.

Dixon's Outlier Test for Barium

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 111 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.314

For 10% significance level, 111 is not an outlier.

For 5% significance level, 111 is not an outlier.

For 1% significance level, 111 is not an outlier.

2. Observation Value 26.2 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.265

For 10% significance level, 26.2 is not an outlier.

For 5% significance level, 26.2 is not an outlier.

For 1% significance level, 26.2 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Chromium

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 7.04 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.241

For 10% significance level, 7.04 is not an outlier.

For 5% significance level, 7.04 is not an outlier.

For 1% significance level, 7.04 is not an outlier.

2. Observation Value 3.76 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.165

For 10% significance level, 3.76 is not an outlier.

For 5% significance level, 3.76 is not an outlier.

For 1% significance level, 3.76 is not an outlier.

Dixon's Outlier Test for Copper

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 3.44 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.676

For 10% significance level, 3.44 is an outlier.

For 5% significance level, 3.44 is an outlier.

For 1% significance level, 3.44 is an outlier.

2. Observation Value 0.59 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.077

For 10% significance level, 0.59 is not an outlier.

For 5% significance level, 0.59 is not an outlier.

For 1% significance level, 0.59 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Copper excl 1 outlier

Number of Observations = 11

10% critical value: 0.517

5% critical value: 0.576

1% critical value: 0.679

1. Observation Value 2.18 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.421

For 10% significance level, 2.18 is not an outlier.

For 5% significance level, 2.18 is not an outlier.

For 1% significance level, 2.18 is not an outlier.

2. Observation Value 0.59 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.127

For 10% significance level, 0.59 is not an outlier.

For 5% significance level, 0.59 is not an outlier.

For 1% significance level, 0.59 is not an outlier.

Dixon's Outlier Test for Iron

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 7650 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.090

For 10% significance level, 7650 is not an outlier.

For 5% significance level, 7650 is not an outlier.

For 1% significance level, 7650 is not an outlier.

2. Observation Value 3520 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.262

For 10% significance level, 3520 is not an outlier.

For 5% significance level, 3520 is not an outlier.

For 1% significance level, 3520 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Lead

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 3.08 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.167

For 10% significance level, 3.08 is not an outlier.

For 5% significance level, 3.08 is not an outlier.

For 1% significance level, 3.08 is not an outlier.

2. Observation Value 0.928 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.291

For 10% significance level, 0.928 is not an outlier.

For 5% significance level, 0.928 is not an outlier.

For 1% significance level, 0.928 is not an outlier.

Dixon's Outlier Test for Ln_Manganese

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 4.62497281328427 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.691

For 10% significance level, 4.62497281328427 is an outlier.

For 5% significance level, 4.62497281328427 is an outlier. **<-- 102 in original units**

For 1% significance level, 4.62497281328427 is an outlier.

2. Observation Value 3.76120011569356 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.142

For 10% significance level, 3.76120011569356 is not an outlier.

For 5% significance level, 3.76120011569356 is not an outlier.

For 1% significance level, 3.76120011569356 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Ln_Manganese excl 1 outlier

Number of Observations = 11

10% critical value: 0.517

5% critical value: 0.576

1% critical value: 0.679

1. Observation Value 4.40305400186596 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.601

For 10% significance level, 4.40305400186596 is an outlier.

For 5% significance level, 4.40305400186596 is an outlier. **<-- 81.7 in original units**

For 1% significance level, 4.40305400186596 is not an outlier.

2. Observation Value 3.76120011569356 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.327

For 10% significance level, 3.76120011569356 is not an outlier.

For 5% significance level, 3.76120011569356 is not an outlier.

For 1% significance level, 3.76120011569356 is not an outlier.

Dixon's Outlier Test for Ln_Manganese excl 2 outliers

Number of Observations = 10

10% critical value: 0.409

5% critical value: 0.477

1% critical value: 0.597

1. Observation Value 4.03953632572711 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.047

For 10% significance level, 4.03953632572711 is not an outlier.

For 5% significance level, 4.03953632572711 is not an outlier.

For 1% significance level, 4.03953632572711 is not an outlier.

2. Observation Value 3.76120011569356 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.061

For 10% significance level, 3.76120011569356 is not an outlier.

For 5% significance level, 3.76120011569356 is not an outlier.

For 1% significance level, 3.76120011569356 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Uranium

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 32.9 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.315

For 10% significance level, 32.9 is not an outlier.

For 5% significance level, 32.9 is not an outlier.

For 1% significance level, 32.9 is not an outlier.

2. Observation Value 17.4 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.235

For 10% significance level, 17.4 is not an outlier.

For 5% significance level, 17.4 is not an outlier.

For 1% significance level, 17.4 is not an outlier.

Dixon's Outlier Test for Zinc

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 18.6 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.256

For 10% significance level, 18.6 is not an outlier.

For 5% significance level, 18.6 is not an outlier.

For 1% significance level, 18.6 is not an outlier.

2. Observation Value 9.94 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.136

For 10% significance level, 9.94 is not an outlier.

For 5% significance level, 9.94 is not an outlier.

For 1% significance level, 9.94 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Ln_Chloride

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 2.2321626286975 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.671

For 10% significance level, 2.2321626286975 is an outlier.

For 5% significance level, 2.2321626286975 is an outlier. **<-- 9.32 in original units**

For 1% significance level, 2.2321626286975 is an outlier.

2. Observation Value 0.896088024556636 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.125

For 10% significance level, 0.896088024556636 is not an outlier.

For 5% significance level, 0.896088024556636 is not an outlier.

For 1% significance level, 0.896088024556636 is not an outlier.

Dixon's Outlier Test for Ln_Chloride excl 1 outlier

Number of Observations = 11

10% critical value: 0.517

5% critical value: 0.576

1% critical value: 0.679

1. Observation Value 1.81807677754543 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.618

For 10% significance level, 1.81807677754543 is an outlier.

For 5% significance level, 1.81807677754543 is an outlier. **<-- 6.16 in original units**

For 1% significance level, 1.81807677754543 is not an outlier.

2. Observation Value 0.896088024556636 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.236

For 10% significance level, 0.896088024556636 is not an outlier.

For 5% significance level, 0.896088024556636 is not an outlier.

For 1% significance level, 0.896088024556636 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Ln_Chloride excl 2 outliers

Number of Observations = 10

10% critical value: 0.409

5% critical value: 0.477

1% critical value: 0.597

1. Observation Value 1.38629436111989 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.220

For 10% significance level, 1.38629436111989 is not an outlier.

For 5% significance level, 1.38629436111989 is not an outlier.

For 1% significance level, 1.38629436111989 is not an outlier.

2. Observation Value 0.896088024556636 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.187

For 10% significance level, 0.896088024556636 is not an outlier.

For 5% significance level, 0.896088024556636 is not an outlier.

For 1% significance level, 0.896088024556636 is not an outlier.

Dixon's Outlier Test for Gamma_Fluoride

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 1.443850293 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.564

For 10% significance level, 1.443850293 is an outlier.

For 5% significance level, 1.443850293 is an outlier. **<-- 3.01 in original units**

For 1% significance level, 1.443850293 is not an outlier.

2. Observation Value 0.757117428 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.142

For 10% significance level, 0.757117428 is not an outlier.

For 5% significance level, 0.757117428 is not an outlier.

For 1% significance level, 0.757117428 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Gamma_Fluoride excl 1 outlier

Number of Observations = 11

10% critical value: 0.517

5% critical value: 0.576

1% critical value: 0.679

1. Observation Value 1.074337071 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.155

For 10% significance level, 1.074337071 is not an outlier.

For 5% significance level, 1.074337071 is not an outlier.

For 1% significance level, 1.074337071 is not an outlier.

2. Observation Value 0.757117428 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.149

For 10% significance level, 0.757117428 is not an outlier.

For 5% significance level, 0.757117428 is not an outlier.

For 1% significance level, 0.757117428 is not an outlier.

Dixon's Outlier Test for Nitrate (as N)

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 15 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.429

For 10% significance level, 15 is not an outlier.

For 5% significance level, 15 is not an outlier.

For 1% significance level, 15 is not an outlier.

2. Observation Value 1.16 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.109

For 10% significance level, 1.16 is not an outlier.

For 5% significance level, 1.16 is not an outlier.

For 1% significance level, 1.16 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for pH

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 9.05 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.460

For 10% significance level, 9.05 is not an outlier.

For 5% significance level, 9.05 is not an outlier.

For 1% significance level, 9.05 is not an outlier.

2. Observation Value 8.53 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.059

For 10% significance level, 8.53 is not an outlier.

For 5% significance level, 8.53 is not an outlier.

For 1% significance level, 8.53 is not an outlier.

Dixon's Outlier Test for Sulfate

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 35.3 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.458

For 10% significance level, 35.3 is not an outlier.

For 5% significance level, 35.3 is not an outlier.

For 1% significance level, 35.3 is not an outlier.

2. Observation Value 5.14 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.178

For 10% significance level, 5.14 is not an outlier.

For 5% significance level, 5.14 is not an outlier.

For 1% significance level, 5.14 is not an outlier.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:23:22 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Total dissolved solids (TDS)

Number of Observations = 12

10% critical value: 0.49

5% critical value: 0.546

1% critical value: 0.642

1. Observation Value 69 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.364

For 10% significance level, 69 is not an outlier.

For 5% significance level, 69 is not an outlier.

For 1% significance level, 69 is not an outlier.

2. Observation Value 32 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.241

For 10% significance level, 32 is not an outlier.

For 5% significance level, 32 is not an outlier.

For 1% significance level, 32 is not an outlier.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:24:38 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Mercury

Total N = 12
Number NDs = 2
Number Detects = 10
Number Data (n) = 12
10% critical value: 0.49
5% critical value: 0.546
1% critical value: 0.642
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 0.0125 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.400

For 10% significance level, 0.0125 is not an outlier.
For 5% significance level, 0.0125 is not an outlier.
For 1% significance level, 0.0125 is not an outlier.

2. Data Value 0.0061 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.061

For 10% significance level, 0.0061 is not an outlier.
For 5% significance level, 0.0061 is not an outlier.
For 1% significance level, 0.0061 is not an outlier.

Dixon's Outlier Test for Ln_Arsenic

Total N = 12
Number NDs = 6
Number Detects = 6
Number Data (n) = 12
10% critical value: 0.49
5% critical value: 0.546
1% critical value: 0.642
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1.393766376 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.799

For 10% significance level, 1.393766376 is an outlier.
For 5% significance level, 1.393766376 is an outlier. **<-- 4.03 in original units**
For 1% significance level, 1.393766376 is an outlier.

2. Data Value -0.082295243 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.645

For 10% significance level, -0.082295243 is an outlier.
For 5% significance level, -0.082295243 is an outlier. **<-- 0.921 J in original units**
For 1% significance level, -0.082295243 is an outlier.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:24:38 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Ln_Arsenic excl 1 high 1 low outlier

Total N = 10
Number NDs = 6
Number Detects = 4
Number Data (n) = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 0.58221562 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.807

For 10% significance level, 0.58221562 is an outlier.
For 5% significance level, 0.58221562 is an outlier. **<-- 1.79 in original units**
For 1% significance level, 0.58221562 is an outlier.

2. Data Value 0.139761942 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.820

For 10% significance level, 0.139761942 is an outlier.
For 5% significance level, 0.139761942 is an outlier. **<-- Half of ND(2) in original units**
For 1% significance level, 0.139761942 is an outlier.

Dixon's Outlier Test for Ln_Arsenic excl 2 low 2 high outliers

Total N = 8
Number NDs = 5
Number Detects = 3
Number Data (n) = 8
10% critical value: 0.479
5% critical value: 0.554
1% critical value: 0.683
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 0.392042088 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.910

For 10% significance level, 0.392042088 is an outlier.
For 5% significance level, 0.392042088 is an outlier. **<-- 1.79 in original units**
For 1% significance level, 0.392042088 is an outlier.

2. Data Value 0.139761942 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.981

For 10% significance level, 0.139761942 is an outlier.
For 5% significance level, 0.139761942 is an outlier. **<-- Half of ND(2) in original units**
For 1% significance level, 0.139761942 is an outlier.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation ProUCL 5.111/6/2017 3:24:38 PM

From File 082148 Background Data for ProUCL (detected analytes).xls

Full Precision OFF

Dixon's Outlier Test for Ln_Arsenic excl 3 high 3 low outliers

Total N = 5
Number NDs = 4
Number Detects = 1
Number Data (n) = 5
10% critical value: 0.557
5% critical value: 0.642
1% critical value: 0.78
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 0.3465735905 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.000

For 10% significance level, 0.3465735905 is not an outlier.
For 5% significance level, 0.3465735905 is not an outlier.
For 1% significance level, 0.3465735905 is not an outlier.

2. Data Value 0.139761942 is a Potential Outlier (Lower Tail)?

Test Statistic: 1.000

For 10% significance level, 0.139761942 is an outlier.
For 5% significance level, 0.139761942 is an outlier. **<-- Half of ND(2) in original units**
For 1% significance level, 0.139761942 is an outlier.

Dixon's Outlier Test for Cyanide (total)

Total N = 12
Number NDs = 6
Number Detects = 6
Number Data (n) = 12
10% critical value: 0.49
5% critical value: 0.546
1% critical value: 0.642
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 1 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.000

For 10% significance level, 1 is not an outlier.
For 5% significance level, 1 is not an outlier.
For 1% significance level, 1 is not an outlier.

2. Data Value 0.22 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 0.22 is not an outlier.
For 5% significance level, 0.22 is not an outlier.
For 1% significance level, 0.22 is not an outlier.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Radium 226 and 228

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	0.625	First Quartile	0.666
Second Largest	1.06	Median	0.772
Maximum	1.116	Third Quartile	0.964
Mean	0.82	SD	0.179
Coefficient of Variation	0.218	Skewness	0.431
Mean of logged Data	-0.22	SD of logged Data	0.215

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.19	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	1.491	90% Percentile (z)	1.05
95% UPL (t)	1.155	95% Percentile (z)	1.115
95% USL	1.229	99% Percentile (z)	1.237

Gamma GOF Test

A-D Test Statistic	0.548	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.196	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	23.52	k star (bias corrected MLE)	17.7
Theta hat (MLE)	0.0349	Theta star (bias corrected MLE)	0.0463
nu hat (MLE)	564.5	nu star (bias corrected)	424.7
MLE Mean (bias corrected)	0.82	MLE Sd (bias corrected)	0.195

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	1.182	90% Percentile	1.078
95% Hawkins Wixley (HW) Approx. Gamma UPL	1.186	95% Percentile	1.165
95% WH Approx. Gamma UTL with 99% Coverage	1.658	99% Percentile	1.34
95% HW Approx. Gamma UTL with 99% Coverage	1.688		
95% WH USL	1.278	95% HW USL	1.286

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	1.797	90% Percentile (z)	1.057
95% UPL (t)	1.2	95% Percentile (z)	1.143
95% USL	1.312	99% Percentile (z)	1.324

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	1.116
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	1.116	95% BCA Bootstrap UTL with 99% Coverage	1.116
95% UPL	1.116	90% Percentile	1.054
90% Chebyshev UPL	1.379	95% Percentile	1.085
95% Chebyshev UPL	1.633	99% Percentile	1.11
95% USL	1.116		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Barium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Minimum	26.2	First Quartile	44.6
Second Largest	95.6	Median	56.9
Maximum	111	Third Quartile	78.53
Mean	63.48	SD	25.08
Coefficient of Variation	0.395	Skewness	0.584
Mean of logged Data	4.077	SD of logged Data	0.407

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.146	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	157.4	90% Percentile (z)	95.61
95% UPL (t)	110.3	95% Percentile (z)	104.7
95% USL	120.8	99% Percentile (z)	121.8

Gamma GOF Test

A-D Test Statistic	0.256	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.136	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.964	k star (bias corrected MLE)	5.279
Theta hat (MLE)	9.114	Theta star (bias corrected MLE)	12.02
nu hat (MLE)	167.1	nu star (bias corrected)	126.7
MLE Mean (bias corrected)	63.48	MLE Sd (bias corrected)	27.63

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	118.3	90% Percentile	100.4
95% Hawkins Wixley (HW) Approx. Gamma UPL	119.9	95% Percentile	114.7
95% WH Approx. Gamma UTL with 99% Coverage	205.2	99% Percentile	144.6
95% HW Approx. Gamma UTL with 99% Coverage	216.7		
95% WH USL	134.9	95% HW USL	137.8

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.154	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	271.4	90% Percentile (z)	99.4
	95% UPL (t)	126.3	95% Percentile (z)	115.3
	95% USL	149.6	99% Percentile (z)	152.1

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

	Order of Statistic, r	12	95% UTL with 99% Coverage	111
	Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
			Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with	99% Coverage	111	95% BCA Bootstrap UTL with 99% Coverage	111
	95% UPL	111	90% Percentile	95.04
	90% Chebyshev UPL	141.8	95% Percentile	102.5
	95% Chebyshev UPL	177.2	99% Percentile	109.3
	95% USL	111		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Chromium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	3.76	First Quartile	4.198
Second Largest	6.36	Median	4.655
Maximum	7.04	Third Quartile	5.6
Mean	4.976	SD	1.065
Coefficient of Variation	0.214	Skewness	0.822
Mean of logged Data	1.585	SD of logged Data	0.205

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.9	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.214	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	99% Coverage	8.966	90% Percentile (z)	6.341
	95% UPL (t)	6.966	95% Percentile (z)	6.728
	95% USL	7.409	99% Percentile (z)	7.453

Gamma GOF Test

A-D Test Statistic	0.449	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.192	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma Statistics

k hat (MLE)	25.43	k star (bias corrected MLE)	19.13
Theta hat (MLE)	0.196	Theta star (bias corrected MLE)	0.26
nu hat (MLE)	610.3	nu star (bias corrected)	459.1
MLE Mean (bias corrected)	4.976	MLE Sd (bias corrected)	1.138

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	7.078	90% Percentile	6.478
95% Hawkins Wixley (HW) Approx. Gamma UPL	7.096	95% Percentile	6.983
95% WH Approx. Gamma UTL with 99% Coverage	9.82	99% Percentile	7.997
95% HW Approx. Gamma UTL with 99% Coverage	9.97		
95% WH USL	7.634	95% HW USL	7.67

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	10.51	90% Percentile (z)	6.343
95% UPL (t)	7.155	95% Percentile (z)	6.834
95% USL	7.792	99% Percentile (z)	7.858

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	7.04
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	7.04	95% BCA Bootstrap UTL with 99% Coverage	7.04
95% UPL	7.04	90% Percentile	6.35
90% Chebyshev UPL	8.301	95% Percentile	6.666
95% Chebyshev UPL	9.807	99% Percentile	6.965
95% USL	7.04		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Copper

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	0.59	First Quartile	0.911
Second Largest	2.18	Median	1.135
Maximum	3.44	Third Quartile	1.545
Mean	1.362	SD	0.791
Coefficient of Variation	0.581	Skewness	1.838
Mean of logged Data	0.184	SD of logged Data	0.504

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Normal GOF Test

Shapiro Wilk Test Statistic	0.818	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	4.327	90% Percentile (z)	2.376
95% UPL (t)	2.841	95% Percentile (z)	2.664
95% USL	3.17	99% Percentile (z)	3.203

Gamma GOF Test

A-D Test Statistic	0.374	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.735	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.161	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	4.164	k star (bias corrected MLE)	3.178
Theta hat (MLE)	0.327	Theta star (bias corrected MLE)	0.429
nu hat (MLE)	99.93	nu star (bias corrected)	76.28
MLE Mean (bias corrected)	1.362	MLE Sd (bias corrected)	0.764

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.93	90% Percentile	2.387
95% Hawkins Wixley (HW) Approx. Gamma UPL	2.958	95% Percentile	2.813
95% WH Approx. Gamma UTL with 99% Coverage	5.696	99% Percentile	3.732
95% HW Approx. Gamma UTL with 99% Coverage	6.062		
95% WH USL	3.44	95% HW USL	3.507

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.957	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.136	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	7.945	90% Percentile (z)	2.294
95% UPL (t)	3.084	95% Percentile (z)	2.755
95% USL	3.803	99% Percentile (z)	3.883

Nonparametric Distribution Free Background Statistics

Data appear Approximate Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	3.44
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	3.44	95% BCA Bootstrap UTL with 99% Coverage	3.44
95% UPL	3.44	90% Percentile	2.118
90% Chebyshev UPL	3.833	95% Percentile	2.747
95% Chebyshev UPL	4.952	99% Percentile	3.301
95% USL	3.44		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Iron

General Statistics

Total Number of Observations	12	Number of Distinct Observations	10
Minimum	3520	First Quartile	4538
Second Largest	7370	Median	5475
Maximum	7650	Third Quartile	7115
Mean	5705	SD	1395
Coefficient of Variation	0.245	Skewness	0.113
Mean of logged Data	8.621	SD of logged Data	0.251

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.174	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	10932	90% Percentile (z)	7493
95% UPL (t)	8312	95% Percentile (z)	7999
95% USL	8892	99% Percentile (z)	8950

Gamma GOF Test

A-D Test Statistic	0.473	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.173	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	17.83	k star (bias corrected MLE)	13.43
Theta hat (MLE)	320	Theta star (bias corrected MLE)	424.9
nu hat (MLE)	427.9	nu star (bias corrected)	322.3
MLE Mean (bias corrected)	5705	MLE Sd (bias corrected)	1557

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	8631	90% Percentile	7769
95% Hawkins Wixley (HW) Approx. Gamma UPL	8683	95% Percentile	8484
95% WH Approx. Gamma UTL with 99% Coverage	12618	99% Percentile	9936
95% HW Approx. Gamma UTL with 99% Coverage	12942		
95% WH USL	9428	95% HW USL	9519

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.92	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.161	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	14198	90% Percentile (z)	7649
95% UPL (t)	8864	95% Percentile (z)	8379
95% USL	9839	99% Percentile (z)	9941

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	7650
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	7650	95% BCA Bootstrap UTL with 99% Coverage	7650
95% UPL	7650	90% Percentile	7370
90% Chebyshev UPL	10061	95% Percentile	7496
95% Chebyshev UPL	12033	99% Percentile	7619
95% USL	7650		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Lead

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	0.928	First Quartile	1.58
Second Largest	2.96	Median	2.07
Maximum	3.08	Third Quartile	2.688
Mean	2.083	SD	0.694
Coefficient of Variation	0.333	Skewness	-0.0985
Mean of logged Data	0.676	SD of logged Data	0.37

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	4.682	90% Percentile (z)	2.972
95% UPL (t)	3.38	95% Percentile (z)	3.224
95% USL	3.668	99% Percentile (z)	3.697

Gamma GOF Test

A-D Test Statistic	0.225	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.14	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.246	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	8.773	k star (bias corrected MLE)	6.635
Theta hat (MLE)	0.237	Theta star (bias corrected MLE)	0.314
nu hat (MLE)	210.5	nu star (bias corrected)	159.2
MLE Mean (bias corrected)	2.083	MLE Sd (bias corrected)	0.809

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	3.666	90% Percentile	3.163
95% Hawkins Wixley (HW) Approx. Gamma UPL	3.721	95% Percentile	3.567
95% WH Approx. Gamma UTL with 99% Coverage	6.067	99% Percentile	4.408
95% HW Approx. Gamma UTL with 99% Coverage	6.391		
95% WH USL	4.13	95% HW USL	4.221

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.126	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	7.872	90% Percentile (z)	3.159
95% UPL (t)	3.927	95% Percentile (z)	3.614
95% USL	4.581	99% Percentile (z)	4.652

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	3.08
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	3.08	95% BCA Bootstrap UTL with 99% Coverage	3.08
95% UPL	3.08	90% Percentile	2.941
90% Chebyshev UPL	4.249	95% Percentile	3.014
95% Chebyshev UPL	5.23	99% Percentile	3.067
95% USL	3.08		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Manganese

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	43	First Quartile	48.3
Second Largest	81.7	Median	54.75
Maximum	102	Third Quartile	56.28
Mean	58.2	SD	17
Coefficient of Variation	0.292	Skewness	1.955
Mean of logged Data	4.032	SD of logged Data	0.25

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.742	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.366	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	121.9	90% Percentile (z)	79.99
95% UPL (t)	89.98	95% Percentile (z)	86.16
95% USL	97.04	99% Percentile (z)	97.75

Gamma GOF Test

A-D Test Statistic	1.092	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.339	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma Statistics

k hat (MLE)	15.99	k star (bias corrected MLE)	12.05
Theta hat (MLE)	3.639	Theta star (bias corrected MLE)	4.83
nu hat (MLE)	383.8	nu star (bias corrected)	289.2
MLE Mean (bias corrected)	58.2	MLE Sd (bias corrected)	16.77

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	89.78	90% Percentile	80.45
95% Hawkins Wixley (HW) Approx. Gamma UPL	89.79	95% Percentile	88.24
95% WH Approx. Gamma UTL with 99% Coverage	133.5	99% Percentile	104.1
95% HW Approx. Gamma UTL with 99% Coverage	135.6		
95% WH USL	98.47	95% HW USL	98.75

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.822	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.322	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data Not Lognormal at 5% Significance Level	

Data Not Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	143.6	90% Percentile (z)	77.64
95% UPL (t)	89.9	95% Percentile (z)	85.01
95% USL	99.73	99% Percentile (z)	100.8

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	102
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	102	95% BCA Bootstrap UTL with 99% Coverage	102
95% UPL	102	90% Percentile	79.21
90% Chebyshev UPL	111.3	95% Percentile	90.84
95% Chebyshev UPL	135.3	99% Percentile	99.77
95% USL	102		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Uranium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	17.4	First Quartile	20.33
Second Largest	28.9	Median	22.05
Maximum	32.9	Third Quartile	26.4
Mean	23.46	SD	4.708
Coefficient of Variation	0.201	Skewness	0.684
Mean of logged Data	3.137	SD of logged Data	0.195

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Normal GOF Test

Shapiro Wilk Test Statistic	0.945	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	41.1	90% Percentile (z)	29.49
95% UPL (t)	32.26	95% Percentile (z)	31.2
95% USL	34.21	99% Percentile (z)	34.41

Gamma GOF Test

A-D Test Statistic	0.244	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.146	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	28.32	k star (bias corrected MLE)	21.3
Theta hat (MLE)	0.828	Theta star (bias corrected MLE)	1.102
nu hat (MLE)	679.7	nu star (bias corrected)	511.1
MLE Mean (bias corrected)	23.46	MLE Sd (bias corrected)	5.083

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	32.81	90% Percentile	30.16
95% Hawkins Wixley (HW) Approx. Gamma UPL	32.9	95% Percentile	32.4
95% WH Approx. Gamma UTL with 99% Coverage	44.86	99% Percentile	36.87
95% HW Approx. Gamma UTL with 99% Coverage	45.52		
95% WH USL	35.27	95% HW USL	35.43

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.967	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.132	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	47.9	90% Percentile (z)	29.6
95% UPL (t)	33.2	95% Percentile (z)	31.77
95% USL	36	99% Percentile (z)	36.29

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	32.9
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	32.9	95% BCA Bootstrap UTL with 99% Coverage	32.9
95% UPL	32.9	90% Percentile	28.83
90% Chebyshev UPL	38.16	95% Percentile	30.7
95% Chebyshev UPL	44.82	99% Percentile	32.46
95% USL	32.9		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Zinc

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	9.94	First Quartile	11.05
Second Largest	17	Median	12.2
Maximum	18.6	Third Quartile	15.08
Mean	13.17	SD	2.855
Coefficient of Variation	0.217	Skewness	0.813
Mean of logged Data	2.558	SD of logged Data	0.207

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.176	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	23.87	90% Percentile (z)	16.83
95% UPL (t)	18.51	95% Percentile (z)	17.87
95% USL	19.69	99% Percentile (z)	19.81

Gamma GOF Test

A-D Test Statistic	0.471	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.166	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	24.83	k star (bias corrected MLE)	18.68
Theta hat (MLE)	0.53	Theta star (bias corrected MLE)	0.705
nu hat (MLE)	596	nu star (bias corrected)	448.3
MLE Mean (bias corrected)	13.17	MLE Sd (bias corrected)	3.047

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	18.81	90% Percentile	17.19
95% Hawkins Wixley (HW) Approx. Gamma UPL	18.85	95% Percentile	18.55
95% WH Approx. Gamma UTL with 99% Coverage	26.18	99% Percentile	21.27
95% HW Approx. Gamma UTL with 99% Coverage	26.58		
95% WH USL	20.3	95% HW USL	20.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.924	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.152	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	28.05	90% Percentile (z)	16.83
95% UPL (t)	19.01	95% Percentile (z)	18.15
95% USL	20.72	99% Percentile (z)	20.9

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	18.6
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	18.6	95% BCA Bootstrap UTL with 99% Coverage	18.6
95% UPL	18.6	90% Percentile	16.95
90% Chebyshev UPL	22.09	95% Percentile	17.72
95% Chebyshev UPL	26.12	99% Percentile	18.42
95% USL	18.6		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Chloride

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	2.45	First Quartile	2.758
Second Largest	6.16	Median	3.365
Maximum	9.32	Third Quartile	3.738
Mean	3.919	SD	1.964
Coefficient of Variation	0.501	Skewness	2.29
Mean of logged Data	1.285	SD of logged Data	0.386

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.696	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.317	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	11.28	90% Percentile (z)	6.436
95% UPL (t)	7.591	95% Percentile (z)	7.15
95% USL	8.407	99% Percentile (z)	8.488

Gamma GOF Test

A-D Test Statistic	1.054	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.267	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.246	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	6.34	k star (bias corrected MLE)	4.81
Theta hat (MLE)	0.618	Theta star (bias corrected MLE)	0.815
nu hat (MLE)	152.2	nu star (bias corrected)	115.4
MLE Mean (bias corrected)	3.919	MLE Sd (bias corrected)	1.787

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	7.46	90% Percentile	6.312
95% Hawkins Wixley (HW) Approx. Gamma UPL	7.452	95% Percentile	7.244
95% WH Approx. Gamma UTL with 99% Coverage	13.19	99% Percentile	9.218
95% HW Approx. Gamma UTL with 99% Coverage	13.61		
95% WH USL	8.545	95% HW USL	8.583

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.828	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.24	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	15.38	90% Percentile (z)	5.931
95% UPL (t)	7.443	95% Percentile (z)	6.825
95% USL	8.74	99% Percentile (z)	8.88

Nonparametric Distribution Free Background Statistics

Data appear Approximate Lognormal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	9.32
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	9.32	95% BCA Bootstrap UTL with 99% Coverage	9.32
95% UPL	9.32	90% Percentile	5.944
90% Chebyshev UPL	10.05	95% Percentile	7.582
95% Chebyshev UPL	12.83	99% Percentile	8.972
95% USL	9.32		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Fluoride

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	0.434	First Quartile	0.545
Second Largest	1.24	Median	0.777
Maximum	3.01	Third Quartile	1.108
Mean	0.968	SD	0.699
Coefficient of Variation	0.722	Skewness	2.569
Mean of logged Data	-0.191	SD of logged Data	0.543

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.691	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.265	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	3.589	90% Percentile (z)	1.865
95% UPL (t)	2.275	95% Percentile (z)	2.119
95% USL	2.566	99% Percentile (z)	2.595

Gamma GOF Test

A-D Test Statistic	0.612	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.182	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.247	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma Statistics

k hat (MLE)	3.307	k star (bias corrected MLE)	2.536
Theta hat (MLE)	0.293	Theta star (bias corrected MLE)	0.382
nu hat (MLE)	79.36	nu star (bias corrected)	60.86
MLE Mean (bias corrected)	0.968	MLE Sd (bias corrected)	0.608

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.229	90% Percentile	1.783
95% Hawkins Wixley (HW) Approx. Gamma UPL	2.235	95% Percentile	2.135
95% WH Approx. Gamma UTL with 99% Coverage	4.579	99% Percentile	2.905
95% HW Approx. Gamma UTL with 99% Coverage	4.858		
95% WH USL	2.655	95% HW USL	2.69

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.91	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.144	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	6.328	90% Percentile (z)	1.658
95% UPL (t)	2.281	95% Percentile (z)	2.019
95% USL	2.859	99% Percentile (z)	2.924

Nonparametric Distribution Free Background Statistics

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	3.01
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	3.01	95% BCA Bootstrap UTL with 99% Coverage	3.01
95% UPL	3.01	90% Percentile	1.235
90% Chebyshev UPL	3.152	95% Percentile	2.037
95% Chebyshev UPL	4.141	99% Percentile	2.815
95% USL	3.01		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Nitrate (as N)

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	1.16	First Quartile	2.425
Second Largest	9.34	Median	4.54
Maximum	15	Third Quartile	7.83
Mean	5.623	SD	4.108
Coefficient of Variation	0.731	Skewness	1.092
Mean of logged Data	1.467	SD of logged Data	0.78

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Normal GOF Test

Shapiro Wilk Test Statistic	0.898	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.175	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	21.02	90% Percentile (z)	10.89
95% UPL (t)	13.3	95% Percentile (z)	12.38
95% USL	15.01	99% Percentile (z)	15.18

Gamma GOF Test

A-D Test Statistic	0.221	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.741	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.129	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.248	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	2.077	k star (bias corrected MLE)	1.613
Theta hat (MLE)	2.707	Theta star (bias corrected MLE)	3.485
nu hat (MLE)	49.85	nu star (bias corrected)	38.72
MLE Mean (bias corrected)	5.623	MLE Sd (bias corrected)	4.426

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	15.33	90% Percentile	11.51
95% Hawkins Wixley (HW) Approx. Gamma UPL	15.89	95% Percentile	14.3
95% WH Approx. Gamma UTL with 99% Coverage	35.64	99% Percentile	20.55
95% HW Approx. Gamma UTL with 99% Coverage	40.82		
95% WH USL	18.88	95% HW USL	19.98

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.972	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.135	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	80.59	90% Percentile (z)	11.78
95% UPL (t)	18.63	95% Percentile (z)	15.64
95% USL	25.77	99% Percentile (z)	26.61

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	15
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	15	95% BCA Bootstrap UTL with 99% Coverage	15
95% UPL	15	90% Percentile	9.339
90% Chebyshev UPL	18.45	95% Percentile	11.89
95% Chebyshev UPL	24.26	99% Percentile	14.38
95% USL	15		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

pH

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Minimum	8.53	First Quartile	8.573
Second Largest	8.87	Median	8.665
Maximum	9.05	Third Quartile	8.813
Mean	8.704	SD	0.161
Coefficient of Variation	0.0185	Skewness	0.856
Mean of logged Data	2.164	SD of logged Data	0.0184

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.177	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	9.308	90% Percentile (z)	8.911
95% UPL (t)	9.005	95% Percentile (z)	8.969
95% USL	9.072	99% Percentile (z)	9.079

Gamma GOF Test

A-D Test Statistic	0.527	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3212	k star (bias corrected MLE)	2409
Theta hat (MLE)	0.00271	Theta star (bias corrected MLE)	0.00361
nu hat (MLE)	77080	nu star (bias corrected)	57811
MLE Mean (bias corrected)	8.704	MLE Sd (bias corrected)	0.177

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	9.007	90% Percentile	8.932
95% Hawkins Wixley (HW) Approx. Gamma UPL	9.007	95% Percentile	8.998
95% WH Approx. Gamma UTL with 99% Coverage	9.318	99% Percentile	9.122
95% HW Approx. Gamma UTL with 99% Coverage	9.32		
95% WH USL	9.075	95% HW USL	9.075

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.906	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.178	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	9.324	90% Percentile (z)	8.91
95% UPL (t)	9.007	95% Percentile (z)	8.97
95% USL	9.076	99% Percentile (z)	9.083

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	9.05
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	9.05	95% BCA Bootstrap UTL with 99% Coverage	9.05
95% UPL	9.05	90% Percentile	8.865
90% Chebyshev UPL	9.207	95% Percentile	8.951
95% Chebyshev UPL	9.435	99% Percentile	9.03
95% USL	9.05		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Sulfate

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Minimum	5.14	First Quartile	9.773
Second Largest	24	Median	12.35
Maximum	35.3	Third Quartile	18.55
Mean	14.89	SD	8.648
Coefficient of Variation	0.581	Skewness	1.277
Mean of logged Data	2.557	SD of logged Data	0.56

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.174	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	47.29	90% Percentile (z)	25.97
95% UPL (t)	31.06	95% Percentile (z)	29.11
95% USL	34.65	99% Percentile (z)	35.01

Gamma GOF Test

A-D Test Statistic	0.181	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.737	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.119	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.247	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.636	k star (bias corrected MLE)	2.783
Theta hat (MLE)	4.095	Theta star (bias corrected MLE)	5.351
nu hat (MLE)	87.27	nu star (bias corrected)	66.78
MLE Mean (bias corrected)	14.89	MLE Sd (bias corrected)	8.927

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	33.48	90% Percentile	26.86
95% Hawkins Wixley (HW) Approx. Gamma UPL	34.08	95% Percentile	31.94
95% WH Approx. Gamma UTL with 99% Coverage	67.25	99% Percentile	43
95% HW Approx. Gamma UTL with 99% Coverage	72.95		
95% WH USL	39.64	95% HW USL	40.86

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.988	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0876	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	105	90% Percentile (z)	26.42
	95% UPL (t)	36.72	95% Percentile (z)	32.38
	95% USL	46.34	99% Percentile (z)	47.42

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

	Order of Statistic, r	12	95% UTL with 99% Coverage	35.3
	Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
			Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with	99% Coverage	35.3	95% BCA Bootstrap UTL with 99% Coverage	35.3
	95% UPL	35.3	90% Percentile	23.8
	90% Chebyshev UPL	41.89	95% Percentile	29.09
	95% Chebyshev UPL	54.12	99% Percentile	34.06
	95% USL	35.3		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Total dissolved solids (TDS)

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Minimum	32	First Quartile	39.75
Second Largest	61	Median	43
Maximum	69	Third Quartile	53.25
Mean	46.5	SD	11.01
Coefficient of Variation	0.237	Skewness	0.867
Mean of logged Data	3.815	SD of logged Data	0.226

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test

Shapiro Wilk Test Statistic	0.922	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.221	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.243	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	99% Coverage	87.75	90% Percentile (z)	60.61
	95% UPL (t)	67.08	95% Percentile (z)	64.61
	95% USL	71.65	99% Percentile (z)	72.11

Gamma GOF Test

A-D Test Statistic	0.37	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.197	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:16 PM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma Statistics

k hat (MLE)	20.87	k star (bias corrected MLE)	15.71
Theta hat (MLE)	2.228	Theta star (bias corrected MLE)	2.961
nu hat (MLE)	500.8	nu star (bias corrected)	377
MLE Mean (bias corrected)	46.5	MLE Sd (bias corrected)	11.73

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	68.37	90% Percentile	62.03
95% Hawkins Wixley (HW) Approx. Gamma UPL	68.58	95% Percentile	67.33
95% WH Approx. Gamma UTL with 99% Coverage	97.58	99% Percentile	78.05
95% HW Approx. Gamma UTL with 99% Coverage	99.37		
95% WH USL	74.25	95% HW USL	74.68

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.958	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.243	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	106.1	90% Percentile (z)	60.68
95% UPL (t)	69.32	95% Percentile (z)	65.88
95% USL	76.16	99% Percentile (z)	76.88

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	12	95% UTL with 99% Coverage	69
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	69	95% BCA Bootstrap UTL with 99% Coverage	69
95% UPL	69	90% Percentile	60.6
90% Chebyshev UPL	80.87	95% Percentile	64.6
95% Chebyshev UPL	96.44	99% Percentile	68.12
95% USL	69		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Mercury

General Statistics

Total Number of Observations	12	Number of Missing Observations	0
Number of Distinct Observations	11		
Number of Detects	10	Number of Non-Detects	2
Number of Distinct Detects	10	Number of Distinct Non-Detects	1
Minimum Detect	0.0061	Minimum Non-Detect	0.025
Maximum Detect	0.00995	Maximum Non-Detect	0.025
Variance Detected	1.5770E-6	Percent Non-Detects	16.67%
Mean Detected	0.00758	SD Detected	0.00126
Mean of Detected Logged Data	-4.895	SD of Detected Logged Data	0.164

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.921	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.182	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Detected Data appear Normal at 5% Significance Level

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.00758	KM SD	0.00119
95% UTL99% Coverage	0.012	95% KM UPL (t)	0.0098
90% KM Percentile (z)	0.0091	95% KM Percentile (z)	0.00954
99% KM Percentile (z)	0.0103	95% KM USL	0.0103

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.0084	SD	0.00223
95% UTL99% Coverage	0.0167	95% UPL (t)	0.0126
90% Percentile (z)	0.0113	95% Percentile (z)	0.0121
99% Percentile (z)	0.0136	95% USL	0.0135

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.393	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	41.28	k star (bias corrected MLE)	28.96
Theta hat (MLE)	1.8358E-4	Theta star (bias corrected MLE)	2.6165E-4
nu hat (MLE)	825.6	nu star (bias corrected)	579.2
MLE Mean (bias corrected)	0.00758		
MLE Sd (bias corrected)	0.00141	95% Percentile of Chisquare (2kstar)	76.69

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.0061	Mean	0.00798
Maximum	0.01	Median	0.0081
SD	0.00148	CV	0.185
k hat (MLE)	31.79	k star (bias corrected MLE)	23.9
Theta hat (MLE)	2.5106E-4	Theta star (bias corrected MLE)	3.3397E-4
nu hat (MLE)	763	nu star (bias corrected)	573.6
MLE Mean (bias corrected)	0.00798	MLE Sd (bias corrected)	0.00163
95% Percentile of Chisquare (2kstar)	64.94	90% Percentile	0.0101
95% Percentile	0.0108	99% Percentile	0.0123

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	0.0148	0.015	95% Approx. Gamma UPL	0.011	0.011
95% Gamma USL	0.0118	0.0118			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.00758	SD (KM)	0.00119
Variance (KM)	1.4193E-6	SE of Mean (KM)	3.9711E-4
k hat (KM)	40.46	k star (KM)	30.4
nu hat (KM)	971.1	nu star (KM)	729.7
theta hat (KM)	1.8729E-4	theta star (KM)	2.4926E-4
80% gamma percentile (KM)	0.0087	90% gamma percentile (KM)	0.00938
95% gamma percentile (KM)	0.00997	99% gamma percentile (KM)	0.0111

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	0.0123	0.0124	95% Approx. Gamma UPL	0.00993	0.00995
95% KM Gamma Percentile	0.00962	0.00963	95% Gamma USL	0.0105	0.0106

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.925	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.179	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.00757	Mean in Log Scale	-4.895
SD in Original Scale	0.00117	SD in Log Scale	0.152
95% UTL99% Coverage	0.0132	95% BCA UTL99% Coverage	0.00995
95% Bootstrap (%) UTL99% Coverage	0.00995	95% UPL (t)	0.00995
90% Percentile (z)	0.0091	95% Percentile (z)	0.00962
99% Percentile (z)	0.0107	95% USL	0.0106

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-4.895	95% KM UTL (Lognormal)99% Coverage	0.0134
KM SD of Logged Data	0.155	95% KM UPL (Lognormal)	0.01
95% KM Percentile Lognormal (z)	0.00967	95% KM USL (Lognormal)	0.0107

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.0084	Mean in Log Scale	-4.809
SD in Original Scale	0.00223	SD in Log Scale	0.249
95% UTL99% Coverage	0.0207	95% UPL (t)	0.013
90% Percentile (z)	0.0112	95% Percentile (z)	0.0123
99% Percentile (z)	0.0145	95% USL	0.0144

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	12	95% UTL with99% Coverage	0.025
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
Approximate Sample Size needed to achieve specified CC	299	95% UPL	0.025
95% USL	0.025	95% KM Chebyshev UPL	0.013

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Arsenic

General Statistics

Total Number of Observations	12	Number of Missing Observations	0
Number of Distinct Observations	7		
Number of Detects	6	Number of Non-Detects	6
Number of Distinct Detects	6	Number of Distinct Non-Detects	1
Minimum Detect	0.921	Minimum Non-Detect	2
Maximum Detect	4.03	Maximum Non-Detect	2
Variance Detected	1.283	Percent Non-Detects	50%
Mean Detected	1.799	SD Detected	1.133
Mean of Detected Logged Data	0.463	SD of Detected Logged Data	0.51

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.744	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.336	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	1.575	KM SD	0.793
95% UTL99% Coverage	4.545	95% KM UPL (t)	3.057
90% KM Percentile (z)	2.591	95% KM Percentile (z)	2.879
99% KM Percentile (z)	3.419	95% KM USL	3.387

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	1.399	SD	0.87
95% UTL99% Coverage	4.659	95% UPL (t)	3.026
90% Percentile (z)	2.514	95% Percentile (z)	2.83
99% Percentile (z)	3.423	95% USL	3.387

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.54	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.7	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.272	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.333	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma Statistics on Detected Data Only

k hat (MLE)	4.183	k star (bias corrected MLE)	2.203
Theta hat (MLE)	0.43	Theta star (bias corrected MLE)	0.816
nu hat (MLE)	50.2	nu star (bias corrected)	26.43
MLE Mean (bias corrected)	1.799		
MLE Sd (bias corrected)	1.212	95% Percentile of Chisquare (2kstar)	10.14

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.587	Mean	1.611
Maximum	4.03	Median	1.45
SD	0.901	CV	0.56
k hat (MLE)	4.395	k star (bias corrected MLE)	3.352
Theta hat (MLE)	0.366	Theta star (bias corrected MLE)	0.48
nu hat (MLE)	105.5	nu star (bias corrected)	80.45
MLE Mean (bias corrected)	1.611	MLE Sd (bias corrected)	0.88
95% Percentile of Chisquare (2kstar)	13.63	90% Percentile	2.79
95% Percentile	3.276	99% Percentile	4.322

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	6.537	6.961	95% Approx. Gamma UPL	3.407	3.445
95% Gamma USL	3.986	4.07			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	1.575	SD (KM)	0.793
Variance (KM)	0.628	SE of Mean (KM)	0.269
k hat (KM)	3.95	k star (KM)	3.018
nu hat (KM)	94.8	nu star (KM)	72.43
theta hat (KM)	0.399	theta star (KM)	0.522
80% gamma percentile (KM)	2.245	90% gamma percentile (KM)	2.791
95% gamma percentile (KM)	3.3	99% gamma percentile (KM)	4.404

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	4.714	4.816	95% Approx. Gamma UPL	2.952	2.944
95% KM Gamma Percentile	2.739	2.726	95% Gamma USL	3.374	3.383

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.892	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.241	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	1.612	Mean in Log Scale	0.383
SD in Original Scale	0.856	SD in Log Scale	0.428
95% UTL99% Coverage	7.281	95% BCA UTL99% Coverage	4.03
95% Bootstrap (%) UTL99% Coverage	4.03	95% UPL (t)	3.261
90% Percentile (z)	2.536	95% Percentile (z)	2.963
99% Percentile (z)	3.966	95% USL	3.896

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	0.37	95% KM UTL (Lognormal)99% Coverage	5.968
KM SD of Logged Data	0.378	95% KM UPL (Lognormal)	2.934
95% KM Percentile Lognormal (z)	2.695	95% KM USL (Lognormal)	3.434

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	1.399	Mean in Log Scale	0.231
SD in Original Scale	0.87	SD in Log Scale	0.42
95% UTL99% Coverage	6.085	95% UPL (t)	2.764
90% Percentile (z)	2.159	95% Percentile (z)	2.516
99% Percentile (z)	3.35	95% USL	3.292

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	12	95% UTL with99% Coverage	4.03
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
Approximate Sample Size needed to achieve specified CC	299	95% UPL	4.03
95% USL	4.03	95% KM Chebyshev UPL	5.172

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Cyanide (total)

General Statistics

Total Number of Observations	12	Number of Missing Observations	0
Number of Distinct Observations	5		
Number of Detects	6	Number of Non-Detects	6
Number of Distinct Detects	4	Number of Distinct Non-Detects	1
Minimum Detect	0.22	Minimum Non-Detect	2
Maximum Detect	0.34	Maximum Non-Detect	2
Variance Detected	0.00328	Percent Non-Detects	50%
Mean Detected	0.27	SD Detected	0.0573
Mean of Detected Logged Data	-1.328	SD of Detected Logged Data	0.211

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.795	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.788	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.309	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.325	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	0.27	KM SD	0.0523
95% UTL99% Coverage	0.466	95% KM UPL (t)	0.368
90% KM Percentile (z)	0.337	95% KM Percentile (z)	0.356
99% KM Percentile (z)	0.392	95% KM USL	0.389

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	0.635	SD	0.383
95% UTL99% Coverage	2.071	95% UPL (t)	1.351
90% Percentile (z)	1.126	95% Percentile (z)	1.265
99% Percentile (z)	1.526	95% USL	1.511

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.708	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.697	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.333	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.332	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	27.02	k star (bias corrected MLE)	13.62
Theta hat (MLE)	0.00999	Theta star (bias corrected MLE)	0.0198
nu hat (MLE)	324.2	nu star (bias corrected)	163.4
MLE Mean (bias corrected)	0.27		
MLE Sd (bias corrected)	0.0732	95% Percentile of Chisquare (2kstar)	40.41

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.2	Mean	0.27
Maximum	0.346	Median	0.268
SD	0.0526	CV	0.195
k hat (MLE)	28.84	k star (bias corrected MLE)	21.68
Theta hat (MLE)	0.00936	Theta star (bias corrected MLE)	0.0125
nu hat (MLE)	692.1	nu star (bias corrected)	520.4
MLE Mean (bias corrected)	0.27	MLE Sd (bias corrected)	0.058
95% Percentile of Chisquare (2kstar)	59.74	90% Percentile	0.346
95% Percentile	0.372	99% Percentile	0.423

The following statistics are computed using Gamma ROS Statistics on Imputed Data

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	0.514	0.522	95% Approx. Gamma UPL	0.377	0.378
95% Gamma USL	0.405	0.407			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	0.27	SD (KM)	0.0523
Variance (KM)	0.00273	SE of Mean (KM)	0.0234
k hat (KM)	26.67	k star (KM)	20.06
nu hat (KM)	640.1	nu star (KM)	481.4
theta hat (KM)	0.0101	theta star (KM)	0.0135
80% gamma percentile (KM)	0.319	90% gamma percentile (KM)	0.35
95% gamma percentile (KM)	0.376	99% gamma percentile (KM)	0.43

The following statistics are computed using gamma distribution and KM estimates

Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	0.484	0.49	95% Approx. Gamma UPL	0.375	0.376
95% KM Gamma Percentile	0.361	0.361	95% Gamma USL	0.403	0.405

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.786	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.788	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.311	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.325	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	0.27	Mean in Log Scale	-1.328
SD in Original Scale	0.052	SD in Log Scale	0.193
95% UTL99% Coverage	0.545	95% BCA UTL99% Coverage	0.346
95% Bootstrap (%) UTL99% Coverage	0.346	95% UPL (t)	0.38
90% Percentile (z)	0.339	95% Percentile (z)	0.364
99% Percentile (z)	0.415	95% USL	0.411

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	-1.328	95% KM UTL (Lognormal)99% Coverage	0.545
KM SD of Logged Data	0.192	95% KM UPL (Lognormal)	0.38
95% KM Percentile Lognormal (z)	0.364	95% KM USL (Lognormal)	0.411

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	0.635	Mean in Log Scale	-0.664
SD in Original Scale	0.383	SD in Log Scale	0.708
95% UTL99% Coverage	7.305	95% UPL (t)	1.933
90% Percentile (z)	1.275	95% Percentile (z)	1.649
99% Percentile (z)	2.672	95% USL	2.595

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	12	95% UTL with99% Coverage	2
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
Approximate Sample Size needed to achieve specified CC	299	95% UPL	2
95% USL	2	95% KM Chebyshev UPL	0.507

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Methylene chloride

General Statistics

Total Number of Observations	12	Number of Missing Observations	0
Number of Distinct Observations	4		
Number of Detects	3	Number of Non-Detects	9
Number of Distinct Detects	3	Number of Distinct Non-Detects	1
Minimum Detect	11.5	Minimum Non-Detect	100
Maximum Detect	14.5	Maximum Non-Detect	100
Variance Detected	2.303	Percent Non-Detects	75%
Mean Detected	12.87	SD Detected	1.518
Mean of Detected Logged Data	2.55	SD of Detected Logged Data	0.117

Warning: Data set has only 3 Detected Values.
This is not enough to compute meaningful or reliable statistics and estimates.

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.747	d2max (for USL)	2.285

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.977	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.236	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.425	Detected Data appear Normal at 5% Significance Level	

Detected Data appear Normal at 5% Significance Level

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Kaplan Meier (KM) Background Statistics Assuming Normal Distribution

KM Mean	12.87	KM SD	1.239
95% UTL99% Coverage	17.51	95% KM UPL (t)	15.18
90% KM Percentile (z)	14.45	95% KM Percentile (z)	14.9
99% KM Percentile (z)	15.75	95% KM USL	15.7

DL/2 Substitution Background Statistics Assuming Normal Distribution

Mean	40.72	SD	16.81
95% UTL99% Coverage	103.7	95% UPL (t)	72.13
90% Percentile (z)	62.26	95% Percentile (z)	68.36
99% Percentile (z)	79.81	95% USL	79.12

DL/2 is not a recommended method. DL/2 provided for comparisons and historical reasons

Gamma GOF Tests on Detected Observations Only

Not Enough Data to Perform GOF Test

Gamma Statistics on Detected Data Only

k hat (MLE)	109.4	k star (bias corrected MLE)	N/A
Theta hat (MLE)	0.118	Theta star (bias corrected MLE)	N/A
nu hat (MLE)	656.6	nu star (bias corrected)	N/A
MLE Mean (bias corrected)	N/A		
MLE Sd (bias corrected)	N/A	95% Percentile of Chisquare (2kstar)	N/A

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	10.11	Mean	12.88
Maximum	15.82	Median	12.72
SD	1.688	CV	0.131
k hat (MLE)	63.24	k star (bias corrected MLE)	47.49
Theta hat (MLE)	0.204	Theta star (bias corrected MLE)	0.271
nu hat (MLE)	1518	nu star (bias corrected)	1140
MLE Mean (bias corrected)	12.88	MLE Sd (bias corrected)	1.869
95% Percentile of Chisquare (2kstar)	118.7	90% Percentile	15.33
95% Percentile	16.1	99% Percentile	17.63

The following statistics are computed using Gamma ROS Statistics on Imputed Data
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	20.23	20.39	95% Approx. Gamma UPL	16.23	16.26
95% Gamma USL	17.07	17.12			

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	12.87	SD (KM)	1.239
Variance (KM)	1.536	SE of Mean (KM)	0.876
k hat (KM)	107.8	k star (KM)	80.91
nu hat (KM)	2587	nu star (KM)	1942
theta hat (KM)	0.119	theta star (KM)	0.159
80% gamma percentile (KM)	14.05	90% gamma percentile (KM)	14.73
95% gamma percentile (KM)	15.31	99% gamma percentile (KM)	16.43

The following statistics are computed using gamma distribution and KM estimates
Upper Limits using Wilson Hilferty (WH) and Hawkins Wixley (HW) Methods

	WH	HW		WH	HW
95% Approx. Gamma UTL with 99% Coverage	17.49	17.54	95% Approx. Gamma UPL	15.26	15.27
95% KM Gamma Percentile	14.95	14.96	95% Gamma USL	15.84	15.86

Background Statistics for Data Sets with Non-Detects

User Selected Options

Date/Time of Computation	ProUCL 5.111/6/2017 3:25:52 PM
From File	082148 Background Data for ProUCL (detected analytes).xls
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
Different or Future K Observations	1
Number of Bootstrap Operations	10000

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.985	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.767	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.222	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.425	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Background Lognormal ROS Statistics Assuming Lognormal Distribution Using Imputed Non-Detects

Mean in Original Scale	12.91	Mean in Log Scale	2.55
SD in Original Scale	1.682	SD in Log Scale	0.13
95% UTL99% Coverage	20.85	95% BCA UTL99% Coverage	15.96
95% Bootstrap (%) UTL99% Coverage	15.96	95% UPL (t)	16.33
90% Percentile (z)	15.13	95% Percentile (z)	15.86
99% Percentile (z)	17.33	95% USL	17.24

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean of Logged Data	2.55	95% KM UTL (Lognormal)99% Coverage	18.31
KM SD of Logged Data	0.0953	95% KM UPL (Lognormal)	15.31
95% KM Percentile Lognormal (z)	14.98	95% KM USL (Lognormal)	15.93

Background DL/2 Statistics Assuming Lognormal Distribution

Mean in Original Scale	40.72	Mean in Log Scale	3.572
SD in Original Scale	16.81	SD in Log Scale	0.618
95% UTL99% Coverage	360.4	95% UPL (t)	112.9
90% Percentile (z)	78.53	95% Percentile (z)	98.3
99% Percentile (z)	149.8	95% USL	146

DL/2 is not a Recommended Method. DL/2 provided for comparisons and historical reasons.

Nonparametric Distribution Free Background Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Upper Limits for BTVs(no distinction made between detects and nondetects)

Order of Statistic, r	12	95% UTL with99% Coverage	100
Approx, f used to compute achieved CC	0.121	Approximate Actual Confidence Coefficient achieved by UTL	0.114
Approximate Sample Size needed to achieve specified CC	299	95% UPL	100
95% USL	100	95% KM Chebyshev UPL	18.49

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/9/2017 9:54:58 AM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Fluoride excl 1 outlier

General Statistics

Total Number of Observations	11	Number of Distinct Observations	11
Minimum	0.434	First Quartile	0.535
Second Largest	1.19	Median	0.748
Maximum	1.24	Third Quartile	0.967
Mean	0.783	SD	0.288
Coefficient of Variation	0.368	Skewness	0.393
Mean of logged Data	-0.308	SD of logged Data	0.377

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.852	d2max (for USL)	2.234

Normal GOF Test

Shapiro Wilk Test Statistic	0.917	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.15	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.251	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	1.894	90% Percentile (z)	1.152
95% UPL (t)	1.329	95% Percentile (z)	1.257
95% USL	1.427	99% Percentile (z)	1.454

Gamma GOF Test

A-D Test Statistic	0.336	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.73	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.153	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.256	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	8.037	k star (bias corrected MLE)	5.906
Theta hat (MLE)	0.0974	Theta star (bias corrected MLE)	0.133
nu hat (MLE)	176.8	nu star (bias corrected)	129.9
MLE Mean (bias corrected)	0.783	MLE Sd (bias corrected)	0.322

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	1.421	90% Percentile	1.213
95% Hawkins Wixley (HW) Approx. Gamma UPL	1.438	95% Percentile	1.377
95% WH Approx. Gamma UTL with 99% Coverage	2.444	99% Percentile	1.719
95% HW Approx. Gamma UTL with 99% Coverage	2.571		
95% WH USL	1.573	95% HW USL	1.601

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.928	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.153	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.251	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	3.143	90% Percentile (z)	1.191
95% UPL (t)	1.501	95% Percentile (z)	1.366
95% USL	1.707	99% Percentile (z)	1.767

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/9/2017 9:54:58 AM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	11	95% UTL with 99% Coverage	1.24
Approx, f used to compute achieved CC	0.111	Approximate Actual Confidence Coefficient achieved by UTL	0.105
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	1.24	95% BCA Bootstrap UTL with 99% Coverage	1.24
95% UPL	1.24	90% Percentile	1.19
90% Chebyshev UPL	1.686	95% Percentile	1.215
95% Chebyshev UPL	2.096	99% Percentile	1.235
95% USL	1.24		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Chloride excl 2 outliers

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	2
Minimum	2.45	First Quartile	2.753
Second Largest	3.65	Median	3.11
Maximum	4	Third Quartile	3.58
Mean	3.155	SD	0.517
Coefficient of Variation	0.164	Skewness	0.233
Mean of logged Data	1.137	SD of logged Data	0.164

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.981	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.178	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	5.213	90% Percentile (z)	3.818
95% UPL (t)	4.149	95% Percentile (z)	4.005
95% USL	4.28	99% Percentile (z)	4.358

Gamma GOF Test

A-D Test Statistic	0.329	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.724	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.186	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.266	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	41.55	k star (bias corrected MLE)	29.15
Theta hat (MLE)	0.0759	Theta star (bias corrected MLE)	0.108
nu hat (MLE)	830.9	nu star (bias corrected)	583
MLE Mean (bias corrected)	3.155	MLE Sd (bias corrected)	0.584

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	4.224	90% Percentile	3.923
95% Hawkins Wixley (HW) Approx. Gamma UPL	4.235	95% Percentile	4.174
95% WH Approx. Gamma UTL with 99% Coverage	5.65	99% Percentile	4.671
95% HW Approx. Gamma UTL with 99% Coverage	5.724		
95% WH USL	4.385	95% HW USL	4.401

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/9/2017 9:54:58 AM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.947	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.171	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.262	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with	99% Coverage	5.986	90% Percentile (z)		3.846
	95% UPL (t)	4.272	95% Percentile (z)		4.082
	95% USL	4.453	99% Percentile (z)		4.564

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

	Order of Statistic, r	10	95% UTL with	99% Coverage	4
	Approx, f used to compute achieved CC	0.101	Approximate Actual Confidence Coefficient achieved by UTL		0.0956
			Approximate Sample Size needed to achieve specified CC		299
95% Percentile Bootstrap UTL with	99% Coverage	4	95% BCA Bootstrap UTL with	99% Coverage	4
	95% UPL	4		90% Percentile	3.685
	90% Chebyshev UPL	4.782		95% Percentile	3.843
	95% Chebyshev UPL	5.519		99% Percentile	3.969
	95% USL	4			

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Copper excl 1 outlier

General Statistics

Total Number of Observations	11	Number of Distinct Observations	11
		Number of Missing Observations	1
Minimum	0.59	First Quartile	0.845
Second Largest	1.56	Median	1.13
Maximum	2.18	Third Quartile	1.425
Mean	1.174	SD	0.467
Coefficient of Variation	0.398	Skewness	0.828
Mean of logged Data	0.0888	SD of logged Data	0.398

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.852	d2max (for USL)	2.234

Normal GOF Test

Shapiro Wilk Test Statistic	0.933	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.85	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.165	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.251	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with	99% Coverage	2.971	90% Percentile (z)		1.772
	95% UPL (t)	2.057	95% Percentile (z)		1.941
	95% USL	2.216	99% Percentile (z)		2.259

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/9/2017 9:54:58 AM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Gamma GOF Test

A-D Test Statistic	0.249	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.731	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.138	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.256	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	7.186	k star (bias corrected MLE)	5.287
Theta hat (MLE)	0.163	Theta star (bias corrected MLE)	0.222
nu hat (MLE)	158.1	nu star (bias corrected)	116.3
MLE Mean (bias corrected)	1.174	MLE Sd (bias corrected)	0.51

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.191	90% Percentile	1.857
95% Hawkins Wixley (HW) Approx. Gamma UPL	2.219	95% Percentile	2.119
95% WH Approx. Gamma UTL with 99% Coverage	3.859	99% Percentile	2.673
95% HW Approx. Gamma UTL with 99% Coverage	4.072		
95% WH USL	2.438	95% HW USL	2.483

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.85	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.152	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.251	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	5.072	90% Percentile (z)	1.821
95% UPL (t)	2.324	95% Percentile (z)	2.105
95% USL	2.662	99% Percentile (z)	2.762

Nonparametric Distribution Free Background Statistics

Data appear Normal at 5% Significance Level

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	11	95% UTL with 99% Coverage	2.18
Approx, f used to compute achieved CC	0.111	Approximate Actual Confidence Coefficient achieved by UTL	0.105
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	2.18	95% BCA Bootstrap UTL with 99% Coverage	2.18
95% UPL	2.18	90% Percentile	1.56
90% Chebyshev UPL	2.636	95% Percentile	1.87
95% Chebyshev UPL	3.298	99% Percentile	2.118
95% USL	2.18		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20.
Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

Manganese excl 2 outliers

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	2
Minimum	43	First Quartile	47.5
Second Largest	56.1	Median	54.3
Maximum	56.8	Third Quartile	55.53
Mean	51.47	SD	5.325
Coefficient of Variation	0.103	Skewness	-0.704
Mean of logged Data	3.936	SD of logged Data	0.107

Background Statistics for Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	ProUCL 5.111/9/2017 9:54:58 AM
From File	082148 Background Data for ProUCL (detected analytes).xlsx
Full Precision	OFF
Confidence Coefficient	95%
Coverage	99%
New or Future K Observations	1
Number of Bootstrap Operations	10000

Critical Values for Background Threshold Values (BTVs)

Tolerance Factor K (For UTL)	3.981	d2max (for USL)	2.176

Normal GOF Test

Shapiro Wilk Test Statistic	0.839	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.289	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Background Statistics Assuming Normal Distribution

95% UTL with 99% Coverage	72.67	90% Percentile (z)	58.29
95% UPL (t)	61.71	95% Percentile (z)	60.23
95% USL	63.06	99% Percentile (z)	63.86

Gamma GOF Test

A-D Test Statistic	0.81	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.724	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.303	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.266	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	99.23	k star (bias corrected MLE)	69.53
Theta hat (MLE)	0.519	Theta star (bias corrected MLE)	0.74
nu hat (MLE)	1985	nu star (bias corrected)	1391
MLE Mean (bias corrected)	51.47	MLE Sd (bias corrected)	6.173

Background Statistics Assuming Gamma Distribution

95% Wilson Hilferty (WH) Approx. Gamma UPL	62.47	90% Percentile	59.52
95% Hawkins Wixley (HW) Approx. Gamma UPL	62.58	95% Percentile	62.03
95% WH Approx. Gamma UTL with 99% Coverage	76.12	99% Percentile	66.91
95% HW Approx. Gamma UTL with 99% Coverage	76.65		
95% WH USL	64.06	95% HW USL	64.2

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.831	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.296	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.262	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Background Statistics assuming Lognormal Distribution

95% UTL with 99% Coverage	78.45	90% Percentile (z)	58.75
95% UPL (t)	62.92	95% Percentile (z)	61.08
95% USL	64.66	99% Percentile (z)	65.71

Nonparametric Distribution Free Background Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Upper Limits for Background Threshold Values

Order of Statistic, r	10	95% UTL with 99% Coverage	56.8
Approx, f used to compute achieved CC	0.101	Approximate Actual Confidence Coefficient achieved by UTL	0.0956
		Approximate Sample Size needed to achieve specified CC	299
95% Percentile Bootstrap UTL with 99% Coverage	56.8	95% BCA Bootstrap UTL with 99% Coverage	56.8
95% UPL	56.8	90% Percentile	56.17
90% Chebyshev UPL	68.22	95% Percentile	56.49
95% Chebyshev UPL	75.81	99% Percentile	56.74
95% USL	56.8		

Note: The use of USL tends to yield a conservative estimate of BTV, especially when the sample size starts exceeding 20. Therefore, one may use USL to estimate a BTV only when the data set represents a background data set free of outliers and consists of observations collected from clean unimpacted locations.
The use of USL tends to provide a balance between false positives and false negatives provided the data represents a background data set and when many onsite observations need to be compared with the BTV.

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