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MEMORANDUM

TO:	Richard Conforti (MDEQ)	REF. NO.:	012636
FROM:	Mike Tomka/Wesley Dyck/Daniela Araujo/kf/84	DATE:	January 18, 2013
CC:	Jack Schinderle/John McCabe/Joe Rogers/ William Yocum (MDEQ)/ Grant Trigger/Dave Favero (RACER)/ Anthony Finch/John O'Neill (OBG)		

RE: Calculated Site-Specific Background Values for Inorganics in Groundwater - Revised
RACER Trust Coldwater Road Industrial Land (former Peregrine Plant)
Genesee Township, Michigan

1.0 INTRODUCTION

On behalf of the Revitalizing Auto Communities Environmental Response (RACER) Trust, Conestoga-Rovers & Associates (CRA) has calculated Site-specific Background Values (BVs), also referred to as Background Threshold Values, for inorganics in groundwater for the Coldwater Road Industrial Land (Former Peregrine Plant) in Genesee Township, Michigan.

The evaluation was undertaken to develop BVs for inorganics in groundwater for use at the Coldwater Road Industrial Land (13270). Appropriate background groundwater data from the Coldwater Road Industrial Land and Coldwater Road Landfill Site were utilized to calculate the BVs. The remainder of this memorandum presents the details on the calculation of the BVs for inorganics in groundwater.

The calculation of BVs is discussed in the Michigan Department of Environmental Quality (MDEQ) document *Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria* (Michigan, 2002, referred to as the "S^{3}TM"). However, in an email dated December 13, 2012 (see Attachment A), the MDEQ requested that the BVs be developed using an upper tolerance limit (UTL) with 95% confidence and 95% coverage. Site-specific BVs have been developed consistent with the MDEQ request including utilizing the ProUCL Technical Guide (USEPA, 2010), and using the current version (4.1.01) of the ProUCL software package.

2.0 SCOPE OF BACKGROUND DATA

Samples suitable for generating Site-specific BVs for inorganics in groundwater were collected from five shallow wells and three drift (deep) aquifer wells (Figure 1).

A total of nine background samples were collected from the shallow wells between May 2011 and March 2012.

A total of ten background samples were collected from the deep wells between May 2011 and March 2012.

Both total and dissolved concentrations of inorganics (metals) were reported and Site-specific BVs were calculated separately for each. For six dissolved metals (chromium, copper, iron, manganese, nickel and zinc), additional samples were available for calculating background values. The additional samples were collected between 1995 and 2012, resulting in a sample populations ranging from 59 to 124 samples.

The background data collected by CRA and O'Brien & Gere (OBG) which was utilized for the generation of Site-specific BVs are provided in Tables 1 and 2, respectively. The S^{3}TM recommends a minimum of nine background samples for establishing Site-specific BVs ("Statistical Guidesheet 10" in Michigan, 2002). The number of background samples collected therefore meets or exceeds the requirements of the guidance.

3.0 STATISTICAL METHODS

Guidance for collecting and analyzing groundwater background samples in order to calculate Facility-Specific Background Concentrations (Site-specific BVs) for assessing compliance with Part 201 requirements is detailed in Chapter 4 of "Statistical Methods" (Tab 7, Section 4.3) of the S^{3}TM. This guidance is also referred to in "Statistical Guidesheets 10, 1, 2 and 6" of the S^{3}TM. Site-specific BVs are suitable for background comparisons performed on a point-by-point basis. However, as noted above in the introduction, more current statistical methods are recommended and implemented in USEPA's ProUCL software. Nonetheless, the requirements of the Michigan Part 201 guidance need to be considered in the Site-specific background calculations.

The general approach of USEPA (2010) in determining Site-specific BVs 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). 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 Site-specific BVs which are expected to rarely be exceeded in samples collected from groundwater consistent with background conditions (e.g., no more frequently than 1 in 20 samples, if a 95 percent value is selected).

As directed in the December 13, 2012 email, an upper tolerance limit with a 95 percent confidence and 95 percent coverage has been used in the Site-specific background calculations.

Statistical calculations were computed using USEPA's statistical software ProUCL (version 4.1.01). Chapter 3 of USEPA (2010) describes statistical methodologies for calculating Site-specific BVs. 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.

ProUCL tests data distributions and the presence of non-detects in calculating Site-specific BVs. Based on the characteristics of each individual data set, a specific Site-specific background statistical method must be selected. For the background data sets considered in the evaluation, the following methods for calculating Site-specific BVs were identified by ProUCL (as indicated in the tabulated results):

- 95 percent UTL with 95 percent Coverage: a 95 percent Student's-t upper tolerance limit, used when a normal data distribution is present with few or no non-detects (see Section 3.4.1 of USEPA, 2010).

- 95 percent Wilson Hilferty (WH) Approximate Gamma UTL with 95% Coverage: a 95 percent approximate gamma upper tolerance limit, used when a gamma distribution (somewhat skewed, compared to a normal distribution) is encountered (see Section 3.4.5.3 of USEPA, 2010).
- 95 percent KM UTL with 95 percent Coverage: a 95 percent Student's-t upper tolerance limit using the Kaplan-Meier (KM) method to accommodate non-detect results, used when non-detects are present and/or non-normal data distributions are present (see Section 5.4.2.1 of USEPA, 2010).

For further discussion of specific BV calculation methodologies, please refer to Chapter 3 of the USEPA (2010).

A number of assumptions for background data set must be statistically assessed before the comparisons are performed. The following memorandum sections provide the required details for the statistical calculations.

3.1 NON-DETECTS IN THE BACKGROUND DATA SET

The calculation of BVs when non-detect data are present is considered in Chapter 5 of USEPA (2010). 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, 2010; Helsel, 2005). The KM method is described in Section 4.6 of USEPA (2010).

3.2 ASSESSMENT OF DATA CHARACTERISTICS AND ASSUMPTIONS

The selection of appropriate background value calculation methods varies with the characteristics of each data set (Michigan, 2002; USEPA, 2010). In selecting a BTV method, one must assess: (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.

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

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 data points) or Rosner's test (for greater than 25 observations), both methods being included in ProUCL. Details of these methods are found in Section 4.4 of USEPA (2006). The appropriate treatment of outliers in background data sets is discussed in Section 2.2 of Tab 7 in the S^{3}TM (Michigan, 2002). In the current assessment, the few outliers identified in the background data sets are considered to be "Facility-Specific Background samples collected off of the property of interest", and since no additional evidence was available to indicate that these observations were not representative of background conditions (e.g., demonstrable sample contamination or laboratory errors), they were retained in the development of BVs.

In the case that ProUCL and Dixon's test detect a possible presence of outliers, no data will be eliminated from the BV calculations, since the samples were collected from background areas and the data therefore believed to be associated with "local" conditions.

3.3 CALCULATION OF SITE-SPECIFIC BACKGROUND CONCENTRATIONS

As noted previously, BVs were calculated using the methods available in ProUCL. Specifically, 95% UTLs were utilized as the BVs, considering the observed data distributions and percentage of non-detect data present.

4.0 RESULTS AND CONCLUSIONS

Background threshold values (BVs) used as screening criteria for the Sites have been established for 19 metals (for both total and dissolved), as presented on Table 3. The calculated Site-specific BVs are representative of background conditions at the Coldwater Road Site. The BVs consist of the following:

- Shallow Water-Bearing Unit:
  - BVs were calculated in ProUCL for 11 total metal analytes and 11 dissolved metals using distribution-specific or non-parametric methods.
  - However, eight total metal analytes and eight dissolved metals were infrequently detected (i.e., in fewer than 20 percent of the samples obtained), and could not be subjected to statistical analysis using ProUCL. In these cases, BVs were established based on the maximum detected value or target detection limit (for data sets containing no detected values), which is considered a non-parametric statistical tolerance limit with less than 95 percent confidence (due to the number of background samples available).
- Deep Aquifer:
  - BVs were calculated using ProUCL for 12 total metal analytes and 10 dissolved metals.
  - Non-parametric UTLs were used as BVs for Seven total metal analytes and nine dissolved metals due to high percentages of non-detect results.

The calculated BVs are appropriate for point-by-point comparisons of on-Site data. Where on-Site concentrations of metals are above both the BV and the applicable generic industrial criterion, follow-up assessment may be necessary. In such cases, professional judgment is to be used to determine whether or not this is a *marginal* exceedance of the BV (per the footnote on page 7.85 of the S^{3}TM).

The MDEQ email dated December 13, 2012 stated that for this Site, dissolved inorganics are most appropriate. Future sample collection at the Site for inorganic analysis will be for the dissolved fraction only. However, sample results to date include both total and dissolved, therefore, the BVs developed, both for total and dissolved inorganics will be used to evaluate existing data.

It is noted that the non-parametric tolerance limits (used when the background data set contained few or no detected values) do not achieve full 95th percentile coverage (due to the number of samples available) and therefore Site data at or slightly above such values may still be consistent with background conditions.

5.0 REFERENCES

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

Michigan, 2002. Sampling Strategies and Statistics Training Materials for Part 201 Cleanup Criteria. Michigan Department of Environmental Quality, Environmental Response Division

USEPA, 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, May 2010. ProUCL Version 4.1.00 Technical Guide (Draft). United States Environmental Protection Agency, Office of Research and Development, Washington DC. EPA/600/R-07/041.

LEGEND

FACILITY BOUNDARY

SHALLOW BACKGROUND MONITORING WELL LOCATION

DEEP BACKGROUND MONITORING WELL LOCATION

0 200 400ft

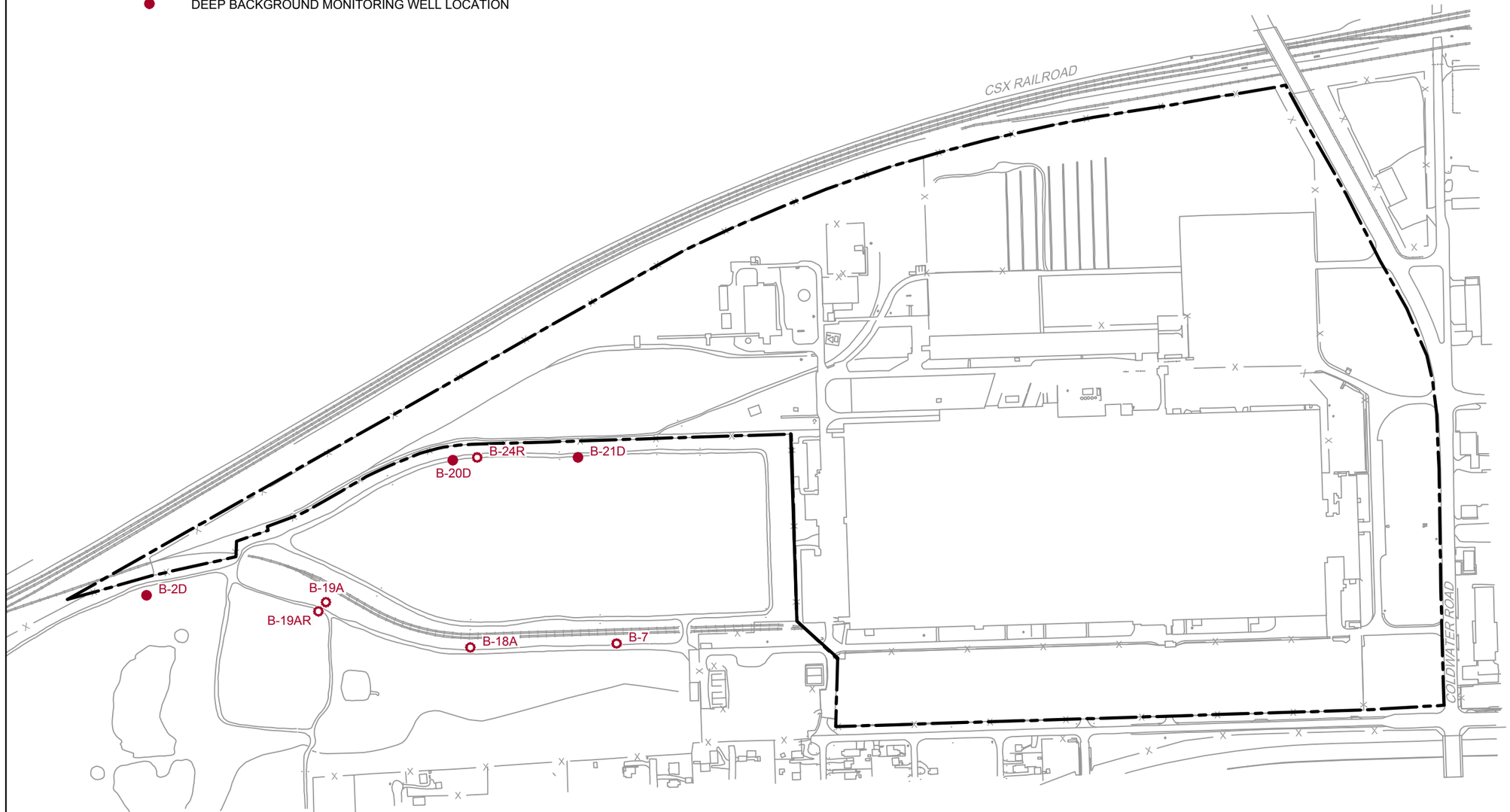

figure 1

BACKGROUND LOCATIONS - SHALLOW AND DEEP
FORMER PEREGRINE (US), INC. COLDWATER ROAD FACILITY
Genesee Township, Michigan

NOTE:
THIS DRAWING IS FOR REFERENCE ONLY AND IS NEITHER COMPLETE NOR TO EXACTING SCALE.

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TABLE 1

CONCENTRATIONS OF TOTAL INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

		Total Metals in Shallow Water Bearing Unit								
	Sample Location:	*B-7*	*B-7*	*B-18A*	*B-18A*	*B-19A*	*B-19A*	*B-19A*	*B-19AR*	*B-19AR*
	Sample ID:	*GW-12636-0915-SSH-022*	*GW-12636-120511-JY-405*	*GW-12636-091411-JY-020*	*GW-12636-120511-JY-406*	*GW-12636-051211-SSH-106*	*GW-12636-091411-JY-016/017*	*GW-12636-120611-JY-412*	*GW-12636-0915-SSH-023*	*GW-12636-120811-JY-420*
	Sample Date:	*9/15/2011*	*12/5/2011*	*9/14/2011*	*12/5/2011*	*5/12/2011*	*9/14/2011 orig./dupl.*	*12/6/2011*	*9/15/2011*	*12/8/2011*
Analyte	*Units*									
Aluminum	mg/L	0.26	0.71	0.05 U	0.05 U	0.2 U	0.05 U/0.05 U	0.05 U	4	9.2
Antimony	mg/L	0.002 U	0.0002 J	0.002 U	0.002 U	0.002 U	0.002 U/0.002 U	0.002 U	0.002 U	0.002 U
Arsenic	mg/L	0.005 U	0.005 U	0.0038 J	0.0066	0.005 U	0.005 U/0.005 U	0.005 U	0.0035 J	0.0086
Barium	mg/L	0.054 J	0.057 J	0.033 J	0.034 J	0.0671 J	0.068 J/0.067 J	0.072 J	0.072 J	0.13
Beryllium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U
Chromium	mg/L	0.005 U	0.008	0.005 U	0.005 U	0.005 U	0.005 U/0.005 U	0.005 U	0.0078	0.03
Cobalt	mg/L	0.007 U	0.007 U	0.007 U	0.0034 J	0.007 U	0.007 U/0.007 U	0.007 U	0.0027 J	0.0056 J
Copper	mg/L	0.0025 U	0.0039	0.002 U	0.002 U	0.002 U	0.002 U/0.002 U	0.002 U	0.0045 U	0.0096
Iron	mg/L	0.3	0.84	0.1 U	0.65	0.0927 J	0.1 U/0.1 U	0.1 U	5.1	12
Lead	mg/L	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U/0.003 U	0.003 U	0.0029 J	0.0023 J
Manganese	mg/L	0.03	0.016	0.015	0.26	0.0065 J	0.0057 J/0.0032 J	0.015 U	0.12	0.26
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.0044 J	0.0043 J	0.02 U	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.01 J	0.023
Selenium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U/0.005 U	0.005 U	0.005 U	0.005 U
Silver	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.00053	0.0002 U
Thallium	mg/L	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U	0.00058 J	0.001 U	0.001 U
Vanadium	mg/L	0.004 U	0.0014 J	0.004 U	0.004 U	0.004 U	0.004 U/0.004 U	0.004 U	0.0096	0.023
Zinc	mg/L	0.02 U	0.01 J	0.02 U	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.035 U	0.039 U

Notes:

J - Estimated concentration.
U - Not present at or above the associated value.
0.05 U/0.05 U - field duplicate.

TABLE 1

CONCENTRATIONS OF TOTAL INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

		Total Metals in Deep Aquifer									
	Sample Location:	*B-2D*	*B-2D*	*B-2D*	*B-2D*	*B-20D*	*B-20D*	*B-20D*	*B-21D*	*B-21D*	*B-21D*
	Sample ID:	*GW-12636-051211-SSH-107*	*GW-12636-091411-JY-019*	*GW-12636-120711-JY-418/419*	*GW-12636-032812-JY-004*	*GW-12636-0915-SSH-025*	*GW-12636-120811-JY-421*	*GW-12636-032812-JY-005*	*GW-12636-0915-SSH-024*	*GW-12636-120811-JY-422*	*GW-12636-032812-JY-006/007*
	Sample Date:	*5/12/2011*	*9/14/2011*	*12/7/2011 orig./dupl.*	*3/28/2012*	*9/15/2011*	*12/8/2011*	*3/28/2012*	*9/15/2011*	*12/8/2011*	*3/28/2012 orig./dupl.*
Analyte	*Units*										
Aluminum	mg/L	0.498	0.26	1.6/1.7	0.67	1.1	0.52	0.53	0.17	3.7	0.79/0.87
Antimony	mg/L	0.002 U	0.002 U	0.002 U/0.002 U	0.002 U	0.002 U	0.002 U	0.00025 J	0.002 U	0.002 U	0.00013 J/0.00014 J
Arsenic	mg/L	0.004 J	0.013	0.0038 J/0.005 U	0.005 U	0.04	0.039	0.038	0.054	0.045	0.052/0.054
Barium	mg/L	0.0833 J	0.31	0.084 J/0.093 J	0.082 J	0.05 J	0.053 J	0.05 J	0.16	0.18	0.17/0.17
Beryllium	mg/L	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U
Cadmium	mg/L	0.001 U	0.001 U	0.001 U/0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U	0.001 U/0.001 U
Chromium	mg/L	0.005 U	0.005 U	0.0031 J/0.003 J	0.005 U	0.005 U	0.005 U	0.005 U	0.0025 J	0.0067	0.005 U/0.0029 J
Cobalt	mg/L	0.007 U	0.007 U	0.007 U/0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.0018 J	0.003 J	0.007 U/0.007 U
Copper	mg/L	0.0091	0.0021 U	0.004/0.0043	0.0032	0.0037 U	0.0026 U	0.0025	0.002 U	0.0073	0.0024/0.0029
Iron	mg/L	3.23	2.2	1.9/2.2	0.99	3.4	2.5	2.7	4.4	7	2.1/2.1
Lead	mg/L	0.003 U	0.003 U	0.003 U/0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.0022 J	0.003 U	0.003 U/0.003 U
Manganese	mg/L	0.167	0.13	0.052/0.057	0.039	0.08	0.064	0.064	0.15	0.18	0.052/0.053
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.0002 U
Nickel	mg/L	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.0055 J	0.0065 J	0.02 U/0.0035 J
Selenium	mg/L	0.005 U	0.005 U	0.005 U/0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U/0.005 U
Silver	mg/L	0.0002 U	0.0002 U	0.0002 U/0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U/0.000094 J
Thallium	mg/L	0.001 U	0.0021 U	0.001 U/0.001 U	0.00019 J	0.001 U	0.001 U	0.00028 J	0.001 U	0.001 U	0.00018 J/0.001 U
Vanadium	mg/L	0.004 U	0.004 U	0.0041/0.0032 J	0.0013 J	0.004 U	0.0025 J	0.0013 J	0.0047	0.01	0.0018 J/0.0025 J
Zinc	mg/L	0.02 U	0.02 U	0.02 U/0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.039 U	0.039	0.02 U/0.02 U

Notes:

J - Estimated concentration.
U - Not present at or above the associated value.
1.6/1.7 - field duplicate.

TABLE 2

CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

i) Shallow Water Bearing Unit

Sample location:		B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7
Date:		6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996	11/13/1996	5/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/16/2001	10/18/2001	5/16/2002	11/7/2002	6/4/2003	11/13/2003	6/30/2004	12/9/2004	6/8/2005
Dissolved metal																							
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	*(mg/L)*	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.005
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	*(mg/L)*	--	--	--	--	--	--	--	--	0.01	--	0.26	--	0.05	--	0.33	--	0.25	--	0.19	--	0.18	0.17
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	*(mg/L)*	--	--	--	--	--	--	--	--	0.424	--	0.313	--	--	--	--	--	<0.005	--	<0.005	--	0.074	0.031
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	*(mg/L)*	<0.03	<0.04	<0.04	<0.02	<0.02	<0.02	0.014	<0.005	0.008	0.01	0.008	<0.005/0.006	0.02	0.007	0.005	<0.005	0.005	<0.005	<0.005	0.009	0.007	0.009
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	*(mg/L)*	<0.02	<0.02	0.022	0.02	0.06	0.05	0.01	0.02	0.03	<0.01	0.03	<0.01/0.01	0.01	<0.01	<0.01	0.01	0.005	<0.005	0.005	0.007	0.014	0.013

ii) Deep Aquifer

Sample location:		B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D
Date:		6/21/1995	8/31/1995	6/19/1996	8/21/1996	11/13/1996	5/6/1997	11/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/15/2001	10/18/2001	5/16/2002	11/7/2002	6/3/2003	11/13/2003	6/30/2004	12/10/2004	6/8/2005
Dissolved metal																							
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	*(mg/L)*	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Iron	*(mg/L)*	--	--	--	--	--	--	0.28	--	<0.01	--	0.07	--	0.04	--	0.23/0.21	--	0.14/0.14	--	0.11	--	0.76	0.66
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	*(mg/L)*	--	--	--	--	--	--	0.577	--	0.017	--	0.021	--	--	--	--	--	0.006/0.006	--	0.007	--	0.145	0.199
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	*(mg/L)*	<0.03	<0.04	<0.02	<0.02	<0.02	0.028	0.039	<0.005	<0.005	<0.005	<0.005	<0.005	0.009	<0.005	<0.005/<0.005	<0.005	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	*(mg/L)*	<0.02	<0.02	<0.02	0.05	0.03	0.03	<0.01	<0.01	0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.005/<0.005	<0.005	<0.005	0.007	0.01	<0.005

TABLE 2

CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

i) Shallow Water Bearing Unit

Sample location:		B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-7	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A
	Date:	12/7/2005	6/29/2006	11/29/2006	6/7/2007	11/14/2007	6/25/2008	11/17/2008	6/24/2009	11/17/2009	6/17/2010	11/8/2010	6/22/2011	9/15/2011	11/16/2011	12/5/2011	6/27/2012	6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996	11/13/1996
Dissolved metal																							
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.05 U	--	0.05 U	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.002 U	--	0.00014 J	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	0.005 U	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.051 J	--	0.053 J	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U	--	--	--	--	--	--	--
Chromium	*(mg/L)*	0.01	0.005	<0.005	0.011	0.014	<0.005	<0.005	<0.005	<0.005	<0.005	0.017	0.01	0.005 U	<0.005	0.0035 J	<0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.007 U	--	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	<0.004	<0.004	<0.004	0.027	0.006	0.003	0.003	0.003	<0.004	<0.004	<0.004	<0.004	0.0027 U	0.006	0.0031	<0.004	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Iron	*(mg/L)*	0.15	0.19	--	0.13	--	0.35	--	0.067	--	<0.02	--	0.22	0.1 U	--	0.1 U	<0.02	--	--	--	--	--	--
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.003 U	--	0.003 U	--	--	--	--	--	--	--
Manganese	*(mg/L)*	0.05	0.15	--	0.042	--	0.01	--	0.036	--	0.047	--	0.006	0.0036 J	--	0.0085 J	0.058	--	--	--	--	--	--
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	--	--	--	--	--	--	--
Nickel	*(mg/L)*	0.006	0.009	0.009	0.005	0.016	0.006	0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.02 U	0.008	0.02 U	<0.005	<0.03	<0.04	<0.04	<0.02	<0.02	<0.02
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	0.005 U	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.004 U	--	0.004 U	--	--	--	--	--	--	--
Zinc	*(mg/L)*	0.02	0.018	0.011	0.014	0.02	<0.005	0.017	0.014	<0.005	<0.005	<0.005	0.006	0.02 U	0.011	0.02 U	<0.005	0.15	<0.02	<0.02	<0.02	0.06	0.07

ii) Deep Aquifer

Sample location:		B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-2D	B-20D	B-20D	B-20D	B-20D	B-20D
	Date:	12/8/2005	6/28/2006	11/30/2006	6/8/2007	11/14/2007	6/25/2008	11/20/2008	6/25/2009	11/16/2009	6/16/2010	11/10/2010	6/21/2011	9/14/2011	11/15/2011	12/7/2011	3/28/2012	6/27/2012	6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996
Dissolved metal																						
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.05 U	--	0.044 J/0.055	0.05 U	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.002 U	--	0.002 U/0.002 U	0.002 U	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.014	--	0.005 U/0.005 U	0.005 U	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.33	--	0.075 J/0.079 J	0.08 J	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U/0.001 U	0.001 U	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.001 U/0.001 U	0.001 U	--	--	--	--	--	--
Chromium	*(mg/L)*	0.009	<0.005/<0.005	<0.005	0.008	0.001	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	0.009	0.005 U	<0.005	0.005 U/0.0022 J	0.005 U	<0.005	<0.02	<0.02	0.032	<0.02	<0.02
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.007 U	--	0.007 U/0.007 U	0.007 U	--	--	--	--	--	--
Copper	*(mg/L)*	<0.004	<0.004/<0.004	<0.004	0.002	0.001	0.001	<0.001	0.203	<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004	0.002 U/0.002 U	0.002 U	<0.004	<0.02	0.02	0.028	<0.02	<0.02
Iron	*(mg/L)*	0.14	0.11/0.12	--	0.11	--	0.35	--	0.022	--	0.04	--	0.25	1.4	--	0.1 U/0.091 J	0.1 U	<0.02	--	--	--	--	--
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.003 U	--	0.003 U/0.003 U	0.003 U	--	--	--	--	--	--
Manganese	*(mg/L)*	0.12	0.07/0.07	--	0.104	--	0.032	--	0.077	--	0.083	--	0.055	0.08	--	0.0064 J/0.0074 J	0.0036 J	0.025	--	--	--	--	--
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U/0.0002 U	0.0002 U	--	--	--	--	--	--
Nickel	*(mg/L)*	<0.005	<0.005/<0.005	<0.005	0.001	0.004	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02 U/0.02 U	0.02 U	<0.005	<0.03	<0.04	0.054	<0.02	<0.02
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	0.005 U/0.005 U	0.005 U	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U/0.0002 U	0.0002 U	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	0.00014 J/0.0004 J	0.00017 J	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	0.004 U	--	0.004 U/0.00087 J	0.004 U	--	--	--	--	--	--
Zinc	*(mg/L)*	<0.01	0.008/0.008	0.018	0.006	0.009	0.007	<0.005	0.113	0.006	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02 U/0.02 U	0.02 U	<0.005	<0.02	<0.02	0.12	<0.02	0.04

TABLE 2

CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

i) Shallow Water Bearing Unit

Sample location:		B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A
	Date:	5/6/1997	11/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/16/2001	10/17/2001	5/16/2002	11/7/2002	6/4/2003	11/13/2003	6/29/2004	12/9/2004	6/8/2005	12/8/2005	6/27/2006	11/30/2006	6/4/2007	11/14/2007	6/25/2008
Dissolved metal																								
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	*(mg/L)*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	0.005	0.005	0.009	0.001	<0.005
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.004	<0.004	0.003	0.002	0.002
Iron	*(mg/L)*	--	0.38	--	0.24	--	0.18	--	<0.01/0.04	--	0.35	--	0.19	--	0.16	--	0.9	0.17	0.39	0.17	--	0.11	--	0.31
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	*(mg/L)*	--	0.062	--	0.128	--	0.155	--	--	--	--	--	0.026	--	<0.005	--	0.363	0.08	0.17	0.05	--	0.022	--	<0.005
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	*(mg/L)*	0.013	0.062	<0.005	<0.005	<0.005	<0.005	<0.005	0.015/0.013	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.009	0.006	<0.005	<0.005	<0.005	0.003	0.006	<0.005
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	*(mg/L)*	0.01	0.01	0.02	0.01	0.02	0.06	0.03	<0.01/<0.01	0.01	<0.01	0.01	<0.005	0.005	<0.005	0.01	0.012	0.016	0.01	0.046	0.009	0.014	0.011	0.011

ii) Deep Aquifer

Sample location:		B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D
	Date:	11/13/1996	5/6/1997	11/6/1997	5/4/1998	11/5/1998	4/26/1999	11/5/1999	4/26/2000	12/8/2000	5/15/2001	10/18/2001	5/16/2002	11/7/2002	6/3/2003	11/13/2003	6/29/2004	12/10/2004	6/7/2005	12/8/2005	6/28/2006	11/30/2006	6/8/2007	11/13/2007
Dissolved metal																								
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	*(mg/L)*	<0.02	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	0.011	0.007	0.006	0.01	0.003
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	<0.02	<0.01	0.02	<0.01	<0.01/<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	<0.004	<0.004	0.022	0.001
Iron	*(mg/L)*	--	--	0.26	--	<0.01/0.17	--	0.13	--	0.02	--	0.3	--	0.25	--	0.2	--	2.11	2.14	0.12	2.12	--	0.61	--
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	*(mg/L)*	--	--	0.035	--	0.018/0.008	--	0.06	--	--	--	--	--	0.074	--	0.015	--	0.092	0.066	0.12	0.06	--	0.16	--
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	*(mg/L)*	<0.02	0.015	0.041	<0.005	<0.005/<0.005	<0.005	<0.005	<0.005	0.015	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.011	0.011	0.005	0.026	<0.005	0.006	0.019	0.013
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	*(mg/L)*	0.04	0.01	<0.01	<0.01	0.01/0.01	0.01	0.06	<0.01	<0.01	<0.01	<0.01	0.01	<0.005	<0.005	<0.005	<0.005	0.01	<0.005	<0.01	0.005	<0.005	0.124	0.009

TABLE 2

CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

i) Shallow Water Bearing Unit

Sample location:		B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-18A	B-19A	B-19A	B-19A	B-19A	B-19A	B-19A	B-19A	B-19A
	Date:	11/18/2008	6/24/2009	11/18/2009	6/17/2010	11/10/2010	6/21/2011	9/14/2011	11/15/2011	12/5/2011	3/28/2012	6/27/2012	5/4/1998	5/16/2001	5/16/2002	6/4/2003	11/13/2003	6/29/2004	12/9/2004	12/7/2011
Dissolved metal																				
Aluminum	*(mg/L)*	--	--	--	--	--	--	0.05 U	--	0.05 U	0.05 U	--	--	--	--	--	--	--	--	0.05 U
Antimony	*(mg/L)*	--	--	--	--	--	--	0.002 U	--	0.002 U	0.002 U	--	--	--	--	--	--	--	--	0.002 U
Arsenic	*(mg/L)*	--	--	--	--	--	--	0.005 U	--	0.0066	0.0072	--	--	--	--	--	--	--	--	0.005 U
Barium	*(mg/L)*	--	--	--	--	--	--	0.033 J	--	0.035 J	0.035 J	--	--	--	--	--	--	--	--	0.071 J
Beryllium	*(mg/L)*	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--	0.001 U
Cadmium	*(mg/L)*	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--	0.001 U
Chromium	*(mg/L)*	<0.005	<0.005	<0.005	<0.005	0.012	0.01	0.005 U	<0.005	0.005 U	0.005 U	<0.005/<0.005	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005/<0.005	--
Cobalt	*(mg/L)*	--	--	--	--	--	--	0.007 U	--	0.003 J	0.007 U	--	--	--	--	--	--	--	--	0.007 U
Copper	*(mg/L)*	<0.001	0.001	<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004	0.002 U	0.002 U	<0.004/<0.004	<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005/<0.005	--
Iron	*(mg/L)*	--	<0.02	--	<0.02	--	0.24	0.1 U	--	0.61	0.4	0.03/0.04	--	--	--	--	0.02	--	0.24/0.17	--
Lead	*(mg/L)*	--	--	--	--	--	--	0.003 U	--	0.003 U	0.003 U	--	--	--	--	--	--	--	--	0.003 U
Manganese	*(mg/L)*	--	<0.005	--	<0.005	--	<0.005	0.025	--	0.26	0.098	0.026/0.027	--	--	--	--	<0.005	--	0.011/<0.005	--
Mercury	*(mg/L)*	--	--	--	--	--	--	0.00019 J	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--	0.0002 U
Nickel	*(mg/L)*	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.0042 J	<0.005	0.02 U	0.02 U	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005/<0.005	--
Selenium	*(mg/L)*	--	--	--	--	--	--	0.005 U	--	0.005 U	0.005 U	--	--	--	--	--	--	--	--	0.005 U
Silver	*(mg/L)*	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--	0.0002 U
Thallium	*(mg/L)*	--	--	--	--	--	--	0.001 U	--	0.001 U	0.00021 J	--	--	--	--	--	--	--	--	0.00027 J
Vanadium	*(mg/L)*	--	--	--	--	--	--	0.004 U	--	0.004 U	0.004 U	--	--	--	--	--	--	--	--	0.004 U
Zinc	*(mg/L)*	<0.005	0.015	0.045	0.008	<0.005	0.012	0.02 U	<0.005	0.02 U	0.02 U	<0.005/0.005	0.03	<0.01	0.01	<0.005	<0.005	0.008	0.009/0.007	--

ii) Deep Aquifer

Sample location:		B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-20D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D
	Date:	6/25/2008	11/18/2008	6/24/2009	11/18/2009	6/16/2010	11/9/2010	6/22/2011	9/15/2011	11/16/2011	12/8/2011	3/28/2012	6/25/2012	6/21/1995	8/31/1995	2/9/1996	6/19/1996	8/21/1996	11/13/1996	5/6/1997
Dissolved metal																				
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	0.085	--	0.034 J	0.019 J	--	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	0.002 U	--	0.002 U	0.00017 J	--	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	0.036	--	0.036	0.035	--	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	0.042 J	--	0.049 J	0.048 J	--	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U	--	--	--	--	--	--	--	--
Chromium	*(mg/L)*	<0.005	<0.005	<0.005/<0.005	<0.005	<0.005	0.011	0.009	0.005 U	<0.005/<0.005	0.005 U	0.005 U	<0.005	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	0.007 U	--	0.007 U	0.007 U	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	0.002	0.004	<0.001/<0.001	<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004/<0.004	0.002 U	0.002 U	<0.004	<0.02	0.021	<0.02	<0.02	<0.02	<0.02	<0.01
Iron	*(mg/L)*	2.4	--	1.72/1.64	--	1.93	--	2.55	1.8	--	1.5	1.6	1.7	--	--	--	--	--	--	--
Lead	*(mg/L)*	--	--	--	--	--	--	--	0.003 U	--	0.003 U	0.003 U	--	--	--	--	--	--	--	--
Manganese	*(mg/L)*	0.055	--	0.056/0.056	--	0.049	--	0.054	0.047	--	0.049	0.047	0.053	--	--	--	--	--	--	--
Mercury	*(mg/L)*	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--
Nickel	*(mg/L)*	<0.005	0.006	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005/<0.005	0.02 U	0.02 U	<0.005	<0.03	<0.04	<0.04	<0.02	<0.02	<0.02	0.008
Selenium	*(mg/L)*	--	--	--	--	--	--	--	0.005 U	--	0.005 U	0.005 U	--	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U	--	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	0.001 U	--	0.00015 J	0.00022 J	--	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	0.004 U	--	0.00072 J	0.004 U	--	--	--	--	--	--	--	--
Zinc	*(mg/L)*	0.007	0.022	<0.005/<0.005	0.005	<0.005	<0.005	0.013	0.02 U	0.005/0.006	0.02 U	0.02 U	<0.005	0.061	<0.02	<0.02	<0.02	0.05	0.04	<0.01

TABLE 2

CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

i) Shallow Water Bearing Unit

Sample location:		B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-19AR	B-24
	Date:	6/7/2005	12/8/2005	6/29/2006	11/30/2006	6/7/2007	11/13/2007	6/25/2008	11/18/2008	6/24/2009	11/19/2009	6/15/2010	11/10/2010	6/22/2011	9/15/2011	11/16/2011	12/7/2011	12/8/2011	3/28/2012	6/27/2012	8/21/1996
Dissolved metal																					
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	1.6	--	--	3.4	0.05 U	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.002 U	--	--	0.002 U	0.0004 J	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	--	0.005 U	0.005 U	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.045 J	--	--	0.077 J	0.027 J	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	--	0.001 U	0.001 U	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	--	0.001 U	0.001 U	--	--
Chromium	*(mg/L)*	<0.005	0.01/0.01	<0.005	0.005	0.006	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	0.012	0.005	0.005 U	<0.005	0.005 U	0.011	0.005 U	<0.005	<0.02
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.007 U	--	--	0.007 U	0.007 U	--	--
Copper	*(mg/L)*	<0.005	<0.004/<0.004	<0.004	<0.004	0.004	0.007	0.003	0.001	0.002	<0.004	<0.004	<0.004	<0.004	0.0052	<0.004	0.002 U	0.0045	0.002 U	<0.004	<0.02
Iron	*(mg/L)*	1.32	0.16/0.15	0.24	--	0.07	--	0.38	--	0.036	--	<0.02	--	0.24	0.23	--	0.1 U	4.4	0.1 U	<0.02	--
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.003 U	--	--	0.003 U	0.003 U	--	--
Manganese	*(mg/L)*	0.228	<0.02/<0.02	0.21	--	0.021	--	0.009	--	<0.005	--	<0.005	--	<0.005	0.0071 J	--	0.015 U	0.094	0.0016 J	<0.005	--
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	--	0.0002 U	0.0002 U	--	--
Nickel	*(mg/L)*	0.007	<0.005/<0.005	0.012	<0.005	0.004	0.026	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	0.02 U	<0.005	0.02 U	0.0079 J	0.02 U	<0.005	<0.02
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.005 U	--	--	0.005 U	0.005 U	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0002 U	--	--	0.0002 U	0.0002 U	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.001 U	--	--	0.00025 J	0.00084 J	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	0.004 U	--	--	0.0089	0.004 U	--	--
Zinc	*(mg/L)*	<0.005	0.02/<0.01	0.021	<0.005	0.009	0.011	0.016	0.014	<0.005	0.007	<0.005	<0.005	<0.005	0.02 U	0.005	0.02 U	0.02 U	0.02 U	<0.005	0.09

ii) Deep Aquifer

Sample location:		B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D
	Date:	11/6/1997	5/4/1998	11/5/1998	4/26/1999	4/26/2000	12/8/2000	5/15/2001	10/18/2001	5/16/2002	6/3/2003	11/13/2003	6/30/2004	12/10/2004	6/8/2005	12/8/2005	6/28/2006	11/30/2006	6/8/2007	11/14/2007	6/26/2008
Dissolved metal																					
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	*(mg/L)*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	0.01	0.002	<0.005
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01/<0.01	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.004	0.006	<0.004	0.002	0.001	0.001
Iron	*(mg/L)*	0.24	--	0.24	--	--	<0.01	--	0.2	--	--	0.1	--	1.33	1.35	1.07	0.43	--	1.2	--	1.39
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	*(mg/L)*	0.027	--	0.043	--	--	--	--	--	--	--	<0.005	--	0.044	0.072	0.06	0.06	--	0.049	--	0.04
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	*(mg/L)*	0.03	<0.005	<0.005	<0.005	<0.005	0.011	<0.005/<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.012	0.008	0.005	<0.005	0.005	0.005	<0.005
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	*(mg/L)*	<0.01	0.02	0.01	0.01	<0.01	<0.01	0.01/0.01	<0.01	<0.01	0.006	0.009	0.007	0.007	0.006	<0.01	0.013	<0.005	0.007	0.008	<0.005

TABLE 2

CONCENTRATIONS OF DISSOLVED INORGANICS IN BACKGROUND GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

i) Shallow Water Bearing Unit

Sample location:		B-24	B-24	B-24	B-24	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R	B-24R
	Date:	11/13/1996	5/6/1997	5/4/1998	11/5/1998	6/7/2005	12/8/2005	6/28/2006	11/30/2006	6/4/2007	11/13/2007	6/26/2008	11/18/2008	6/24/2009	11/18/2009	6/16/2010	11/9/2010	6/21/2011	11/16/2011	6/26/2012
Dissolved metal																				
Aluminum	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Antimony	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Barium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	*(mg/L)*	<0.02	<0.01	<0.01	<0.01	0.008	0.011	0.006	0.006	0.009	0.003	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	0.01/0.008	<0.005	<0.005
Cobalt	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	*(mg/L)*	<0.02	<0.01	<0.01	<0.01	<0.005	<0.004	<0.004	<0.004	0.002	0.001	0.001	<0.001	<0.001	<0.004	<0.004	<0.004	<0.004/<0.004	<0.004	<0.004
Iron	*(mg/L)*	--	--	--	0.06	10.6	3.18	3.76	--	2.4	--	3.49	--	4	--	1.88	--	1.13/1.07	--	1.2
Lead	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	*(mg/L)*	--	--	--	0.12	0.448	0.21	0.21	--	0.194	--	0.175	--	0.155	--	0.222	--	0.255/0.255	--	0.242
Mercury	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	*(mg/L)*	<0.02	0.031	0.008	0.009	<0.005	<0.005	<0.005	<0.005	0.002	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.006/0.006	<0.005	<0.005
Selenium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	*(mg/L)*	0.05	0.01	0.02	0.02	<0.005	0.01	<0.005	<0.005	0.019	0.007	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005/<0.005	<0.005	<0.005

ii) Deep Aquifer

Sample location:		B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D	B-21D
	Date:	11/19/2008	6/25/2009	11/19/2009	6/17/2010	11/10/2010	6/22/2011	9/15/2011	11/16/2011	12/8/2011	3/28/2012	6/26/2012
Dissolved metal												
Aluminum	*(mg/L)*	--	--	--	--	--	--	0.05 U	--	0.1	0.05 U/0.05 U	--
Antimony	*(mg/L)*	--	--	--	--	--	--	0.002 U	--	0.002 U	0.002 U/0.002 U	--
Arsenic	*(mg/L)*	--	--	--	--	--	--	0.048	--	0.042	0.048/0.045	--
Barium	*(mg/L)*	--	--	--	--	--	--	0.15	--	0.16	0.17/0.17	--
Beryllium	*(mg/L)*	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U/0.001 U	--
Cadmium	*(mg/L)*	--	--	--	--	--	--	0.001 U	--	0.001 U	0.001 U/0.001 U	--
Chromium	*(mg/L)*	<0.005	<0.005	<0.005/<0.005	<0.005	0.011	0.01	0.005 U	<0.005	0.005 U	0.005 U/0.005 U	<0.005
Cobalt	*(mg/L)*	--	--	--	--	--	--	0.007 U	--	0.007 U	0.007 U/0.007 U	--
Copper	*(mg/L)*	<0.001	<0.001	<0.004/<0.004	<0.004	<0.004	<0.004	0.002 U	<0.004	0.001 J	0.002 U/0.002 U	<0.004
Iron	*(mg/L)*	--	1.21	--	0.98	--	1.54	1	--	1.2	0.9/0.87	0.64
Lead	*(mg/L)*	--	--	--	--	--	--	0.003 U	--	0.003 U	0.003 U/0.003 U	--
Manganese	*(mg/L)*	--	0.034	--	0.034	--	0.033	0.035	--	0.05	0.035/0.034	0.042
Mercury	*(mg/L)*	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U/0.0002 U	--
Nickel	*(mg/L)*	0.005	<0.005	<0.005/<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02 U	0.02 U/0.02 U	<0.005
Selenium	*(mg/L)*	--	--	--	--	--	--	0.005 U	--	0.005 U	0.005 U/0.005 U	--
Silver	*(mg/L)*	--	--	--	--	--	--	0.0002 U	--	0.0002 U	0.0002 U/0.0002 U	--
Thallium	*(mg/L)*	--	--	--	--	--	--	0.001 U	--	0.001 U	0.00014 J/0.001 U	--
Vanadium	*(mg/L)*	--	--	--	--	--	--	0.004 U	--	0.004 U	0.004 U/0.004 U	--
Zinc	*(mg/L)*	<0.005	<0.005	0.006/<0.005	<0.005	<0.005	<0.005	0.02 U	<0.005	0.02	0.02 U/0.02 U	<0.005

TABLE 3

FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

		Total Metals in Shallow Water Bearing Unit							
		Number of	*Percent*					*Facility-Specific Background*	
Analyte	*Unit*	*Samples*	*ND*	*Minimum*	*Maximum*	*Distribution* [1]	*Outliers*	*Method*	*Value*
Aluminum	mg/L	9	56%	0.05 U	9.2	--	--	95% KM UTL[2]	10.5
Antimony	mg/L	9	89%	0.0002 J	0.002 U	--	--	NP UTL	0.002 U
Arsenic	mg/L	9	56%	0.005 U	0.0086	--	--	95% KM UTL[2]	0.01
Barium	mg/L	9	0%	0.033 J	0.13	Normal	1	95% UTL[2]	0.15
Beryllium	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Cadmium	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Chromium	mg/L	9	67%	0.005 U	0.03	--	--	95% KM UTL[2]	0.031
Cobalt	mg/L	9	67%	0.0027 J	0.0056 J	--	--	95% KM UTL[2]	0.008
Copper	mg/L	9	78%	0.002 U	0.0096	--	--	95% KM UTL[2]	0.01
Iron	mg/L	9	33%	0.1 U	12	Gamma	0	95% WH Approx. Gamma UTL [2]	32.58
Lead	mg/L	9	78%	0.003 U	0.0029 J	--	--	95% KM UTL[2]	0.0035
Manganese	mg/L	9	11%	0.00445	0.26	Gamma	0	95% WH Approx. Gamma UTL [2]	0.963
Mercury	mg/L	9	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Nickel	mg/L	9	56%	0.0043 J	0.023	--	--	95% KM UTL[2]	0.026
Selenium	mg/L	9	100%	0.005 U	0.005 U	--	--	NP UTL	0.005 U
Silver	mg/L	9	89%	0.0002 U	0.00053	--	--	NP UTL	0.00053
Thallium	mg/L	9	89%	0.00058 J	0.001 U	--	--	NP UTL	0.001 U
Vanadium	mg/L	9	67%	0.0014 J	0.023	--	--	95% KM UTL[2]	0.026
Zinc	mg/L	9	89%	0.02 U	0.039 U	--	--	NP UTL	0.039 U

Notes:

J - Estimated concentration.
U - Not present at or above the associated value.
-- Not tested due to high percentage of non-detects (> 50 percent).
[1] Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).
[2] With 95% Coverage.

TABLE 3

FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

		Dissolved Metals in Shallow Water Bearing Unit							
		Number of	*Percent*					*Facility-Specific Background*	
Analyte	*Unit*	*Samples*	*ND*	*Minimum*	*Maximum*	*Distribution* [1]	*Outliers*	*Method*	*Value*
Aluminum (dissolved)	mg/L	9	78%	0.05 U	3.4	--	--	95% KM UTL[2]	3.52
Antimony (dissolved)	mg/L	9	78%	0.00014 J	0.002 U	--	--	95% KM UTL[2]	0.002 U[3]
Arsenic (dissolved)	mg/L	9	78%	0.005 U	0.0072	--	--	95% KM UTL[2]	0.0072
Barium (dissolved)	mg/L	9	0%	0.027 J	0.077 J	Normal	0	95% UTL[2]	0.1
Beryllium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Cadmium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Chromium (dissolved)	mg/L	124	76%	0.001	0.017	--	--	95% KM UTL[2]	0.010
Cobalt (dissolved)	mg/L	9	89%	0.003 J	0.007 U	--	--	NP UTL	0.007 U
Copper (dissolved)	mg/L	124	81%	<0.001	0.027	--	--	95% KM UTL[2]	0.0074
Iron (dissolved)	mg/L	63	17%	<0.02	10.6	Not Normal	1	95% KM UTL[2]	4.0
Lead (dissolved)	mg/L	9	100%	0.003 U	0.003 U	--	--	NP UTL	0.003 U
Manganese (dissolved)	mg/L	59	24%	0.0016 J	0.448	Gamma	0	95% WH Approx. Gamma UTL [2]	0.547
Mercury (dissolved)	mg/L	9	89%	0.00019 J	0.0002 U	--	--	NP UTL	0.0002 U
Nickel (dissolved)	mg/L	124	65%	0.002	0.062	--	--	95% KM UTL[2]	0.0185
Selenium (dissolved)	mg/L	9	100%	0.005 U	0.005 U	--	--	NP UTL	0.005 U
Silver (dissolved)	mg/L	9	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Thallium (dissolved)	mg/L	9	56%	0.00021 J	0.00084 J	--	--	95% KM UTL[2]	0.0012
Vanadium (dissolved)	mg/L	9	89%	0.004 U	0.0089	--	--	NP UTL	0.0089
Zinc (dissolved)	mg/L	124	41%	<0.005	0.15	Not Normal	1	95% KM UTL[2]	0.051

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

-- Not tested due to high percentage of non-detects (> 50 percent).

[1] Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).

[2] With 95% Coverage.

[3] Calculated UTL is below the reporting limit; therefore the reporting limit is used as the background value.

TABLE 3

FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

		Total Metals in Deep Aquifer							
		Number of	*Percent*					*Facility-Specific Background*	
Analyte	*Unit*	*Samples*	*ND*	*Minimum*	*Maximum*	*Distribution* [1]	*Outliers*	*Method*	*Value*
Aluminum	mg/L	10	0%	0.17	3.7	Gamma	0	95% WH Approx. Gamma UTL [2]	5.3
Antimony	mg/L	10	80%	0.000135	0.002 U	--	--	95% KM UTL[2]	0.002 U[3]
Arsenic	mg/L	10	10%	0.005 U	0.054	Normal	0	MLE 95% UTL[2]	0.102
Barium	mg/L	10	0%	0.05 J	0.31	Gamma	0	95% WH Approx. Gamma UTL [2]	0.47
Beryllium	mg/L	10	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Cadmium	mg/L	10	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Chromium	mg/L	10	60%	0.005 U	0.0067	--	--	95% KM UTL[2]	0.007
Cobalt	mg/L	10	80%	0.0018 J	0.007 U	--	--	95% KM UTL[2]	0.007 U[3]
Copper	mg/L	10	40%	0.002 U	0.0091	Normal	0	MLE 95% UTL[2]	0.015
Iron	mg/L	10	0%	0.99	7	Normal	1	95% UTL[2]	7.9
Lead	mg/L	10	90%	0.0022 J	0.003 U	--	--	NP UTL	0.003 U
Manganese	mg/L	10	0%	0.039	0.18	Normal	0	95% UTL[2]	0.252
Mercury	mg/L	10	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Nickel	mg/L	10	70%	0.0035	0.02 U	--	--	95% KM UTL[2]	0.02 U[3]
Selenium	mg/L	10	100%	0.005 U	0.005 U	--	--	NP UTL	0.005 U
Silver	mg/L	10	90%	0.000094	0.0002 U	--	--	NP UTL	0.0002 U
Thallium	mg/L	10	70%	0.00018	0.0021 U	--	--	95% KM UTL[2]	0.001 U[3]
Vanadium	mg/L	10	30%	0.0013 J	0.01	Gamma	0	95% WH Approx. Gamma UTL [2]	0.015
Zinc	mg/L	10	90%	0.02 U	0.039	--	--	NP UPL	0.039

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

-- Not tested due to high percentage of non-detects (> 50 percent).

[1] Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).

[2] With 95% Coverage.

[3] Calculated UTL is below the reporting limit; therefore the reporting limit is used as the background value.

TABLE 3

FACILITY-SPECIFIC BACKGROUND CONCENTRATIONS FOR INORGANICS IN GROUNDWATER
RACER TRUST COLDWATER ROAD INDUSTRIAL LANDS
GENESEE TOWNSHIP, MICHIGAN

		Dissolved Metals in Deep Aquifer							
		Number of	*Percent*					*Facility-Specific Background*	
Analyte	*Unit*	*Samples*	*ND*	*Minimum*	*Maximum*	*Distribution* [1]	*Outliers*	*Method*	*Value*
Aluminum (dissolved)	mg/L	9	44%	0.019 J	0.1	Normal	0	95% UTL[2]	0.133
Antimony (dissolved)	mg/L	9	89%	0.00017 J	0.002 U	--	--	NP UTL	0.002 U[3]
Arsenic (dissolved)	mg/L	9	22%	ND(0.005)	0.048	Normal	0	MLE 95% UTL[2]	0.089
Barium (dissolved)	mg/L	9	0%	0.042 J	0.33	Gamma	0	95% WH Approx. Gamma UTL [2]	0.553
Beryllium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Cadmium (dissolved)	mg/L	9	100%	0.001 U	0.001 U	--	--	NP UTL	0.001 U
Chromium (dissolved)	mg/L	117	82%	0.001	0.032	--	--	95% KM UTL[2]	0.011
Cobalt (dissolved)	mg/L	9	100%	0.007 U	0.007 U	--	--	NP UTL	0.007 U
Copper (dissolved)	mg/L	117	85%	<0.001	0.203	--	--	95% KM UTL[2]	0.04
Iron (dissolved)	mg/L	58	7%	<0.01	2.55	Gamma	0	95% WH Approx. Gamma UTL [2]	3.62
Lead (dissolved)	mg/L	9	100%	0.003 U	0.003 U	--	--	NP UTL	0.003 U
Manganese (dissolved)	mg/L	52	2%	<0.005	0.577	Lognormal	1	Log ROS 95% UTL[2]	0.292
Mercury (dissolved)	mg/L	9	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Nickel (dissolved)	mg/L	117	76%	0.001	0.054	--	--	95% KM UTL[2]	0.022
Selenium (dissolved)	mg/L	9	100%	0.005 U	0.005 U	--	--	NP UTL	0.005 U
Silver (dissolved)	mg/L	9	100%	0.0002 U	0.0002 U	--	--	NP UTL	0.0002 U
Thallium (dissolved)	mg/L	9	44%	0.00014	0.001 U	Normal	0	95% UTL[2]	0.001 U
Vanadium (dissolved)	mg/L	9	78%	0.00072 J	0.004 U	--	--	NP UTL	0.004 U
Zinc (dissolved)	mg/L	117	59%	ND(0.005)	0.124	--	--	95% KM UTL[2]	0.0521

Notes:

J - Estimated concentration.

U - Not present at or above the associated value.

-- Not tested due to high percentage of non-detects (> 50 percent).

[1] Data distribution test result considering detected values only (default ProUCL version 4.1.01 approach).

[2] With 95% Coverage.

[3] Calculated UTL is below the reporting limit; therefore the reporting limit is used as the background value.

ATTACHMENT A

Tomka, Mike

From: Conforti, Rich (DEQ) [CONFORTIR@michigan.gov]
Sent: Thursday, December 13, 2012 4:30 PM
To: Tomka, Mike
Cc: Grant Trigger; Dave Favero; Anthony Finch; John O'Neill; Dyck, Wesley; Yocum, William (DEQ); Araujo, Daniela; Chatfield, Richard; Project Email Hold; Rogers, Joseph (DEQ); McCabe, John (DEQ); Schinderle, Jack (DEQ)
Subject: RE: Calculated Site-Specific Background Values for Inorganics in Groundwater, RACER Trust, Coldwater Road Sites~COR-012636~

Mike,

We have completed our review of the November 21, 2012, Memorandum (Memo) concerning Site-specific Background values (BV) for inorganics in groundwater and have the following comments.

It is the DEQ's contention that the BVs presented in Table 3 of the Memo, calculated using the 99% upper prediction limits (UPL) statistical method, should be recalculated using an upper tolerance limit (UTL) with 95% confidence and 95% coverage. This 95% UTL is the method that is recommended in Section 7.5 of USEPA's Unified Guidance (USEPA 2010). The 95% UTL method is more conservative than the proposed 99% UPL (i.e. less potential for false negative or Type II error) which is appropriate given the use of the background statistic to determine if any of the naturally occurring inorganics are present above background and/or are migrating off-site.

It is also the DEQ's contention that the BVs calculated for dissolved inorganics are the most appropriate for use at the former Peregrine site. This is due to the fact that groundwater in both the shallow and deep aquifers is historically turbid, with turbidity values typically much higher than 5 NTU despite significant efforts to ensure turbidity is minimized during sampling. The larger data set used to generate the BVs for several of the significant inorganic constituents also supports this position. In light of this, site groundwater samples should be analyzed for dissolved inorganic constituents for purposes of comparison to the proposed BVs.

In addition, please be advised that these calculated BVs apply only to the former Peregrine site. Site specific background inorganic values have already been developed for the purposes of detection monitoring at the hazardous waste landfill and corrective action at the former wastewater treatment plant, for the Coldwater Rd. Landfill site to the north of the former Peregrine site.

Please revise the Memo to reflect the recalculated BVs and resubmit the Memo to the DEQ for final review and approval.

Thank you

Richard A. Conforti, Jr., P.E.
Environmental Engineer
DEQ - OWMRP
Phone: 517-241-2108
Fax: 517-373-4797

From: Tomka, Mike [mailto:mtomka@craworld.com]
Sent: Wednesday, November 21, 2012 3:30 PM
To: Conforti, Rich (DEQ); Rogers, Joseph (DEQ); McCabe, John (DEQ); Schinderle, Jack (DEQ); Yocum,

William (DEQ)
Cc: Grant Trigger; Dave Favero; Anthony Finch; John O'Neill; Dyck, Wesley; Araujo, Daniela; Chatfield, Richard; Project Email Hold
Subject: Calculated Site-Specific Background Values for Inorganics in Groundwater, RACER Trust, Coldwater Road Sites~COR-012636~

Please find attached a memorandum on the calculation of Site-Specific Background Values for inorganics in Groundwater for the RACER Trust Coldwater Road Industrial Lands, for your review and comment.
Please let me know if you need a hard copy.
Please call or email with any questions or comments.
Thanks Mike

Michael Tomka, P. Eng., P.E.
Conestoga-Rovers & Associates (CRA)

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Perform every task the safe way, the right way, every time!

ATTACHMENT B

ATTACHMENT B.1

PROUCL OUTPUT
TOTAL METALS IN SHALLOW WATER BEARING UNIT

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Total Metals - Shallow.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	10000

Aluminum

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics

Minimum Detected	0.26
Maximum Detected	9.2
Mean of Detected	3.543
SD of Detected	4.124
Minimum Non-Detect	0.05
Maximum Non-Detect	0.2

Log-transformed Statistics

Minimum Detected	-1.347
Maximum Detected	2.219
Mean of Detected	0.479
SD of Detected	1.619
Minimum Non-Detect	-2.996
Maximum Non-Detect	-1.609

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	5
Number treated as Detected with Single DL	4
Single DL Non-Detect Percentage	55.56%

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.879
5% Shapiro Wilk Critical Value	0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.956
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method		
Mean		1.597
SD		3.128
95% UTL	95% Coverage	11.08
95% UPL (t)		7.728
90% Percentile (z)		5.605
95% Percentile (z)		6.742

Assuming Lognormal Distribution

DL/2 Substitution Method		
Mean (Log Scale)		-1.682
SD (Log Scale)		2.319
95% UTL	95% Coverage	210.1
95% UPL (t)		17.53
90% Percentile (z)		3.633
95% Percentile (z)		8.436

99% Percentile (z)	8.874

Maximum Likelihood Estimate(MLE) Method

Mean	-0.868
SD	5.244
95% UTL with 95% Coverage	15.03
95% UPL (t)	9.41
90% Percentile (z)	5.852
95% Percentile (z)	7.757
99% Percentile (z)	11.33

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.357
Theta Star	9.93
nu star	2.854
A-D Test Statistic	0.272
5% A-D Critical Value	0.67
K-S Test Statistic	0.257
5% K-S Critical Value	0.405

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	1.574
Median	0.000001
SD	3.14
k star	0.142
Theta star	11.07
Nu star	2.561
95% Percentile of Chisquare (2k)	1.582
90% Percentile	4.631
95% Percentile	8.752
99% Percentile	20.84

Note: DL/2 is not a recommended method.

99% Percentile (z)	40.98

Log ROS Method

Mean in Original Scale	1.582
SD in Original Scale	3.136
95% UTL with 95% Coverage	1351
95% BCA UTL with 95% Coverage	9.2
95% Bootstrap (%) UTL with 95% Coverage	9.2
95% UPL (t)	43.09
90% Percentile (z)	4.855
95% Percentile (z)	15.63
99% Percentile (z)	140

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	1.719
SD	2.886
SE of Mean	1.111
95% KM UTL with 95% Coverage	10.47
95% KM Chebyshev UPL	14.98
95% KM UPL (t)	7.376
90% Percentile (z)	5.417
95% Percentile (z)	6.466
99% Percentile (z)	8.433

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	9.801
95% Hawkins Wixley (HW) Approx. Gamma UPL	12.43
95% WH Approx. Gamma UTL with 95% Coverage	26.72
95% HW Approx. Gamma UTL with 95% Coverage	45.92

Antimony

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0035	Minimum Detected	-5.655
Maximum Detected	0.0086	Maximum Detected	-4.756
Mean of Detected	0.00563	Mean of Detected	-5.251
SD of Detected	0.00243	SD of Detected	0.434
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set

the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.895	Shapiro Wilk Test Statistic	0.893
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00389	Mean (Log Scale)	-5.662
SD	0.00222	SD (Log Scale)	0.472
95% UTL 95% Coverage	0.0106	95% UTL 95% Coverage	0.0145
95% UPL (t)	0.00824	95% UPL (t)	0.00876
90% Percentile (z)	0.00673	90% Percentile (z)	0.00636
95% Percentile (z)	0.00754	95% Percentile (z)	0.00755
99% Percentile (z)	0.00905	99% Percentile (z)	0.0104

Maximum Likelihood Estimate(MLE) Method	N/A

Log ROS Method	
Mean in Original Scale	0.0046
SD in Original Scale	0.0019
Mean in Log Scale	-5.448
SD in Log Scale	0.374
95% UTL 95% Coverage	0.0134
95% UPL (t)	0.00896
90% Percentile (z)	0.00695
95% Percentile (z)	0.00796
99% Percentile (z)	0.0103

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.979
Theta Star	0.00284
nu star	15.83
A-D Test Statistic	0.385
5% A-D Critical Value	0.658
K-S Test Statistic	0.306
5% K-S Critical Value	0.395

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	0.00461
Median	0.00394
SD	0.00216
k star	3.189
Theta star	0.00144
Nu star	57.4
95% Percentile of Chisquare (2k)	13.15
90% Percentile	0.00806
95% Percentile	0.0095
99% Percentile	0.0126

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.00453
SD	0.00171
SE of Mean	0.0006645
95% KM UTL with 95% Coverage	0.00972
95% KM Chebyshev UPL	0.0124
95% KM UPL (t)	0.00789
90% Percentile (z)	0.00672
95% Percentile (z)	0.00735
99% Percentile (z)	0.00851

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.01
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0103
95% WH Approx. Gamma UTL with 95% Coverage	0.0147
95% HW Approx. Gamma UTL with 95% Coverage	0.0156

Note: DL/2 is not a recommended method.

Barium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
Tolerance Factor	3.031		

Raw Statistics

Minimum	0.033
Maximum	0.13
Second Largest	0.072
First Quartile	0.054
Median	0.0671
Third Quartile	0.072
Mean	0.0652
Geometric Mean	0.0603
SD	0.0285
Coefficient of Variation	0.437
Skewness	1.439

Log-Transformed Statistics

Minimum	-3.411
Maximum	-2.04
Second Largest	-2.631
First Quartile	-2.919
Median	-2.702
Third Quartile	-2.631
Mean	-2.808
SD	0.416

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.842
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.912
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with	95% Coverage	0.152
95% UPL (t)		0.121
90% Percentile (z)		0.102
95% Percentile (z)		0.112
99% Percentile (z)		0.132

Assuming Lognormal Distribution

95% UTL with	95% Coverage	0.213
95% UPL (t)		0.136
90% Percentile (z)		0.103
95% Percentile (z)		0.12
99% Percentile (z)		0.159

Gamma Distribution Test

k star	4.468
Theta Star	0.0146
MLE of Mean	0.0652
MLE of Standard Deviation	0.0308
nu star	80.42
A-D Test Statistic	0.472
5% A-D Critical Value	0.722
K-S Test Statistic	0.237
5% K-S Critical Value	0.28

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	0.0836
95% Percentile	0.107
99% Percentile	0.125

Assuming Gamma Distribution				
90% Percentile	0.106	95% UTL with	95% Coverage	0.13
95% Percentile	0.123	95% Percentile Bootstrap UTL with	95% Coverage	0.13
99% Percentile	0.157	95% BCA Bootstrap UTL with	95% Coverage	0.13
		95% UPL		0.13
		95% Chebyshev UPL		0.196
95% WH Approx. Gamma UPL	0.128	Upper Threshold Limit Based upon IQR		0.099
95% HW Approx. Gamma UPL	0.13			
95% WH Approx. Gamma UTL with	95% Coverage 0.179			
95% HW Approx. Gamma UTL with	95% Coverage 0.185			

Beryllium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	9	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	6

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	66.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0078	Minimum Detected	-4.854
Maximum Detected	0.03	Maximum Detected	-3.507
Mean of Detected	0.0153	Mean of Detected	-4.396
SD of Detected	0.0128	SD of Detected	0.771
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.757	Shapiro Wilk Test Statistic	0.764
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean	0.00676		Mean (Log Scale)	-5.46	
SD	0.00902		SD (Log Scale)	0.886	
95% UTL	95% Coverage	0.0341	95% UTL	95% Coverage	0.0624
95% UPL (t)		0.0244	95% UPL (t)		0.0242
90% Percentile (z)		0.0183	90% Percentile (z)		0.0132
95% Percentile (z)		0.0216	95% Percentile (z)		0.0183
99% Percentile (z)		0.0278	99% Percentile (z)		0.0334
Maximum Likelihood Estimate(MLE) Method			Log ROS Method		
Mean		-0.00293	Mean in Original Scale		0.00572
SD		0.0172	SD in Original Scale		0.00961
95% UTL with	95% Coverage	0.0492	95% UTL with	95% Coverage	0.352
			95% BCA UTL with	95% Coverage	0.03
			95% Bootstrap (%) UTL with	95% Coverage	0.03

95% UPL (t)	0.0308
90% Percentile (z)	0.0191
95% Percentile (z)	0.0253
99% Percentile (z)	0.0371

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Note: DL/2 is not a recommended method.

95% UPL (t)	0.0535
90% Percentile (z)	0.0162
95% Percentile (z)	0.0307
99% Percentile (z)	0.102

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0103
SD	0.00697
SE of Mean	0.00285
95% KM UTL with 95% Coverage	0.0314
95% KM Chebyshev UPL	0.0423
95% KM UPL (t)	0.0239
90% Percentile (z)	0.0192
95% Percentile (z)	0.0218
99% Percentile (z)	0.0265

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Cobalt

General Statistics

Number of Valid Data	9	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	6

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	66.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0027	Minimum Detected	-5.915
Maximum Detected	0.0056	Maximum Detected	-5.185
Mean of Detected	0.0039	Mean of Detected	-5.594
SD of Detected	0.00151	SD of Detected	0.373
Minimum Non-Detect	0.007	Minimum Non-Detect	-4.962
Maximum Non-Detect	0.007	Maximum Non-Detect	-4.962

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.918	Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean	0.00363		Mean (Log Scale)	-5.635	
SD	0.0007826		SD (Log Scale)	0.189	
95% UTL	95% Coverage	0.00601	95% UTL	95% Coverage	0.00633
95% UPL (t)		0.00517	95% UPL (t)		0.00517
90% Percentile (z)		0.00464	90% Percentile (z)		0.00455
95% Percentile (z)		0.00492	95% Percentile (z)		0.00487
99% Percentile (z)		0.00545	99% Percentile (z)		0.00554
Maximum Likelihood Estimate(MLE) Method		N/A	Log ROS Method		
			Mean in Original Scale		0.00396
			SD in Original Scale		0.00151
			Mean in Log Scale		-5.594
			SD in Log Scale		0.379
			95% UTL	95% Coverage	0.0117

95% UPL (t)	0.00782
90% Percentile (z)	0.00605
95% Percentile (z)	0.00694
99% Percentile (z)	0.00899

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0039
SD	0.00124
SE of Mean	0.0008737
95% KM UTL with 95% Coverage	0.00765
95% KM Chebyshev UPL	0.00958
95% KM UPL (t)	0.00632
90% Percentile (z)	0.00548
95% Percentile (z)	0.00593
99% Percentile (z)	0.00677

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Note: DL/2 is not a recommended method.

Copper

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0039	Minimum Detected	-5.547
Maximum Detected	0.0096	Maximum Detected	-4.646
Mean of Detected	0.00675	Mean of Detected	-5.096
SD of Detected	0.00403	SD of Detected	0.637
Minimum Non-Detect	0.002	Minimum Non-Detect	-6.215
Maximum Non-Detect	0.0045	Maximum Non-Detect	-5.404

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	8
Number treated as Detected with Single DL	1
Single DL Non-Detect Percentage	88.89%

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method		
Mean		0.00244
SD		0.00286
95% UTL	95% Coverage	0.0111
95% UPL (t)		0.00804
90% Percentile (z)		0.0061

Assuming Lognormal Distribution

DL/2 Substitution Method		
Mean (Log Scale)		-6.39
SD (Log Scale)		0.811
95% UTL	95% Coverage	0.0196
95% UPL (t)		0.00823
90% Percentile (z)		0.00475

95% Percentile (z)	0.00714
99% Percentile (z)	0.00909

Maximum Likelihood Estimate(MLE) Method	N/A

95% Percentile (z)	0.00637
99% Percentile (z)	0.0111

Log ROS Method		
Mean in Original Scale		N/A
SD in Original Scale		N/A
Mean in Log Scale		N/A
SD in Log Scale		N/A
95% UTL	95% Coverage	N/A
	95% UPL (t)	N/A
	90% Percentile (z)	N/A
	95% Percentile (z)	N/A
	99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method		
Mean		0.00453
SD		0.00179
SE of Mean		0.0008444
95% KM UTL with	95% Coverage	0.00996
	95% KM Chebyshev UPL	0.0128
	95% KM UPL (t)	0.00804
	90% Percentile (z)	0.00683
	95% Percentile (z)	0.00748
	99% Percentile (z)	0.0087

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL		N/A
95% WH Approx. Gamma UTL with	95% Coverage	N/A
95% HW Approx. Gamma UTL with	95% Coverage	N/A

Note: DL/2 is not a recommended method.

Iron

General Statistics

Number of Valid Data	9	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	3
Tolerance Factor	3.031	Percent Non-Detects	33.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0927	Minimum Detected	-2.378
Maximum Detected	12	Maximum Detected	2.485
Mean of Detected	3.164	Mean of Detected	-0.0122
SD of Detected	4.715	SD of Detected	1.797
Minimum Non-Detect	0.1	Minimum Non-Detect	-2.303
Maximum Non-Detect	0.1	Maximum Non-Detect	-2.303

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.732	Shapiro Wilk Test Statistic	0.964
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean	2.126		Mean (Log Scale)	-1.007	
SD	4.04		SD (Log Scale)	2.06	
95% UTL	95% Coverage	14.37	95% UTL	95% Coverage	188.2
95% UPL (t)		10.04	95% UPL (t)		20.73
90% Percentile (z)		7.303	90% Percentile (z)		5.121
95% Percentile (z)		8.771	95% Percentile (z)		10.83
99% Percentile (z)		11.52	99% Percentile (z)		44.07
Maximum Likelihood Estimate(MLE) Method			Log ROS Method		
Mean		0.0874	Mean in Original Scale		2.132
SD		5.792	SD in Original Scale		4.036
95% UTL with	95% Coverage	17.64	95% UTL with	95% Coverage	213.8
			95% BCA UTL with	95% Coverage	12
			95% Bootstrap (%) UTL with	95% Coverage	12
95% UPL (t)		11.44	95% UPL (t)		22.65
90% Percentile (z)		7.51	90% Percentile (z)		5.459
95% Percentile (z)		9.614	95% Percentile (z)		11.69
99% Percentile (z)		13.56	99% Percentile (z)		48.8

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.381
Theta Star	8.308
nu star	4.57
A-D Test Statistic	0.374
5% A-D Critical Value	0.734
K-S Test Statistic	0.291
5% K-S Critical Value	0.348

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	2.109
Median	0.3
SD	4.05
k star	0.17
Theta star	12.39
Nu star	3.064
95% Percentile of Chisquare (2k)	1.824
90% Percentile	6.339
95% Percentile	11.3
99% Percentile	25.36

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	2.14
SD	3.801
SE of Mean	1.388
95% KM UTL with 95% Coverage	13.66
95% KM Chebyshev UPL	19.61
95% KM UPL (t)	9.591
90% Percentile (z)	7.012
95% Percentile (z)	8.393
99% Percentile (z)	10.98

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	12.8
95% Hawkins Wixley (HW) Approx. Gamma UPL	16.7
95% WH Approx. Gamma UTL with 95% Coverage	32.58
95% HW Approx. Gamma UTL with 95% Coverage	55.13

Lead

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0023	Minimum Detected	-6.075
Maximum Detected	0.0029	Maximum Detected	-5.843
Mean of Detected	0.0026	Mean of Detected	-5.959
SD of Detected	0.0004243	SD of Detected	0.164
Minimum Non-Detect	0.003	Minimum Non-Detect	-5.809
Maximum Non-Detect	0.003	Maximum Non-Detect	-5.809

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.00174	Mean (Log Scale)		-6.382
SD		0.0005077	SD (Log Scale)		0.247
95% UTL	95% Coverage	0.00328	95% UTL	95% Coverage	0.00357
95% UPL (t)		0.00274	95% UPL (t)		0.00274
90% Percentile (z)		0.0024	90% Percentile (z)		0.00232
95% Percentile (z)		0.00258	95% Percentile (z)		0.00254
99% Percentile (z)		0.00293	99% Percentile (z)		0.003

Maximum Likelihood Estimate(MLE) Method	N/A

Log ROS Method		
Mean in Original Scale		N/A
SD in Original Scale		N/A
Mean in Log Scale		N/A
SD in Log Scale		N/A
95% UTL	95% Coverage	N/A
	95% UPL (t)	N/A
	90% Percentile (z)	N/A
	95% Percentile (z)	N/A
	99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method		
Mean		0.0026
SD		0.0003
SE of Mean		0.0003
95% KM UTL with	95% Coverage	0.00351
	95% KM Chebyshev UPL	0.00398
	95% KM UPL (t)	0.00319
	90% Percentile (z)	0.00298
	95% Percentile (z)	0.00309
	99% Percentile (z)	0.0033

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL		N/A
95% WH Approx. Gamma UTL with	95% Coverage	N/A
95% HW Approx. Gamma UTL with	95% Coverage	N/A

Note: DL/2 is not a recommended method.

Manganese

General Statistics

Number of Valid Data	9	Number of Detected Data	8
Number of Distinct Detected Data	7	Number of Non-Detect Data	1
Tolerance Factor	3.031	Percent Non-Detects	11.11%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.00445	Minimum Detected	-5.415
Maximum Detected	0.26	Maximum Detected	-1.347
Mean of Detected	0.089	Mean of Detected	-3.388
SD of Detected	0.112	SD of Detected	1.603
Minimum Non-Detect	0.015	Minimum Non-Detect	-4.2
Maximum Non-Detect	0.015	Maximum Non-Detect	-4.2

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.736	Shapiro Wilk Test Statistic	0.901
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean	0.0799		Mean (Log Scale)	-3.555	
SD	0.108		SD (Log Scale)	1.581	
95% UTL	95% Coverage	0.408	95% UTL	95% Coverage	3.447
95% UPL (t)		0.292	95% UPL (t)		0.634
90% Percentile (z)		0.219	90% Percentile (z)		0.217
95% Percentile (z)		0.258	95% Percentile (z)		0.385
99% Percentile (z)		0.332	99% Percentile (z)		1.131
Maximum Likelihood Estimate(MLE) Method			Log ROS Method		
Mean		0.051	Mean in Original Scale		0.0796
SD		0.135	SD in Original Scale		0.108
95% UTL with	95% Coverage	0.46	95% UTL with	95% Coverage	3.903
			95% BCA UTL with	95% Coverage	0.26
			95% Bootstrap (%) UTL with	95% Coverage	0.26
95% UPL (t)		0.316	95% UPL (t)		0.674
90% Percentile (z)		0.224	90% Percentile (z)		0.221
95% Percentile (z)		0.273	95% Percentile (z)		0.402
99% Percentile (z)		0.365	99% Percentile (z)		1.229

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.479
Theta Star	0.186
nu star	7.66
A-D Test Statistic	0.556
5% A-D Critical Value	0.753
K-S Test Statistic	0.238
5% K-S Critical Value	0.306

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0791
Median	0.016
SD	0.109
k star	0.299
Theta star	0.265
Nu star	5.373
95% Percentile of Chisquare (2k)	2.736
90% Percentile	0.233
95% Percentile	0.362
99% Percentile	0.698

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0797
SD	0.102
SE of Mean	0.0364
95% KM UTL with 95% Coverage	0.389
95% KM Chebyshev UPL	0.549
95% KM UPL (t)	0.28
90% Percentile (z)	0.211
95% Percentile (z)	0.248
99% Percentile (z)	0.317

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.429
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.531
95% WH Approx. Gamma UTL with 95% Coverage	0.963
95% HW Approx. Gamma UTL with 95% Coverage	1.437

Note: DL/2 is not a recommended method.

Mercury

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Nickel

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0043	Minimum Detected	-5.449
Maximum Detected	0.023	Maximum Detected	-3.772
Mean of Detected	0.0104	Mean of Detected	-4.813
SD of Detected	0.0088	SD of Detected	0.797
Minimum Non-Detect	0.02	Minimum Non-Detect	-3.912
Maximum Non-Detect	0.02	Maximum Non-Detect	-3.912

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.819	Shapiro Wilk Test Statistic	0.873
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean	0.0102		Mean (Log Scale)	-4.698	
SD	0.00539		SD (Log Scale)	0.5	
95% UTL	95% Coverage	0.0265	95% UTL	95% Coverage	0.0415
95% UPL (t)	0.0208		95% UPL (t)	0.0243	
90% Percentile (z)	0.0171		90% Percentile (z)	0.0173	
95% Percentile (z)	0.0191		95% Percentile (z)	0.0208	
99% Percentile (z)	0.0227		99% Percentile (z)	0.0292	
Maximum Likelihood Estimate(MLE) Method	N/A		Log ROS Method		
			Mean in Original Scale	0.00816	
			SD in Original Scale	0.00619	
			Mean in Log Scale	-5.005	
			SD in Log Scale	0.632	
			95% UTL	95% Coverage	0.0455
			95% UPL (t)	0.0231	
			90% Percentile (z)	0.0151	
			95% Percentile (z)	0.019	
			99% Percentile (z)	0.0292	

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.705
Theta Star	0.0148
nu star	5.643
A-D Test Statistic	0.429
5% A-D Critical Value	0.66
K-S Test Statistic	0.307
5% K-S Critical Value	0.398

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00851
Median	0.00643
SD	0.00694
k star	0.985
Theta star	0.00864
Nu star	17.73
95% Percentile of Chisquare (2k)	5.933
90% Percentile	0.0197
95% Percentile	0.0256
99% Percentile	0.0395

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0081
SD	0.00584
SE of Mean	0.00257
95% KM UTL with 95% Coverage	0.0258
95% KM Chebyshev UPL	0.0349
95% KM UPL (t)	0.0195
90% Percentile (z)	0.0156
95% Percentile (z)	0.0177
99% Percentile (z)	0.0217

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0291
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0318
95% WH Approx. Gamma UTL with 95% Coverage	0.0517
95% HW Approx. Gamma UTL with 95% Coverage	0.0617

Note: DL/2 is not a recommended method.

Selenium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!
It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Thallium was not processed!

Vanadium

General Statistics

Number of Valid Data	9	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	6

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	66.67%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0014	Minimum Detected	-6.571
Maximum Detected	0.023	Maximum Detected	-3.772
Mean of Detected	0.0113	Mean of Detected	-4.997
SD of Detected	0.0109	SD of Detected	1.432
Minimum Non-Detect	0.004	Minimum Non-Detect	-5.521
Maximum Non-Detect	0.004	Maximum Non-Detect	-5.521

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.981	Shapiro Wilk Test Statistic	0.955
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00511
SD		0.00718
95% UTL	95% Coverage	0.0269
95% UPL (t)		0.0192
90% Percentile (z)		0.0143
95% Percentile (z)		0.0169
99% Percentile (z)		0.0218

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.809
SD (Log Scale)		0.94
95% UTL	95% Coverage	0.0519
95% UPL (t)		0.0189
90% Percentile (z)		0.01
95% Percentile (z)		0.0141
99% Percentile (z)		0.0267

Log ROS Method

Mean in Original Scale		0.00495
SD in Original Scale		0.00735
Mean in Log Scale		-6.119
SD in Log Scale		1.338
95% UTL	95% Coverage	0.127
95% UPL (t)		0.0303
90% Percentile (z)		0.0122
95% Percentile (z)		0.0199
99% Percentile (z)		0.0495

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.00471
SD		0.00695
SE of Mean		0.00284
95% KM UTL with	95% Coverage	0.0258
95% KM Chebyshev UPL		0.0367
95% KM UPL (t)		0.0183
90% Percentile (z)		0.0136
95% Percentile (z)		0.0161
99% Percentile (z)		0.0209

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL		N/A
95% WH Approx. Gamma UTL with	95% Coverage	N/A
95% HW Approx. Gamma UTL with	95% Coverage	N/A

Note: DL/2 is not a recommended method.

Zinc

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Zinc was not processed!

ATTACHMENT B.2

PROUCL OUTPUT
TOTAL METALS IN DEEP AQUIFER

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Total Metals - Deep.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	10000

Aluminum

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Tolerance Factor	2.911		

Raw Statistics		Log-Transformed Statistics	
Minimum	0.17	Minimum	-1.772
Maximum	3.7	Maximum	1.308
Second Largest	1.65	Second Largest	0.501
First Quartile	0.504	First Quartile	-0.686
Median	0.6	Median	-0.518
Third Quartile	1.033	Third Quartile	0.0249
Mean	0.993	Mean	-0.379
Geometric Mean	0.685	SD	0.882
SD	1.043		
Coefficient of Variation	1.051		
Skewness	2.3		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.72	Shapiro Wilk Test Statistic	0.974
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 95% Coverage	4.03	95% UTL with 95% Coverage	8.928
95% UPL (t)	2.999	95% UPL (t)	3.733
90% Percentile (z)	2.33	90% Percentile (z)	2.121
95% Percentile (z)	2.709	95% Percentile (z)	2.922
99% Percentile (z)	3.42	99% Percentile (z)	5.33

Gamma Distribution Test		Data Distribution Test
k star	1.11	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.894	
MLE of Mean	0.993	
MLE of Standard Deviation	0.942	
nu star	22.2	
A-D Test Statistic	0.406	Nonparametric Statistics
5% A-D Critical Value	0.739	90% Percentile 1.855

K-S Test Statistic	0.173	95% Percentile	2.778
5% K-S Critical Value	0.271	99% Percentile	3.516

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

90% Percentile	2.228	95% UTL with 95% Coverage	3.7
95% Percentile	2.867	95% Percentile Bootstrap UTL with 95% Coverage	3.7
99% Percentile	4.34	95% BCA Bootstrap UTL with 95% Coverage	3.7
		95% UPL	3.7
		95% Chebyshev UPL	5.763
95% WH Approx. Gamma UPL	3.147	Upper Threshold Limit Based upon IQR	1.826
95% HW Approx. Gamma UPL	3.231		
95% WH Approx. Gamma UTL with 95% Coverage	5.334		
95% HW Approx. Gamma UTL with 95% Coverage	5.798		

Antimony

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	2.911	Percent Non-Detects	80.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.000135	Minimum Detected	-8.91
Maximum Detected	0.00025	Maximum Detected	-8.294
Mean of Detected	0.0001925	Mean of Detected	-8.602
SD of Detected	8.132E-05	SD of Detected	0.436
Minimum Non-Detect	0.002	Minimum Non-Detect	-6.215
Maximum Non-Detect	0.002	Maximum Non-Detect	-6.215

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.0008385	Mean (Log Scale)		-7.247
SD		0.0003416	SD (Log Scale)		0.729
95% UTL	95% Coverage	0.00183	95% UTL	95% Coverage	0.00595
95% UPL (t)		0.0015	95% UPL (t)		0.00289
90% Percentile (z)		0.00128	90% Percentile (z)		0.00181
95% Percentile (z)		0.0014	95% Percentile (z)		0.00236
99% Percentile (z)		0.00163	99% Percentile (z)		0.00388

Maximum Likelihood Estimate(MLE) Method	N/A

Log ROS Method		
Mean in Original Scale		N/A
SD in Original Scale		N/A
Mean in Log Scale		N/A
SD in Log Scale		N/A
95% UTL	95% Coverage	N/A
	95% UPL (t)	N/A
	90% Percentile (z)	N/A
	95% Percentile (z)	N/A
	99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method		
Mean		0.0001925
SD		0.0000575
SE of Mean		0.0000575
95% KM UTL with	95% Coverage	0.0003599
	95% KM Chebyshev UPL	0.0004554
	95% KM UPL (t)	0.0003031
	90% Percentile (z)	0.0002662
	95% Percentile (z)	0.0002871
	99% Percentile (z)	0.0003263

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL		N/A
95% WH Approx. Gamma UTL with	95% Coverage	N/A
95% HW Approx. Gamma UTL with	95% Coverage	N/A

Note: DL/2 is not a recommended method.

Arsenic

General Statistics

Number of Valid Data	10	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	2
Tolerance Factor	2.911	Percent Non-Detects	20.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.004	Minimum Detected	-5.521
Maximum Detected	0.054	Maximum Detected	-2.919
Mean of Detected	0.0358	Mean of Detected	-3.569
SD of Detected	0.018	SD of Detected	0.908
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Warning: There are only 8 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.858	Shapiro Wilk Test Statistic	0.729
5% Shapiro Wilk Critical Value	0.818	5% Shapiro Wilk Critical Value	0.818
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.0291	Mean (Log Scale)		-4.054
SD		0.0212	SD (Log Scale)		1.298
95% UTL	95% Coverage	0.0908	95% UTL	95% Coverage	0.759
95% UPL (t)		0.0699	95% UPL (t)		0.21
90% Percentile (z)		0.0563	90% Percentile (z)		0.0916
95% Percentile (z)		0.064	95% Percentile (z)		0.147
99% Percentile (z)		0.0784	99% Percentile (z)		0.355
Maximum Likelihood Estimate(MLE) Method			Log ROS Method		
Mean		0.0252	Mean in Original Scale		0.03
SD		0.0264	SD in Original Scale		0.02
95% UTL with	95% Coverage	0.102	95% UTL with	95% Coverage	0.395
			95% BCA UTL with	95% Coverage	0.054
			95% Bootstrap (%) UTL with	95% Coverage	0.054
95% UPL (t)		0.0758	95% UPL (t)		0.146
90% Percentile (z)		0.0589	90% Percentile (z)		0.0769
95% Percentile (z)		0.0685	95% Percentile (z)		0.111
99% Percentile (z)		0.0865	99% Percentile (z)		0.22

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.491
Theta Star	0.024
nu star	23.85
A-D Test Statistic	0.931
5% A-D Critical Value	0.723
K-S Test Statistic	0.374
5% K-S Critical Value	0.297

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0294
Median	0.0385
SD	0.0208
k star	0.437
Theta star	0.0674
Nu star	8.736
95% Percentile of Chisquare (2k)	3.52
90% Percentile	0.0818
95% Percentile	0.119
99% Percentile	0.21

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0294
SD	0.0197
SE of Mean	0.00667
95% KM UTL with 95% Coverage	0.0868
95% KM Chebyshev UPL	0.12
95% KM UPL (t)	0.0673
90% Percentile (z)	0.0547
95% Percentile (z)	0.0618
99% Percentile (z)	0.0753

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.128
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.17
95% WH Approx. Gamma UTL with 95% Coverage	0.242
95% HW Approx. Gamma UTL with 95% Coverage	0.377

Barium

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Tolerance Factor	2.911		

Raw Statistics		Log-Transformed Statistics	
Minimum	0.05	Minimum	-2.996
Maximum	0.31	Maximum	-1.171
Second Largest	0.18	Second Largest	-1.715
First Quartile	0.0603	First Quartile	-2.828
Median	0.0859	Median	-2.455
Third Quartile	0.168	Third Quartile	-1.787
Mean	0.123	Mean	-2.283
Geometric Mean	0.102	SD	0.63
SD	0.0829		
Coefficient of Variation	0.675		
Skewness	1.378		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.832	Shapiro Wilk Test Statistic	0.909
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 95% Coverage	0.364	95% UTL with 95% Coverage	0.639
95% UPL (t)	0.282	95% UPL (t)	0.343
90% Percentile (z)	0.229	90% Percentile (z)	0.229
95% Percentile (z)	0.259	95% Percentile (z)	0.288
99% Percentile (z)	0.315	99% Percentile (z)	0.442

Gamma Distribution Test		Data Distribution Test
k star	2.069	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.0593	
MLE of Mean	0.123	
MLE of Standard Deviation	0.0853	
nu star	41.38	
A-D Test Statistic	0.493	
5% A-D Critical Value	0.733	
K-S Test Statistic	0.226	
5% K-S Critical Value	0.269	
Data appear Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
90% Percentile	0.193
95% Percentile	0.252
99% Percentile	0.298

Assuming Gamma Distribution			
90% Percentile	0.237	95% UTL with 95% Coverage	0.31
95% Percentile	0.288	95% Percentile Bootstrap UTL with 95% Coverage	0.31
99% Percentile	0.401	95% BCA Bootstrap UTL with 95% Coverage	0.31
		95% UPL	0.31
		95% Chebyshev UPL	0.502

95% WH Approx. Gamma UPL	0.308	Upper Threshold Limit Based upon IQR	0.328
95% HW Approx. Gamma UPL	0.315		
95% WH Approx. Gamma UTL with 95% Coverage	0.47		
95% HW Approx. Gamma UTL with 95% Coverage	0.498		

Beryllium

General Statistics

Number of Valid Data	10	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data	10	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	10	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	7

Warning: Data set has only 3 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	2.911	Percent Non-Detects	70.00%

Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.0025	Minimum Detected	-5.991
Maximum Detected	0.0067	Maximum Detected	-5.006
Mean of Detected	0.00408	Mean of Detected	-5.597
SD of Detected	0.00228	SD of Detected	0.521
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Warning: There are only 3 Distinct Detected Values in this data set

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.846	Shapiro Wilk Test Statistic	0.894
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Assuming Normal Distribution			**Assuming Lognormal Distribution**	
DL/2 Substitution Method			DL/2 Substitution Method	
Mean	0.00298		Mean (Log Scale)	-5.873
SD	0.00132		SD (Log Scale)	0.311
95% UTL	95% Coverage	0.00682	95% UTL	95% Coverage 0.00696
95% UPL (t)		0.00551	95% UPL (t)	0.00512
90% Percentile (z)		0.00467	90% Percentile (z)	0.00419
95% Percentile (z)		0.00515	95% Percentile (z)	0.00469
99% Percentile (z)		0.00605	99% Percentile (z)	0.0058
Maximum Likelihood Estimate(MLE) Method		N/A	Log ROS Method	
			Mean in Original Scale	0.00326
			SD in Original Scale	0.00143
			Mean in Log Scale	-5.798
			SD in Log Scale	0.388
			95% UTL	95% Coverage 0.0094

95% UPL (t)	0.0064
90% Percentile (z)	0.00499
95% Percentile (z)	0.00575
99% Percentile (z)	0.00749

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.00317
SD	0.00121
SE of Mean	0.0005039
95% KM UTL with 95% Coverage	0.00668
95% KM Chebyshev UPL	0.00868
95% KM UPL (t)	0.00549
90% Percentile (z)	0.00471
95% Percentile (z)	0.00515
99% Percentile (z)	0.00597

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Cobalt

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	2.911	Percent Non-Detects	80.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0018	Minimum Detected	-6.32
Maximum Detected	0.003	Maximum Detected	-5.809
Mean of Detected	0.0024	Mean of Detected	-6.065
SD of Detected	0.0008485	SD of Detected	0.361
Minimum Non-Detect	0.007	Minimum Non-Detect	-4.962
Maximum Non-Detect	0.007	Maximum Non-Detect	-4.962

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.00328	Mean (Log Scale)		-5.737
SD		0.0005432	SD (Log Scale)		0.211
95% UTL	95% Coverage	0.00486	95% UTL	95% Coverage	0.00595
95% UPL (t)		0.00432	95% UPL (t)		0.00483
90% Percentile (z)		0.00398	90% Percentile (z)		0.00422
95% Percentile (z)		0.00417	95% Percentile (z)		0.00456
99% Percentile (z)		0.00454	99% Percentile (z)		0.00526
Maximum Likelihood Estimate(MLE) Method		N/A	Log ROS Method		

Mean in Original Scale	N/A
SD in Original Scale	N/A
Mean in Log Scale	N/A
SD in Log Scale	N/A
95% UTL 95% Coverage	N/A
95% UPL (t)	N/A
90% Percentile (z)	N/A
95% Percentile (z)	N/A
99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.0024
SD	0.0006
SE of Mean	0.0006
95% KM UTL with 95% Coverage	0.00415
95% KM Chebyshev UPL	0.00514
95% KM UPL (t)	0.00355
90% Percentile (z)	0.00317
95% Percentile (z)	0.00339
99% Percentile (z)	0.0038

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Copper

General Statistics

Number of Valid Data	10	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	4
Tolerance Factor	2.911	Percent Non-Detects	40.00%

Raw Statistics

Minimum Detected	0.0025
Maximum Detected	0.0091
Mean of Detected	0.00482
SD of Detected	0.00274
Minimum Non-Detect	0.002
Maximum Non-Detect	0.0037

Log-transformed Statistics

Minimum Detected	-5.991
Maximum Detected	-4.699
Mean of Detected	-5.462
SD of Detected	0.54
Minimum Non-Detect	-6.215
Maximum Non-Detect	-5.599

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	7
Number treated as Detected with Single DL	3
Single DL Non-Detect Percentage	70.00%

Warning: There are only 6 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.843
5% Shapiro Wilk Critical Value	0.788

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.888
5% Shapiro Wilk Critical Value	0.788

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00341
SD		0.00274
95% UTL	95% Coverage	0.0114
95% UPL (t)		0.00869
90% Percentile (z)		0.00693
95% Percentile (z)		0.00792
99% Percentile (z)		0.00979

Maximum Likelihood Estimate(MLE) Method

Mean		0.00137
SD		0.00463
95% UTL with	95% Coverage	0.0149
95% UPL (t)		0.0103
90% Percentile (z)		0.0073

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.948
SD (Log Scale)		0.762
95% UTL	95% Coverage	0.024
95% UPL (t)		0.0113
90% Percentile (z)		0.00694
95% Percentile (z)		0.00915
99% Percentile (z)		0.0154

Log ROS Method

Mean in Original Scale		0.00346
SD in Original Scale		0.0027
95% UTL with	95% Coverage	0.0217
95% BCA UTL with	95% Coverage	0.0091
95% Bootstrap (%) UTL with	95% Coverage	0.0091
95% UPL (t)		0.0107
90% Percentile (z)		0.0068

95% Percentile (z)	0.00899
99% Percentile (z)	0.0121

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.166
Theta Star	0.00222
nu star	26
A-D Test Statistic	0.451
5% A-D Critical Value	0.7
K-S Test Statistic	0.228
5% K-S Critical Value	0.333

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00295
Median	0.00258
SD	0.00316
k star	0.274
Theta star	0.0108
Nu star	5.474
95% Percentile of Chisquare (2k)	2.578
90% Percentile	0.00879
95% Percentile	0.0139
99% Percentile	0.0273

Note: DL/2 is not a recommended method.

95% Percentile (z)	0.00881
99% Percentile (z)	0.0143

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0039
SD	0.00224
SE of Mean	0.0007768
95% KM UTL with 95% Coverage	0.0104
95% KM Chebyshev UPL	0.0141
95% KM UPL (t)	0.00821
90% Percentile (z)	0.00678
95% Percentile (z)	0.00759
99% Percentile (z)	0.00912

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.017
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0233
95% WH Approx. Gamma UTL with 95% Coverage	0.037
95% HW Approx. Gamma UTL with 95% Coverage	0.0622

Iron

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
Tolerance Factor	2.911		

Raw Statistics

Minimum	0.99
Maximum	7
Second Largest	4.4
First Quartile	2.125
Median	2.6
Third Quartile	3.358
Mean	3.057
Geometric Mean	2.711
SD	1.662
Coefficient of Variation	0.544
Skewness	1.578

Log-Transformed Statistics

Minimum	-0.0101
Maximum	1.946
Second Largest	1.482
First Quartile	0.754
Median	0.955
Third Quartile	1.211
Mean	0.997
SD	0.519

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.864
Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.962
Shapiro Wilk Critical Value	0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with	95% Coverage	7.896
95% UPL (t)		6.253
90% Percentile (z)		5.187
95% Percentile (z)		5.791
99% Percentile (z)		6.924

Assuming Lognormal Distribution

95% UTL with	95% Coverage	12.28
95% UPL (t)		7.353
90% Percentile (z)		5.272
95% Percentile (z)		6.366
99% Percentile (z)		9.067

Gamma Distribution Test

k star	3.088
Theta Star	0.99
MLE of Mean	3.057
MLE of Standard Deviation	1.74
nu star	61.76
A-D Test Statistic	0.317
5% A-D Critical Value	0.729
K-S Test Statistic	0.17
5% K-S Critical Value	0.268

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	4.66
95% Percentile	5.83
99% Percentile	6.766

Assuming Gamma Distribution

90% Percentile	5.39
95% Percentile	6.362
99% Percentile	8.468
95% WH Approx. Gamma UPL	6.691

95% UTL with	95% Coverage	7
95% Percentile Bootstrap UTL with	95% Coverage	7
95% BCA Bootstrap UTL with	95% Coverage	7
95% UPL		7
95% Chebyshev UPL		10.66
Upper Threshold Limit Based upon IQR		5.206

95% HW Approx. Gamma UPL		6.811
95% WH Approx. Gamma UTL with	95% Coverage	9.618
95% HW Approx. Gamma UTL with	95% Coverage	10.07

Lead

General Statistics

Number of Valid Data	10	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	9

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead was not processed!

Manganese

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
Tolerance Factor	2.911		

Raw Statistics

Minimum	0.039
Maximum	0.18
Second Largest	0.167
First Quartile	0.0569
Median	0.072
Third Quartile	0.145
Mean	0.0981
Geometric Mean	0.0857
SD	0.053
Coefficient of Variation	0.54
Skewness	0.54

Log-Transformed Statistics

Minimum	-3.244
Maximum	-1.715
Second Largest	-1.79
First Quartile	-2.869
Median	-2.637
Third Quartile	-1.933
Mean	-2.457
SD	0.55

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.863
Shapiro Wilk Critical Value	0.842

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.906
Shapiro Wilk Critical Value	0.842

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	0.252
95% UPL (t)	0.2
90% Percentile (z)	0.166
95% Percentile (z)	0.185
99% Percentile (z)	0.221

Assuming Lognormal Distribution

95% UTL with 95% Coverage	0.425
95% UPL (t)	0.247
90% Percentile (z)	0.173
95% Percentile (z)	0.212
99% Percentile (z)	0.308

Gamma Distribution Test

k star	2.774
Theta Star	0.0354
MLE of Mean	0.0981
MLE of Standard Deviation	0.0589
nu star	55.47
A-D Test Statistic	0.558
5% A-D Critical Value	0.73
K-S Test Statistic	0.229
5% K-S Critical Value	0.268

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	0.168
95% Percentile	0.174
99% Percentile	0.179

Assuming Gamma Distribution

90% Percentile	0.177
95% Percentile	0.211
99% Percentile	0.284

95% UTL with	95% Coverage	0.18
95% Percentile Bootstrap UTL with	95% Coverage	0.18
95% BCA Bootstrap UTL with	95% Coverage	0.18
95% UPL		0.18
95% Chebyshev UPL		0.34

95% WH Approx. Gamma UPL	0.223	Upper Threshold Limit Based upon IQR	0.277
95% HW Approx. Gamma UPL	0.228		
95% WH Approx. Gamma UTL with 95% Coverage	0.326		
95% HW Approx. Gamma UTL with 95% Coverage	0.343		

Mercury

General Statistics

Number of Valid Data	10	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Nickel

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	2.911	Percent Non-Detects	80.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0055	Minimum Detected	-5.203
Maximum Detected	0.0065	Maximum Detected	-5.036
Mean of Detected	0.006	Mean of Detected	-5.119
SD of Detected	0.0007071	SD of Detected	0.118
Minimum Non-Detect	0.02	Minimum Non-Detect	-3.912
Maximum Non-Detect	0.02	Maximum Non-Detect	-3.912

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		**Data not Lognormal at 5% Significance Level**	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.0092	Mean (Log Scale)		-4.708
SD		0.0017	SD (Log Scale)		0.22
95% UTL	95% Coverage	0.0142	95% UTL	95% Coverage	0.0171
95% UPL (t)		0.0125	95% UPL (t)		0.0138
90% Percentile (z)		0.0114	90% Percentile (z)		0.012
95% Percentile (z)		0.012	95% Percentile (z)		0.013
99% Percentile (z)		0.0132	99% Percentile (z)		0.0151

Maximum Likelihood Estimate(MLE) Method	N/A

Log ROS Method		
Mean in Original Scale		N/A
SD in Original Scale		N/A
Mean in Log Scale		N/A
SD in Log Scale		N/A
95% UTL	95% Coverage	N/A
	95% UPL (t)	N/A
	90% Percentile (z)	N/A
	95% Percentile (z)	N/A
	99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method		
Mean		0.006
SD		0.0005
SE of Mean		0.0005
95% KM UTL with	95% Coverage	0.00746
	95% KM Chebyshev UPL	0.00829
	95% KM UPL (t)	0.00696
	90% Percentile (z)	0.00664
	95% Percentile (z)	0.00682
	99% Percentile (z)	0.00716

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL		N/A
95% WH Approx. Gamma UTL with	95% Coverage	N/A
95% HW Approx. Gamma UTL with	95% Coverage	N/A

Note: DL/2 is not a recommended method.

Selenium

General Statistics

Number of Valid Data	10	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver

General Statistics

Number of Valid Data	10	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	10

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8

Warning: Data set has only 2 Detected Values.
This is not enough to compute meaningful and reliable test statistics and estimates.
No statistics will be produced!

Tolerance Factor	2.911	Percent Non-Detects	80.00%

Raw Statistics

Minimum Detected	0.00019
Maximum Detected	0.00028
Mean of Detected	0.000235
SD of Detected	6.364E-05
Minimum Non-Detect	0.001
Maximum Non-Detect	0.0021

Log-transformed Statistics

Minimum Detected	-8.568
Maximum Detected	-8.181
Mean of Detected	-8.375
SD of Detected	0.274
Minimum Non-Detect	-6.908
Maximum Non-Detect	-6.166

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended
For all methods (except KM, DL/2, and ROS Methods),
Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	10
Number treated as Detected with Single DL	0
Single DL Non-Detect Percentage	100.00%

Warning: Data set has only 2 Distinct Detected Values.
This may not be adequate enough to compute meaningful and reliable test statistics and estimates.
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.
Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.
However, results obtained using 4 to 9 distinct values may not be reliable.
It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only | **Lognormal Distribution Test with Detected Values Only**

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

	Mean	0.000502
	SD	0.0002229
95% UTL	95% Coverage	0.00115
	95% UPL (t)	0.0009305
	90% Percentile (z)	0.0007876
	95% Percentile (z)	0.0008686
	99% Percentile (z)	0.00102

Maximum Likelihood Estimate(MLE) Method N/A

Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A

Data not Lognormal at 5% Significance Level

Assuming Lognormal Distribution

DL/2 Substitution Method

	Mean (Log Scale)	-7.681
	SD (Log Scale)	0.442
95% UTL	95% Coverage	0.00167
	95% UPL (t)	0.00108
	90% Percentile (z)	0.0008128
	95% Percentile (z)	0.0009544
	99% Percentile (z)	0.00129

Log ROS Method

	Mean in Original Scale	N/A
	SD in Original Scale	N/A
	Mean in Log Scale	N/A
	SD in Log Scale	N/A
95% UTL	95% Coverage	N/A
	95% UPL (t)	N/A
	90% Percentile (z)	N/A
	95% Percentile (z)	N/A
	99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

	Mean	0.000235
	SD	0.000045
	SE of Mean	0.000045
95% KM UTL with	95% Coverage	0.000366
	95% KM Chebyshev UPL	0.0004407
	95% KM UPL (t)	0.0003215
	90% Percentile (z)	0.0002927
	95% Percentile (z)	0.000309
	99% Percentile (z)	0.0003397

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL		N/A
95% WH Approx. Gamma UTL with	95% Coverage	N/A
95% HW Approx. Gamma UTL with	95% Coverage	N/A

Note: DL/2 is not a recommended method.

Vanadium

General Statistics

Number of Valid Data	10	Number of Detected Data	7
Number of Distinct Detected Data	6	Number of Non-Detect Data	3
Tolerance Factor	2.911	Percent Non-Detects	30.00%

Raw Statistics

Minimum Detected	0.0013
Maximum Detected	0.01
Mean of Detected	0.00366
SD of Detected	0.00306
Minimum Non-Detect	0.004
Maximum Non-Detect	0.004

Log-transformed Statistics

Minimum Detected	-6.645
Maximum Detected	-4.605
Mean of Detected	-5.858
SD of Detected	0.732
Minimum Non-Detect	-5.521
Maximum Non-Detect	-5.521

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.792
5% Shapiro Wilk Critical Value	0.803

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.936
5% Shapiro Wilk Critical Value	0.803

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00316
SD		0.00262
95% UTL	95% Coverage	0.0108
	95% UPL (t)	0.0082
	90% Percentile (z)	0.00652
	95% Percentile (z)	0.00747
	99% Percentile (z)	0.00926

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.965
SD (Log Scale)		0.622
95% UTL	95% Coverage	0.0157
	95% UPL (t)	0.00849
	90% Percentile (z)	0.0057
	95% Percentile (z)	0.00715
	99% Percentile (z)	0.0109

Log ROS Method

Mean in Original Scale		0.00321
SD in Original Scale		0.00263
Mean in Log Scale		-5.959
SD in Log Scale		0.651
95% UTL	95% Coverage	0.0172
	95% UPL (t)	0.00902
	90% Percentile (z)	0.00594
	95% Percentile (z)	0.00753
	99% Percentile (z)	0.0117

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.341
Theta Star	0.00273
nu star	18.78
A-D Test Statistic	0.346
5% A-D Critical Value	0.714
K-S Test Statistic	0.187
5% K-S Critical Value	0.315

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00331
Median	0.00253
SD	0.00269
k star	1.519
Theta star	0.00218
Nu star	30.37
95% Percentile of Chisquare (2k)	7.879
90% Percentile	0.00687
95% Percentile	0.00858
99% Percentile	0.0124

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.00321
SD	0.00251
SE of Mean	0.0008813
95% KM UTL with 95% Coverage	0.0105
95% KM Chebyshev UPL	0.0147
95% KM UPL (t)	0.00804
90% Percentile (z)	0.00643
95% Percentile (z)	0.00734
99% Percentile (z)	0.00905

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.00931
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0096
95% WH Approx. Gamma UTL with 95% Coverage	0.0149
95% HW Approx. Gamma UTL with 95% Coverage	0.0162

Note: DL/2 is not a recommended method.

Zinc

General Statistics

Number of Valid Data	10	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	9

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Zinc was not processed!

ATTACHMENT B.3

PROUCL OUTPUT
DISSOLVED METALS IN SHALLOW WATER BEARING UNIT

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Dissolved Metals - Shallow.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	10000

Aluminum

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	1.6	Minimum Detected	0.47
Maximum Detected	3.4	Maximum Detected	1.224
Mean of Detected	2.5	Mean of Detected	0.847
SD of Detected	1.273	SD of Detected	0.533
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A

Data not Normal at 5% Significance Level

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

Assuming Lognormal Distribution

DL/2 Substitution Method	
Mean	0.575
SD	1.181
95% UTL 95% Coverage	4.153
95% UPL (t)	2.889
90% Percentile (z)	2.088
95% Percentile (z)	2.517
99% Percentile (z)	3.321

Maximum Likelihood Estimate(MLE) Method	N/A

DL/2 Substitution Method	
Mean (Log Scale)	-2.681
SD (Log Scale)	2.009
95% UTL 95% Coverage	30.21
95% UPL (t)	3.514
90% Percentile (z)	0.899
95% Percentile (z)	1.865
99% Percentile (z)	7.334

Log ROS Method	
Mean in Original Scale	N/A
SD in Original Scale	N/A
Mean in Log Scale	N/A
SD in Log Scale	N/A
95% UTL 95% Coverage	N/A
95% UPL (t)	N/A
90% Percentile (z)	N/A
95% Percentile (z)	N/A
99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	1.8
SD	0.566
SE of Mean	0.267
95% KM UTL with 95% Coverage	3.515
95% KM Chebyshev UPL	4.399
95% KM UPL (t)	2.909
90% Percentile (z)	2.525
95% Percentile (z)	2.73
99% Percentile (z)	3.116

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Note: DL/2 is not a recommended method.

Antimony

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.00014	Minimum Detected	-8.874
Maximum Detected	0.0004	Maximum Detected	-7.824
Mean of Detected	0.00027	Mean of Detected	-8.349
SD of Detected	0.0001839	SD of Detected	0.742
Minimum Non-Detect	0.002	Minimum Non-Detect	-6.215
Maximum Non-Detect	0.002	Maximum Non-Detect	-6.215

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.0008378	Mean (Log Scale)		-7.228
SD		0.0003284	SD (Log Scale)		0.688
95% UTL	95% Coverage	0.00183	95% UTL	95% Coverage	0.00583
95% UPL (t)		0.00148	95% UPL (t)		0.00279
90% Percentile (z)		0.00126	90% Percentile (z)		0.00175
95% Percentile (z)		0.00138	95% Percentile (z)		0.00225
99% Percentile (z)		0.0016	99% Percentile (z)		0.00359

Maximum Likelihood Estimate(MLE) Method	N/A

Log ROS Method		
Mean in Original Scale		N/A
SD in Original Scale		N/A
Mean in Log Scale		N/A
SD in Log Scale		N/A
95% UTL	95% Coverage	N/A
	95% UPL (t)	N/A
	90% Percentile (z)	N/A
	95% Percentile (z)	N/A
	99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method		
Mean		0.00027
SD		0.00013
SE of Mean		0.00013
95% KM UTL with	95% Coverage	0.000664
	95% KM Chebyshev UPL	0.0008673
	95% KM UPL (t)	0.0005248
	90% Percentile (z)	0.0004366
	95% Percentile (z)	0.0004838
	99% Percentile (z)	0.0005724

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL		N/A
95% WH Approx. Gamma UTL with	95% Coverage	N/A
95% HW Approx. Gamma UTL with	95% Coverage	N/A

Note: DL/2 is not a recommended method.

Arsenic

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7

Warning: Data set has only 2 Detected Values.

This is not enough to compute meaningful and reliable test statistics and estimates.

No statistics will be produced!

Tolerance Factor	3.031	Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0066	Minimum Detected	-5.021
Maximum Detected	0.0072	Maximum Detected	-4.934
Mean of Detected	0.0069	Mean of Detected	-4.977
SD of Detected	0.0004243	SD of Detected	0.0615
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Warning: Data set has only 2 Distinct Detected Values.

This may not be adequate enough to compute meaningful and reliable test statistics and estimates.

The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

Unless Data Quality Objectives (DQOs) have been met, it is suggested to collect additional observations.

The number of detected data may not be adequate enough to perform GOF tests, bootstrap, and ROS methods.

Those methods will return a 'N/A' value on your output display!

It is necessary to have 4 or more Distinct Values for bootstrap methods.

However, results obtained using 4 to 9 distinct values may not be reliable.

It is recommended to have 10 to 15 or more observations for accurate and meaningful results and estimates.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	N/A	Shapiro Wilk Test Statistic	N/A
5% Shapiro Wilk Critical Value	N/A	5% Shapiro Wilk Critical Value	N/A
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.00348	Mean (Log Scale)		-5.766
SD		0.00195	SD (Log Scale)		0.448
95% UTL	95% Coverage	0.00938	95% UTL	95% Coverage	0.0122
95% UPL (t)		0.00729	95% UPL (t)		0.00753
90% Percentile (z)		0.00597	90% Percentile (z)		0.00556
95% Percentile (z)		0.00668	95% Percentile (z)		0.00654
99% Percentile (z)		0.008	99% Percentile (z)		0.00888

Maximum Likelihood Estimate(MLE) Method	N/A

Log ROS Method	
Mean in Original Scale	N/A
SD in Original Scale	N/A
Mean in Log Scale	N/A
SD in Log Scale	N/A
95% UTL 95% Coverage	N/A
95% UPL (t)	N/A
90% Percentile (z)	N/A
95% Percentile (z)	N/A
99% Percentile (z)	N/A

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	N/A
Theta Star	N/A
nu star	N/A
A-D Test Statistic	N/A
5% A-D Critical Value	N/A
K-S Test Statistic	N/A
5% K-S Critical Value	N/A

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data	
Mean	N/A
Median	N/A
SD	N/A
k star	N/A
Theta star	N/A
Nu star	N/A
95% Percentile of Chisquare (2k)	N/A
90% Percentile	N/A
95% Percentile	N/A
99% Percentile	N/A

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method	
Mean	0.00667
SD	0.0001886
SE of Mean	8.889E-05
95% KM UTL with 95% Coverage	0.00724
95% KM Chebyshev UPL	0.00753
95% KM UPL (t)	0.00704
90% Percentile (z)	0.00691
95% Percentile (z)	0.00698
99% Percentile (z)	0.00711

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	N/A
95% Hawkins Wixley (HW) Approx. Gamma UPL	N/A
95% WH Approx. Gamma UTL with 95% Coverage	N/A
95% HW Approx. Gamma UTL with 95% Coverage	N/A

Note: DL/2 is not a recommended method.

Barium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	8
Tolerance Factor	3.031		

Raw Statistics

Minimum	0.027
Maximum	0.077
Second Largest	0.071
First Quartile	0.035
Median	0.045
Third Quartile	0.053
Mean	0.0474
Geometric Mean	0.0448
SD	0.0174
Coefficient of Variation	0.366
Skewness	0.726

Log-Transformed Statistics

Minimum	-3.612
Maximum	-2.564
Second Largest	-2.645
First Quartile	-3.352
Median	-3.101
Third Quartile	-2.937
Mean	-3.106
SD	0.357

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.909
Shapiro Wilk Critical Value	0.829

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.946
Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with	95% Coverage	0.1
	95% UPL (t)	0.0815
	90% Percentile (z)	0.0697
	95% Percentile (z)	0.076
	99% Percentile (z)	0.0879

Assuming Lognormal Distribution

95% UTL with	95% Coverage	0.132
	95% UPL (t)	0.0903
	90% Percentile (z)	0.0708
	95% Percentile (z)	0.0806
	99% Percentile (z)	0.103

Gamma Distribution Test

k star	5.978
Theta Star	0.00794
MLE of Mean	0.0474
MLE of Standard Deviation	0.0194
nu star	107.6
A-D Test Statistic	0.329
5% A-D Critical Value	0.722
K-S Test Statistic	0.217
5% K-S Critical Value	0.279

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	0.0722
95% Percentile	0.0746
99% Percentile	0.0765

Assuming Gamma Distribution		95% UTL with	95% Coverage 0.077
90% Percentile	0.0734	95% Percentile Bootstrap UTL with	95% Coverage 0.077
95% Percentile	0.0832	95% BCA Bootstrap UTL with	95% Coverage 0.077
99% Percentile	0.104	95% UPL	0.077
		95% Chebyshev UPL	0.127
95% WH Approx. Gamma UPL	0.0862	Upper Threshold Limit Based upon IQR	0.08
95% HW Approx. Gamma UPL	0.0871		
95% WH Approx. Gamma UTL with	95% Coverage 0.116		
95% HW Approx. Gamma UTL with	95% Coverage 0.119		

Beryllium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	124	Number of Detected Data	30
Number of Distinct Detected Data	12	Number of Non-Detect Data	94
Tolerance Factor	1.892	Percent Non-Detects	75.81%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.017
Mean of Detected	0.00812
SD of Detected	0.0037
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-4.075
Mean of Detected	-4.948
SD of Detected	0.588
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	124
Number treated as Detected with Single DL	0
Single DL Non-Detect Percentage	100.00%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.957
5% Shapiro Wilk Critical Value	0.927

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.884
5% Shapiro Wilk Critical Value	0.927

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00525
SD		0.00333
95% UTL	95% Coverage	0.0115
	95% UPL (t)	0.0108
	90% Percentile (z)	0.00952
	95% Percentile (z)	0.0107
	99% Percentile (z)	0.013

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.432
SD (Log Scale)		0.596
95% UTL	95% Coverage	0.0135
	95% UPL (t)	0.0118
	90% Percentile (z)	0.00939
	95% Percentile (z)	0.0117
	99% Percentile (z)	0.0175

Log ROS Method

Mean in Original Scale		0.00422
SD in Original Scale		0.0032
Mean in Log Scale		-5.722
SD in Log Scale		0.719
95% UTL	95% Coverage	0.0128
	95% UPL (t)	0.0108
	90% Percentile (z)	0.00823
	95% Percentile (z)	0.0107
	99% Percentile (z)	0.0174

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.521
Theta Star	0.00231
nu star	211.3

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

A-D Test Statistic	0.838
5% A-D Critical Value	0.75
K-S Test Statistic	0.18
5% K-S Critical Value	0.161

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00449
Median	0.00449
SD	0.00377
k star	0.36
Theta star	0.0125
Nu star	89.3
95% Percentile of Chisquare (2k)	3.102
90% Percentile	0.0129
95% Percentile	0.0193
99% Percentile	0.0357

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.00429
SD	0.00323
SE of Mean	0.0004727
95% KM UTL with 95% Coverage	0.0104
95% KM Chebyshev UPL	0.0184
95% KM UPL (t)	0.00967
90% Percentile (z)	0.00844
95% Percentile (z)	0.00961
99% Percentile (z)	0.0118

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0178
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0228
95% WH Approx. Gamma UTL with 95% Coverage	0.0216
95% HW Approx. Gamma UTL with 95% Coverage	0.029

Note: DL/2 is not a recommended method.

Cobalt

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cobalt was not processed!

Copper

General Statistics

Number of Valid Data	124	Number of Detected Data	23
Number of Distinct Detected Data	11	Number of Non-Detect Data	101
Tolerance Factor	1.892	Percent Non-Detects	81.45%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.027
Mean of Detected	0.00451
SD of Detected	0.00537
Minimum Non-Detect	0.001
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-3.612
Mean of Detected	-5.758
SD of Detected	0.798
Minimum Non-Detect	-6.908
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	123
Number treated as Detected with Single DL	1
Single DL Non-Detect Percentage	99.19%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.567
5% Shapiro Wilk Critical Value	0.914

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.914

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00399
SD		0.00342
95% UTL	95% Coverage	0.0105
95% UPL (t)		0.00968
90% Percentile (z)		0.00837
95% Percentile (z)		0.00961
99% Percentile (z)		0.0119

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.788
SD (Log Scale)		0.719
95% UTL	95% Coverage	0.0119
95% UPL (t)		0.0101
90% Percentile (z)		0.0077
95% Percentile (z)		0.01
99% Percentile (z)		0.0163

Log ROS Method

Mean in Original Scale		0.00217
SD in Original Scale		0.00275
Mean in Log Scale		-6.489
SD in Log Scale		0.805
95% UTL	95% Coverage	0.00697
95% UPL (t)		0.0058
90% Percentile (z)		0.00426
95% Percentile (z)		0.00571
99% Percentile (z)		0.00989

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.374
Theta Star	0.00329
nu star	63.18

Data Distribution Test with Detected Values Only

Data follow Appr. Gamma Distribution at 5% Significance Level

A-D Test Statistic	0.916
5% A-D Critical Value	0.76
K-S Test Statistic	0.173
5% K-S Critical Value	0.185

Data follow Appx. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00241
Median	0.00164
SD	0.00324
k star	0.257
Theta star	0.00939
Nu star	63.72
95% Percentile of Chisquare (2k)	2.467
90% Percentile	0.00723
95% Percentile	0.0116
99% Percentile	0.0231

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.00231
SD	0.0027
SE of Mean	0.0002981
95% KM UTL with 95% Coverage	0.00742
95% KM Chebyshev UPL	0.0141
95% KM UPL (t)	0.0068
90% Percentile (z)	0.00577
95% Percentile (z)	0.00675
99% Percentile (z)	0.00859

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0103
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0127
95% WH Approx. Gamma UTL with 95% Coverage	0.0128
95% HW Approx. Gamma UTL with 95% Coverage	0.0168

Note: DL/2 is not a recommended method.

Iron

General Statistics

Number of Valid Data	63	Number of Detected Data	52
Number of Distinct Detected Data	42	Number of Non-Detect Data	11
Tolerance Factor	2.007	Percent Non-Detects	17.46%

Raw Statistics

Minimum Detected	0.01
Maximum Detected	10.6
Mean of Detected	0.892
SD of Detected	1.769
Minimum Non-Detect	0.02
Maximum Non-Detect	0.1

Log-transformed Statistics

Minimum Detected	-4.605
Maximum Detected	2.361
Mean of Detected	-1.24
SD of Detected	1.473
Minimum Non-Detect	-3.912
Maximum Non-Detect	-2.303

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	20
Number treated as Detected with Single DL	43
Single DL Non-Detect Percentage	31.75%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.359
5% Lilliefors Critical Value	0.123

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.163
5% Lilliefors Critical Value	0.123

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.741
SD		1.638
95% UTL	95% Coverage	4.028
95% UPL (t)		3.498
90% Percentile (z)		2.84
95% Percentile (z)		3.435
99% Percentile (z)		4.552

Maximum Likelihood Estimate(MLE) Method

Mean		0.253
SD		2.079
95% UTL with	95% Coverage	4.423
95% UPL (t)		3.751
90% Percentile (z)		2.917
95% Percentile (z)		3.672
99% Percentile (z)		5.088

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-1.7
SD (Log Scale)		1.707
95% UTL	95% Coverage	5.615
95% UPL (t)		3.232
90% Percentile (z)		1.629
95% Percentile (z)		3.028
99% Percentile (z)		9.694

Log ROS Method

Mean in Original Scale		0.74
SD in Original Scale		1.639
95% UTL with	95% Coverage	6
95% BCA UTL with	95% Coverage	4.36
95% Bootstrap (%) UTL with	95% Coverage	4.4
95% UPL (t)		3.391
90% Percentile (z)		1.671
95% Percentile (z)		3.171
99% Percentile (z)		10.55

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.536
Theta Star	1.663
nu star	55.75

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	3.349
5% A-D Critical Value	0.81
K-S Test Statistic	0.273
5% K-S Critical Value	0.13

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.736
Median	0.19
SD	1.64
k star	0.23
Theta star	3.205
Nu star	28.94
95% Percentile of Chisquare (2k)	2.279
90% Percentile	2.22
95% Percentile	3.652
99% Percentile	7.511

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.739
SD	1.626
SE of Mean	0.207
95% KM UTL with 95% Coverage	4.002
95% KM Chebyshev UPL	7.882
95% KM UPL (t)	3.476
90% Percentile (z)	2.823
95% Percentile (z)	3.414
99% Percentile (z)	4.522

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.779
95% Hawkins Wixley (HW) Approx. Gamma UPL	3.177
95% WH Approx. Gamma UTL with 95% Coverage	3.775
95% HW Approx. Gamma UTL with 95% Coverage	4.619

Note: DL/2 is not a recommended method.

Lead

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead was not processed!

Manganese

General Statistics

Number of Valid Data	59	Number of Detected Data	45
Number of Distinct Detected Data	41	Number of Non-Detect Data	14
Tolerance Factor	2.02	Percent Non-Detects	23.73%

Raw Statistics

Minimum Detected	0.0016
Maximum Detected	0.448
Mean of Detected	0.123
SD of Detected	0.117
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.438
Maximum Detected	-0.803
Mean of Detected	-2.776
SD of Detected	1.411
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	22
Number treated as Detected with Single DL	37
Single DL Non-Detect Percentage	37.29%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.867
5% Shapiro Wilk Critical Value	0.945

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.928
5% Shapiro Wilk Critical Value	0.945

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0945
SD		0.114
95% UTL	95% Coverage	0.326
95% UPL (t)		0.287
90% Percentile (z)		0.241
95% Percentile (z)		0.283
99% Percentile (z)		0.361

Maximum Likelihood Estimate(MLE) Method

Mean		0.0588
SD		0.156
95% UTL with	95% Coverage	0.373
95% UPL (t)		0.321
90% Percentile (z)		0.258
95% Percentile (z)		0.315
99% Percentile (z)		0.421

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-3.497
SD (Log Scale)		1.804
95% UTL	95% Coverage	1.16
95% UPL (t)		0.634
90% Percentile (z)		0.306
95% Percentile (z)		0.589
99% Percentile (z)		2.015

Log ROS Method

Mean in Original Scale		0.0948
SD in Original Scale		0.114
95% UTL with	95% Coverage	1.082
95% BCA UTL with	95% Coverage	0.426
95% Bootstrap (%) UTL with	95% Coverage	0.426
95% UPL (t)		0.605
90% Percentile (z)		0.3
95% Percentile (z)		0.564
99% Percentile (z)		1.84

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.823
Theta Star	0.149
nu star	74.03

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

A-D Test Statistic	0.475
5% A-D Critical Value	0.784
K-S Test Statistic	0.109
5% K-S Critical Value	0.136

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0937
Median	0.042
SD	0.115
k star	0.236
Theta star	0.397
Nu star	27.84
95% Percentile of Chisquare (2k)	2.323
90% Percentile	0.282
95% Percentile	0.461
99% Percentile	0.942

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0943
SD	0.114
SE of Mean	0.0149
95% KM UTL with 95% Coverage	0.324
95% KM Chebyshev UPL	0.593
95% KM UPL (t)	0.286
90% Percentile (z)	0.24
95% Percentile (z)	0.281
99% Percentile (z)	0.358

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.402
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.508
95% WH Approx. Gamma UTL with 95% Coverage	0.547
95% HW Approx. Gamma UTL with 95% Coverage	0.75

Note: DL/2 is not a recommended method.

Mercury

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Nickel

General Statistics

Number of Valid Data	124	Number of Detected Data	42
Number of Distinct Detected Data	19	Number of Non-Detect Data	82
Tolerance Factor	1.892	Percent Non-Detects	66.13%

Raw Statistics

Minimum Detected	0.002
Maximum Detected	0.062
Mean of Detected	0.0101
SD of Detected	0.01
Minimum Non-Detect	0.005
Maximum Non-Detect	0.04

Log-transformed Statistics

Minimum Detected	-6.215
Maximum Detected	-2.781
Mean of Detected	-4.836
SD of Detected	0.623
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.219

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	123
Number treated as Detected with Single DL	1
Single DL Non-Detect Percentage	99.19%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.567
5% Shapiro Wilk Critical Value	0.942

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.9
5% Shapiro Wilk Critical Value	0.942

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00674
SD		0.00736
95% UTL	95% Coverage	0.0207
	95% UPL (t)	0.019
	90% Percentile (z)	0.0162
	95% Percentile (z)	0.0189
	99% Percentile (z)	0.0239

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.336
SD (Log Scale)		0.762
95% UTL	95% Coverage	0.0203
	95% UPL (t)	0.0171
	90% Percentile (z)	0.0128
	95% Percentile (z)	0.0168
	99% Percentile (z)	0.0283

Log ROS Method

Mean in Original Scale		0.00542
SD in Original Scale		0.00684
Mean in Log Scale		-5.584
SD in Log Scale		0.808
95% UTL	95% Coverage	0.0173
	95% UPL (t)	0.0144
	90% Percentile (z)	0.0106
	95% Percentile (z)	0.0142
	99% Percentile (z)	0.0246

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.107
Theta Star	0.00478
nu star	177

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	2.244
5% A-D Critical Value	0.758
K-S Test Statistic	0.238
5% K-S Critical Value	0.138

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00499
Median	0.00401
SD	0.00736
k star	0.249
Theta star	0.02
Nu star	61.73
95% Percentile of Chisquare (2k)	2.413
90% Percentile	0.015
95% Percentile	0.0242
99% Percentile	0.0487

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.00589
SD	0.00669
SE of Mean	0.0006795
95% KM UTL with 95% Coverage	0.0185
95% KM Chebyshev UPL	0.0351
95% KM UPL (t)	0.017
90% Percentile (z)	0.0145
95% Percentile (z)	0.0169
99% Percentile (z)	0.0214

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0211
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0264
95% WH Approx. Gamma UTL with 95% Coverage	0.0263
95% HW Approx. Gamma UTL with 95% Coverage	0.0348

Note: DL/2 is not a recommended method.

Selenium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.00021	Minimum Detected	-8.468
Maximum Detected	0.00084	Maximum Detected	-7.082
Mean of Detected	0.0003925	Mean of Detected	-8.015
SD of Detected	0.0002994	SD of Detected	0.631
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.001	Maximum Non-Detect	-6.908

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.708	Shapiro Wilk Test Statistic	0.78
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0004522	Mean (Log Scale)	-7.785
SD	0.0001919	SD (Log Scale)	0.444
95% UTL 95% Coverage	0.00103	95% UTL 95% Coverage	0.0016
95% UPL (t)	0.0008283	95% UPL (t)	0.0009928
90% Percentile (z)	0.0006981	90% Percentile (z)	0.0007346
95% Percentile (z)	0.0007678	95% Percentile (z)	0.0008631
99% Percentile (z)	0.0008986	99% Percentile (z)	0.00117
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
		Mean in Original Scale	0.0003832
		SD in Original Scale	0.0002364
		Mean in Log Scale	-8.015
		SD in Log Scale	0.561
		95% UTL 95% Coverage	0.00181
		95% UPL (t)	0.0009918
		90% Percentile (z)	0.0006778
		95% Percentile (z)	0.000831
		99% Percentile (z)	0.00122

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.931
Theta Star	0.0004217
nu star	7.446
A-D Test Statistic	0.683
5% A-D Critical Value	0.659
K-S Test Statistic	0.412
5% K-S Critical Value	0.397

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0003929
Median	0.00027
SD	0.0002572
k star	1.737
Theta star	0.0002262
Nu star	31.26
95% Percentile of Chisquare (2k)	8.621
90% Percentile	0.0007902
95% Percentile	0.0009752
99% Percentile	0.00139

Data Distribution Test with Detected Values Only

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0003925
SD	0.0002593
SE of Mean	0.0001497
95% KM UTL with 95% Coverage	0.00118
95% KM Chebyshev UPL	0.00158
95% KM UPL (t)	0.0009007
90% Percentile (z)	0.0007248
95% Percentile (z)	0.000819
99% Percentile (z)	0.0009956

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.00106
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.00111
95% WH Approx. Gamma UTL with 95% Coverage	0.00171
95% HW Approx. Gamma UTL with 95% Coverage	0.00188

Note: DL/2 is not a recommended method.

Vanadium

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Vanadium was not processed!

Zinc

General Statistics

Number of Valid Data	124	Number of Detected Data	71
Number of Distinct Detected Data	27	Number of Non-Detect Data	53
Tolerance Factor	1.892	Percent Non-Detects	42.74%

Raw Statistics

Minimum Detected	0.005
Maximum Detected	0.15
Mean of Detected	0.0212
SD of Detected	0.023
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-5.298
Maximum Detected	-1.897
Mean of Detected	-4.174
SD of Detected	0.729
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	100
Number treated as Detected with Single DL	24
Single DL Non-Detect Percentage	80.65%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.296
5% Lilliefors Critical Value	0.105

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.134
5% Lilliefors Critical Value	0.105

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0142
SD		0.0193
95% UTL	95% Coverage	0.0507
95% UPL (t)		0.0463
90% Percentile (z)		0.0389
95% Percentile (z)		0.046
99% Percentile (z)		0.0591

Maximum Likelihood Estimate(MLE) Method

Mean		-0.0233
SD		0.048
95% UTL with	95% Coverage	0.0675
95% UPL (t)		0.0566
90% Percentile (z)		0.0382
95% Percentile (z)		0.0557
99% Percentile (z)		0.0884

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-4.755
SD (Log Scale)		0.956
95% UTL	95% Coverage	0.0526
95% UPL (t)		0.0423
90% Percentile (z)		0.0293
95% Percentile (z)		0.0415
99% Percentile (z)		0.0796

Log ROS Method

Mean in Original Scale		0.0139
SD in Original Scale		0.0194
95% UTL with	95% Coverage	0.0567
95% BCA UTL with	95% Coverage	0.06
95% Bootstrap (%) UTL with	95% Coverage	0.06
95% UPL (t)		0.0447
90% Percentile (z)		0.0301
95% Percentile (z)		0.0439
99% Percentile (z)		0.0888

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.641
Theta Star	0.0129
nu star	233.1

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	3.807
5% A-D Critical Value	0.767
K-S Test Statistic	0.202
5% K-S Critical Value	0.107

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0129
Median	0.00907
SD	0.0202
k star	0.21
Theta star	0.0615
Nu star	52.05
95% Percentile of Chisquare (2k)	2.136
90% Percentile	0.0391
95% Percentile	0.0657
99% Percentile	0.138

Note: DL/2 is not a recommended method.

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0147
SD	0.0189
SE of Mean	0.00172
95% KM UTL with 95% Coverage	0.0505
95% KM Chebyshev UPL	0.0976
95% KM UPL (t)	0.0462
90% Percentile (z)	0.039
95% Percentile (z)	0.0458
99% Percentile (z)	0.0588

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0553
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0694
95% WH Approx. Gamma UTL with 95% Coverage	0.0694
95% HW Approx. Gamma UTL with 95% Coverage	0.0926

ATTACHMENT B.4

PROUCL OUTPUT
DISSOLVED METALS IN DEEP AQUIFER

General Background Statistics for Data Sets with Non-Detects

User Selected Options

From File	C:\Documents and Settings\rchatfield\Desktop\Peregrine - Pro UCL\12636 Dissolved Metals - Deep.wst
Full Precision	OFF
Confidence Coefficient	95%
Coverage	95%
Different or Future K Values	1
Number of Bootstrap Operations	10000

Aluminum

General Statistics

Number of Valid Data	9	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Non-Detect Data	4
Tolerance Factor	3.031	Percent Non-Detects	44.44%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.019	Minimum Detected	-3.963
Maximum Detected	0.1	Maximum Detected	-2.303
Mean of Detected	0.0575	Mean of Detected	-3.024
SD of Detected	0.0341	SD of Detected	0.679
Minimum Non-Detect	0.05	Minimum Non-Detect	-2.996
Maximum Non-Detect	0.05	Maximum Non-Detect	-2.996

Warning: There are only 5 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.939	Shapiro Wilk Test Statistic	0.952
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0431	Mean (Log Scale)	-3.319
SD	0.0296	SD (Log Scale)	0.594
95% UTL 95% Coverage	0.133	95% UTL 95% Coverage	0.219
95% UPL (t)	0.101	95% UPL (t)	0.116
90% Percentile (z)	0.081	90% Percentile (z)	0.0775
95% Percentile (z)	0.0917	95% Percentile (z)	0.0962
99% Percentile (z)	0.112	99% Percentile (z)	0.144
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
		Mean in Original Scale	0.0466

SD in Original Scale	0.0285
Mean in Log Scale	-3.224
SD in Log Scale	0.59
95% UTL 95% Coverage	0.238
95% UPL (t)	0.127
90% Percentile (z)	0.0848
95% Percentile (z)	0.105
99% Percentile (z)	0.157

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.389
Theta Star	0.0414
nu star	13.89
A-D Test Statistic	0.242
5% A-D Critical Value	0.682
K-S Test Statistic	0.222
5% K-S Critical Value	0.359

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0479
Median	0.0456
SD	0.0303
k star	1.623
Theta star	0.0295
Nu star	29.21
95% Percentile of Chisquare (2k)	8.236
90% Percentile	0.0979
95% Percentile	0.122
99% Percentile	0.175

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0471
SD	0.0269
SE of Mean	0.0111
95% KM UTL with 95% Coverage	0.129
95% KM Chebyshev UPL	0.171
95% KM UPL (t)	0.0998
90% Percentile (z)	0.0815
95% Percentile (z)	0.0913
99% Percentile (z)	0.11

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.133
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.141
95% WH Approx. Gamma UTL with 95% Coverage	0.217
95% HW Approx. Gamma UTL with 95% Coverage	0.243

Note: DL/2 is not a recommended method.

Antimony

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Antimony was not processed!

Arsenic

General Statistics

Number of Valid Data	9	Number of Detected Data	7
Number of Distinct Detected Data	6	Number of Non-Detect Data	2
Tolerance Factor	3.031	Percent Non-Detects	22.22%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.014	Minimum Detected	-4.269
Maximum Detected	0.048	Maximum Detected	-3.037
Mean of Detected	0.0368	Mean of Detected	-3.364
SD of Detected	0.0113	SD of Detected	0.419
Minimum Non-Detect	0.005	Minimum Non-Detect	-5.298
Maximum Non-Detect	0.005	Maximum Non-Detect	-5.298

Warning: There are only 7 Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.845	Shapiro Wilk Test Statistic	0.728
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data appear Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution			Assuming Lognormal Distribution		
DL/2 Substitution Method			DL/2 Substitution Method		
Mean		0.0292	Mean (Log Scale)		-3.947
SD		0.018	SD (Log Scale)		1.214
95% UTL	95% Coverage	0.0838	95% UTL	95% Coverage	0.766
95% UPL (t)		0.0645	95% UPL (t)		0.209
90% Percentile (z)		0.0523	90% Percentile (z)		0.0915
95% Percentile (z)		0.0588	95% Percentile (z)		0.142
99% Percentile (z)		0.0711	99% Percentile (z)		0.325
Maximum Likelihood Estimate(MLE) Method			Log ROS Method		
Mean		0.0275	Mean in Original Scale		0.0319
SD		0.0202	SD in Original Scale		0.0138
95% UTL with	95% Coverage	0.0886	95% UTL with	95% Coverage	0.14
			95% BCA UTL with	95% Coverage	0.048
			95% Bootstrap (%) UTL with	95% Coverage	0.048
95% UPL (t)		0.067	95% UPL (t)		0.0799
90% Percentile (z)		0.0533	90% Percentile (z)		0.0561
95% Percentile (z)		0.0606	95% Percentile (z)		0.0678
99% Percentile (z)		0.0744	99% Percentile (z)		0.0967

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	4.883
Theta Star	0.00753
nu star	68.37
A-D Test Statistic	0.794
5% A-D Critical Value	0.709
K-S Test Statistic	0.346
5% K-S Critical Value	0.312

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0293
Median	0.036
SD	0.0179
k star	0.428
Theta star	0.0684
Nu star	7.708
95% Percentile of Chisquare (2k)	3.475
90% Percentile	0.0818
95% Percentile	0.119
99% Percentile	0.212

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0317
SD	0.0132
SE of Mean	0.00477
95% KM UTL with 95% Coverage	0.0719
95% KM Chebyshev UPL	0.0926
95% KM UPL (t)	0.0577
90% Percentile (z)	0.0487
95% Percentile (z)	0.0535
99% Percentile (z)	0.0625

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.129
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.178
95% WH Approx. Gamma UTL with 95% Coverage	0.25
95% HW Approx. Gamma UTL with 95% Coverage	0.413

Barium

General Statistics

Total Number of Observations	9	Number of Distinct Observations	9
Tolerance Factor	3.031		

Raw Statistics		Log-Transformed Statistics	
Minimum	0.042	Minimum	-3.17
Maximum	0.33	Maximum	-1.109
Second Largest	0.17	Second Largest	-1.772
First Quartile	0.049	First Quartile	-3.016
Median	0.08	Median	-2.526
Third Quartile	0.16	Third Quartile	-1.833
Mean	0.123	Mean	-2.325
Geometric Mean	0.0978	SD	0.708
SD	0.0927		
Coefficient of Variation	0.755		
Skewness	1.518		

Warning: There are only 9 Values in this data

Note: It should be noted that even though bootstrap methods may be performed on this data set, the resulting calculations may not be reliable enough to draw conclusions

The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.824	Shapiro Wilk Test Statistic	0.921
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 95% Coverage	0.404	95% UTL with 95% Coverage	0.835
95% UPL (t)	0.305	95% UPL (t)	0.392
90% Percentile (z)	0.242	90% Percentile (z)	0.242
95% Percentile (z)	0.275	95% Percentile (z)	0.313
99% Percentile (z)	0.339	99% Percentile (z)	0.507

Gamma Distribution Test		Data Distribution Test
k star	1.637	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.0751	
MLE of Mean	0.123	
MLE of Standard Deviation	0.0961	
nu star	29.46	
A-D Test Statistic	0.431	Nonparametric Statistics
5% A-D Critical Value	0.729	90% Percentile 0.202
K-S Test Statistic	0.206	95% Percentile 0.266
5% K-S Critical Value	0.282	99% Percentile 0.317
Data appear Gamma Distributed at 5% Significance Level		

Assuming Gamma Distribution				
90% Percentile	0.251	95% UTL with	95% Coverage	0.33
95% Percentile	0.311	95% Percentile Bootstrap UTL with	95% Coverage	0.33
99% Percentile	0.446	95% BCA Bootstrap UTL with	95% Coverage	0.33
		95% UPL		0.33
		95% Chebyshev UPL		0.549
95% WH Approx. Gamma UPL	0.34	Upper Threshold Limit Based upon IQR		0.327
95% HW Approx. Gamma UPL	0.349			
95% WH Approx. Gamma UTL with	95% Coverage 0.553			
95% HW Approx. Gamma UTL with	95% Coverage 0.596			

Beryllium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Beryllium was not processed!

Cadmium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cadmium was not processed!

Chromium

General Statistics

Number of Valid Data	117	Number of Detected Data	20
Number of Distinct Detected Data	10	Number of Non-Detect Data	97
Tolerance Factor	1.9	Percent Non-Detects	82.91%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.032
Mean of Detected	0.00925
SD of Detected	0.00614
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-3.442
Mean of Detected	-4.883
SD of Detected	0.719
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	116
Number treated as Detected with Single DL	1
Single DL Non-Detect Percentage	99.15%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.684
5% Shapiro Wilk Critical Value	0.905

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.805
5% Shapiro Wilk Critical Value	0.905

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00534
SD		0.00391
95% UTL	95% Coverage	0.0128
	95% UPL (t)	0.0119
	90% Percentile (z)	0.0104
	95% Percentile (z)	0.0118
	99% Percentile (z)	0.0144

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.429
SD (Log Scale)		0.609
95% UTL	95% Coverage	0.014
	95% UPL (t)	0.0121
	90% Percentile (z)	0.00958
	95% Percentile (z)	0.0119
	99% Percentile (z)	0.0181

Log ROS Method

Mean in Original Scale		0.00381
SD in Original Scale		0.00386
Mean in Log Scale		-5.916
SD in Log Scale		0.829
95% UTL	95% Coverage	0.013
	95% UPL (t)	0.0107
	90% Percentile (z)	0.0078
	95% Percentile (z)	0.0105
	99% Percentile (z)	0.0185

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	2.291
Theta Star	0.00404
nu star	91.62

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	1.522
5% A-D Critical Value	0.749
K-S Test Statistic	0.261
5% K-S Critical Value	0.195

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00449
Median	0.00391
SD	0.00456
k star	0.289
Theta star	0.0155
Nu star	67.74
95% Percentile of Chisquare (2k)	2.679
90% Percentile	0.0133
95% Percentile	0.0208
99% Percentile	0.0403

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.00363
SD	0.00395
SE of Mean	0.00056
95% KM UTL with 95% Coverage	0.0111
95% KM Chebyshev UPL	0.0209
95% KM UPL (t)	0.0102
90% Percentile (z)	0.00869
95% Percentile (z)	0.0101
99% Percentile (z)	0.0128

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0189
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0242
95% WH Approx. Gamma UTL with 95% Coverage	0.0234
95% HW Approx. Gamma UTL with 95% Coverage	0.0317

Note: DL/2 is not a recommended method.

Cobalt

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Cobalt was not processed!

Copper

General Statistics

Number of Valid Data	117	Number of Detected Data	17
Number of Distinct Detected Data	9	Number of Non-Detect Data	100
Tolerance Factor	1.9	Percent Non-Detects	85.47%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.203
Mean of Detected	0.0198
SD of Detected	0.0482
Minimum Non-Detect	0.001
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-1.595
Mean of Detected	-5.377
SD of Detected	1.636
Minimum Non-Detect	-6.908
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	111
Number treated as Detected with Single DL	6
Single DL Non-Detect Percentage	94.87%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.413
5% Shapiro Wilk Critical Value	0.892

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.845
5% Shapiro Wilk Critical Value	0.892

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00629
SD		0.0189
95% UTL	95% Coverage	0.0423
95% UPL (t)		0.0378
90% Percentile (z)		0.0305
95% Percentile (z)		0.0374
99% Percentile (z)		0.0503

Maximum Likelihood Estimate(MLE) Method

Mean		-0.156
SD		0.106
95% UTL with	95% Coverage	0.0457
95% UPL (t)		0.0208
90% Percentile (z)		-0.02
95% Percentile (z)		0.0186
99% Percentile (z)		0.091

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.72
SD (Log Scale)		0.932
95% UTL	95% Coverage	0.0193
95% UPL (t)		0.0155
90% Percentile (z)		0.0108
95% Percentile (z)		0.0152
99% Percentile (z)		0.0287

Log ROS Method

Mean in Original Scale		0.00383
SD in Original Scale		0.0191
95% UTL with	95% Coverage	0.0149
95% BCA UTL with	95% Coverage	0.0212
95% Bootstrap (%) UTL with	95% Coverage	0.0212
95% UPL (t)		0.0102
90% Percentile (z)		0.00546
95% Percentile (z)		0.00985
99% Percentile (z)		0.0298

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.406
Theta Star	0.0487
nu star	13.8

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	1.585
5% A-D Critical Value	0.81
K-S Test Statistic	0.249
5% K-S Critical Value	0.223

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00624
Median	0.000001
SD	0.0201
k star	0.149
Theta star	0.0419
Nu star	34.85
95% Percentile of Chisquare (2k)	1.642
90% Percentile	0.0185
95% Percentile	0.0344
99% Percentile	0.0806

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.00389
SD	0.019
SE of Mean	0.00181
95% KM UTL with 95% Coverage	0.04
95% KM Chebyshev UPL	0.087
95% KM UPL (t)	0.0355
90% Percentile (z)	0.0282
95% Percentile (z)	0.0351
99% Percentile (z)	0.0481

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0221
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0228
95% WH Approx. Gamma UTL with 95% Coverage	0.0292
95% HW Approx. Gamma UTL with 95% Coverage	0.0322

Note: DL/2 is not a recommended method.

Iron

General Statistics

Number of Valid Data	58	Number of Detected Data	53
Number of Distinct Detected Data	46	Number of Non-Detect Data	5
Tolerance Factor	2.024	Percent Non-Detects	8.62%

Raw Statistics

Minimum Detected	0.02
Maximum Detected	2.55
Mean of Detected	0.815
SD of Detected	0.746
Minimum Non-Detect	0.01
Maximum Non-Detect	0.1

Log-transformed Statistics

Minimum Detected	-3.912
Maximum Detected	0.936
Mean of Detected	-0.84
SD of Detected	1.322
Minimum Non-Detect	-4.605
Maximum Non-Detect	-2.303

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	11
Number treated as Detected with Single DL	47
Single DL Non-Detect Percentage	18.97%

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.208
5% Lilliefors Critical Value	0.122

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.148
5% Lilliefors Critical Value	0.122

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.747
SD		0.747
95% UTL	95% Coverage	2.26
95% UPL (t)		2.007
90% Percentile (z)		1.705
95% Percentile (z)		1.976
99% Percentile (z)		2.486

Maximum Likelihood Estimate(MLE) Method

Mean		0.661
SD		0.858
95% UTL with	95% Coverage	2.398
95% UPL (t)		2.108
90% Percentile (z)		1.761
95% Percentile (z)		2.073
99% Percentile (z)		2.657

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-1.133
SD (Log Scale)		1.617
95% UTL	95% Coverage	8.5
95% UPL (t)		4.922
90% Percentile (z)		2.558
95% Percentile (z)		4.603
99% Percentile (z)		13.86

Log ROS Method

Mean in Original Scale		0.748
SD in Original Scale		0.747
95% UTL with	95% Coverage	6.918
95% BCA UTL with	95% Coverage	2.4
95% Bootstrap (%) UTL with	95% Coverage	2.423
95% UPL (t)		4.186
90% Percentile (z)		2.293
95% Percentile (z)		3.935
99% Percentile (z)		10.84

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.877
Theta Star	0.93
nu star	92.99

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	1.181
5% A-D Critical Value	0.784
K-S Test Statistic	0.128
5% K-S Critical Value	0.126

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.745
Median	0.325
SD	0.749
k star	0.387
Theta star	1.926
Nu star	44.89
95% Percentile of Chisquare (2k)	3.252
90% Percentile	2.117
95% Percentile	3.132
99% Percentile	5.692

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.747
SD	0.74
SE of Mean	0.0982
95% KM UTL with 95% Coverage	2.246
95% KM Chebyshev UPL	4.003
95% KM UPL (t)	1.996
90% Percentile (z)	1.696
95% Percentile (z)	1.965
99% Percentile (z)	2.47

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	2.772
95% Hawkins Wixley (HW) Approx. Gamma UPL	3.355
95% WH Approx. Gamma UTL with 95% Coverage	3.617
95% HW Approx. Gamma UTL with 95% Coverage	4.643

Note: DL/2 is not a recommended method.

Lead

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Lead was not processed!

Manganese

General Statistics

Number of Valid Data	52	Number of Detected Data	51
Number of Distinct Detected Data	41	Number of Non-Detect Data	1
Tolerance Factor	2.049	Percent Non-Detects	1.92%

Raw Statistics

Minimum Detected	0.0036
Maximum Detected	0.577
Mean of Detected	0.0665
SD of Detected	0.0827
Minimum Non-Detect	0.005
Maximum Non-Detect	0.005

Log-transformed Statistics

Minimum Detected	-5.627
Maximum Detected	-0.55
Mean of Detected	-3.094
SD of Detected	0.895
Minimum Non-Detect	-5.298
Maximum Non-Detect	-5.298

Background Statistics

Normal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.264
5% Lilliefors Critical Value	0.124

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Lilliefors Test Statistic	0.152
5% Lilliefors Critical Value	0.124

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0653
SD		0.0824
95% UTL	95% Coverage	0.234
95% UPL (t)		0.205
90% Percentile (z)		0.171
95% Percentile (z)		0.201
99% Percentile (z)		0.257

Maximum Likelihood Estimate(MLE) Method

Mean		0.0634
SD		0.0839
95% UTL with	95% Coverage	0.235
95% UPL (t)		0.205
90% Percentile (z)		0.171
95% Percentile (z)		0.201
99% Percentile (z)		0.259

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-3.149
SD (Log Scale)		0.973
95% UTL	95% Coverage	0.315
95% UPL (t)		0.222
90% Percentile (z)		0.149
95% Percentile (z)		0.213
99% Percentile (z)		0.413

Log ROS Method

Mean in Original Scale		0.0653
SD in Original Scale		0.0823
95% UTL with	95% Coverage	0.292
95% BCA UTL with	95% Coverage	0.348
95% Bootstrap (%) UTL with	95% Coverage	0.369
95% UPL (t)		0.21
90% Percentile (z)		0.143
95% Percentile (z)		0.201
99% Percentile (z)		0.378

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.378
Theta Star	0.0483
nu star	140.6
A-D Test Statistic	1.305
5% A-D Critical Value	0.769
K-S Test Statistic	0.142

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0653

5% K-S Critical Value	0.127

Data not Gamma Distributed at 5% Significance Level

SD	0.0816
SE of Mean	0.0114
95% KM UTL with 95% Coverage	0.232
95% KM Chebyshev UPL	0.424
95% KM UPL (t)	0.203
90% Percentile (z)	0.17
95% Percentile (z)	0.199
99% Percentile (z)	0.255

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0652
Median	0.049
SD	0.0824
k star	0.966
Theta star	0.0675
Nu star	100.5
95% Percentile of Chisquare (2k)	5.861
90% Percentile	0.151
95% Percentile	0.198
99% Percentile	0.306

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.184
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.198
95% WH Approx. Gamma UTL with 95% Coverage	0.229
95% HW Approx. Gamma UTL with 95% Coverage	0.254

Note: DL/2 is not a recommended method.

Mercury

General Statistics

Number of Valid Data	9
Number of Detected Data	0
Number of Distinct Detected Data	0
Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Mercury was not processed!

Nickel

General Statistics

Number of Valid Data	117	Number of Detected Data	28
Number of Distinct Detected Data	17	Number of Non-Detect Data	89
Tolerance Factor	1.9	Percent Non-Detects	76.07%

Raw Statistics

Minimum Detected	0.001
Maximum Detected	0.054
Mean of Detected	0.0144
SD of Detected	0.0131
Minimum Non-Detect	0.005
Maximum Non-Detect	0.04

Log-transformed Statistics

Minimum Detected	-6.908
Maximum Detected	-2.919
Mean of Detected	-4.602
SD of Detected	0.879
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.219

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	115
Number treated as Detected with Single DL	2
Single DL Non-Detect Percentage	98.29%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.79
5% Shapiro Wilk Critical Value	0.924

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.948
5% Shapiro Wilk Critical Value	0.924

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.00741
SD		0.00855
95% UTL	95% Coverage	0.0237
95% UPL (t)		0.0217
90% Percentile (z)		0.0184
95% Percentile (z)		0.0215
99% Percentile (z)		0.0273

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.329
SD (Log Scale)		0.856
95% UTL	95% Coverage	0.0247
95% UPL (t)		0.0202
90% Percentile (z)		0.0145
95% Percentile (z)		0.0198
99% Percentile (z)		0.0355

Log ROS Method

Mean in Original Scale		0.00507
SD in Original Scale		0.0084
Mean in Log Scale		-6.068
SD in Log Scale		1.239
95% UTL	95% Coverage	0.0244
95% UPL (t)		0.0182
90% Percentile (z)		0.0113
95% Percentile (z)		0.0178
99% Percentile (z)		0.0414

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.398
Theta Star	0.0103
nu star	78.29

Data Distribution Test with Detected Values Only

Data follow Appr. Gamma Distribution at 5% Significance Level

A-D Test Statistic	0.891
5% A-D Critical Value	0.762
K-S Test Statistic	0.138
5% K-S Critical Value	0.168

Data follow Appx. Gamma Distribution at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.00497
Median	0.000001
SD	0.00892
k star	0.176
Theta star	0.0282
Nu star	41.24
95% Percentile of Chisquare (2k)	1.874
90% Percentile	0.015
95% Percentile	0.0264
99% Percentile	0.0586

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0057
SD	0.00831
SE of Mean	0.00112
95% KM UTL with 95% Coverage	0.0215
95% KM Chebyshev UPL	0.0421
95% KM UPL (t)	0.0195
90% Percentile (z)	0.0164
95% Percentile (z)	0.0194
99% Percentile (z)	0.025

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0207
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0238
95% WH Approx. Gamma UTL with 95% Coverage	0.0267
95% HW Approx. Gamma UTL with 95% Coverage	0.0329

Note: DL/2 is not a recommended method.

Selenium

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Selenium was not processed!

Silver

General Statistics

Number of Valid Data	9	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	9

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!
Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!
The Project Team may decide to use alternative site specific values to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Silver was not processed!

Thallium

General Statistics

Number of Valid Data	9	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	5
Tolerance Factor	3.031	Percent Non-Detects	55.56%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.00015	Minimum Detected	-8.805
Maximum Detected	0.00027	Maximum Detected	-8.217
Mean of Detected	0.0002025	Mean of Detected	-8.531
SD of Detected	5.377E-05	SD of Detected	0.263
Minimum Non-Detect	0.001	Minimum Non-Detect	-6.908
Maximum Non-Detect	0.001	Maximum Non-Detect	-6.908

Warning: There are only 4 Distinct Detected Values in this data

Note: It should be noted that even though bootstrap may be performed on this data set the resulting calculations may not be reliable enough to draw conclusions

It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

Background Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.951	Shapiro Wilk Test Statistic	0.963
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution

DL/2 Substitution Method

Mean	0.0003678		
SD	0.0001602		
95% UTL	95% Coverage	0.0008534	
95% UPL (t)		0.0006818	
90% Percentile (z)		0.0005731	
95% Percentile (z)		0.0006313	
99% Percentile (z)		0.0007405	

Maximum Likelihood Estimate(MLE) Method N/A

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)	-8.014		
SD (Log Scale)	0.516		
95% UTL	95% Coverage	0.00158	
95% UPL (t)		0.0009092	
90% Percentile (z)		0.0006407	
95% Percentile (z)		0.0007727	
99% Percentile (z)		0.0011	

Log ROS Method

Mean in Original Scale	0.0002029		
SD in Original Scale	5.087E-05		
Mean in Log Scale	-8.531		
SD in Log Scale	0.251		
95% UTL	95% Coverage	0.0004216	
95% UPL (t)		0.0003224	
90% Percentile (z)		0.000272	
95% Percentile (z)		0.0002979	
99% Percentile (z)		0.0003534	

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	4.994
Theta Star	4.055E-05
nu star	39.95
A-D Test Statistic	0.261
5% A-D Critical Value	0.657
K-S Test Statistic	0.249
5% K-S Critical Value	0.394

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.000202
Median	0.0002088
SD	5.011E-05
k star	11.65
Theta star	1.733E-05
Nu star	209.8
95% Percentile of Chisquare (2k)	35.56
90% Percentile	0.0002806
95% Percentile	0.0003081
99% Percentile	0.0003644

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.0002025
SD	4.657E-05
SE of Mean	2.689E-05
95% KM UTL with 95% Coverage	0.0003437
95% KM Chebyshev UPL	0.0004165
95% KM UPL (t)	0.0002938
90% Percentile (z)	0.0002622
95% Percentile (z)	0.0002791
99% Percentile (z)	0.0003108

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0003153
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0003178
95% WH Approx. Gamma UTL with 95% Coverage	0.0003954
95% HW Approx. Gamma UTL with 95% Coverage	0.000403

Note: DL/2 is not a recommended method.

Vanadium

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8

Warning: Only one distinct data value was detected! ProUCL (or any other software) should not be used on such a data set!

It is suggested to use alternative site specific values determined by the Project Team to estimate environmental parameters (e.g., EPC, BTV).

The data set for variable Vanadium was not processed!

Zinc

General Statistics

Number of Valid Data	117	Number of Detected Data	48
Number of Distinct Detected Data	19	Number of Non-Detect Data	69
Tolerance Factor	1.9	Percent Non-Detects	58.97%

Raw Statistics

Minimum Detected	0.005
Maximum Detected	0.124
Mean of Detected	0.0236
SD of Detected	0.0292
Minimum Non-Detect	0.005
Maximum Non-Detect	0.02

Log-transformed Statistics

Minimum Detected	-5.298
Maximum Detected	-2.087
Mean of Detected	-4.234
SD of Detected	0.912
Minimum Non-Detect	-5.298
Maximum Non-Detect	-3.912

Data with Multiple Detection Limits

Note: Data have multiple DLs - Use of KM Method is recommended

For all methods (except KM, DL/2, and ROS Methods),

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	101
Number treated as Detected with Single DL	16
Single DL Non-Detect Percentage	86.32%

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.638
5% Shapiro Wilk Critical Value	0.947

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.857
5% Shapiro Wilk Critical Value	0.947

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0128
SD		0.0208
95% UTL	95% Coverage	0.0523
95% UPL (t)		0.0475
90% Percentile (z)		0.0395
95% Percentile (z)		0.047
99% Percentile (z)		0.0612

Maximum Likelihood Estimate(MLE) Method

Mean		-0.0569
SD		0.0698
95% UTL with	95% Coverage	0.0757
95% UPL (t)		0.0593
90% Percentile (z)		0.0325
95% Percentile (z)		0.0579
99% Percentile (z)		0.105

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-4.933
SD (Log Scale)		0.928
95% UTL	95% Coverage	0.0421
95% UPL (t)		0.0338
90% Percentile (z)		0.0237
95% Percentile (z)		0.0332
99% Percentile (z)		0.0625

Log ROS Method

Mean in Original Scale		0.0115
SD in Original Scale		0.0213
95% UTL with	95% Coverage	0.0582
95% BCA UTL with	95% Coverage	0.061
95% Bootstrap (%) UTL with	95% Coverage	0.0714
95% UPL (t)		0.0425
90% Percentile (z)		0.0254
95% Percentile (z)		0.0413
99% Percentile (z)		0.103

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.103
Theta Star	0.0214
nu star	105.9

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

A-D Test Statistic	3.637
5% A-D Critical Value	0.775
K-S Test Statistic	0.289
5% K-S Critical Value	0.131

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0109
Median	0.00108
SD	0.0219
k star	0.169
Theta star	0.0645
Nu star	39.53
95% Percentile of Chisquare (2k)	1.814
90% Percentile	0.0327
95% Percentile	0.0585
99% Percentile	0.132

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.013
SD	0.0206
SE of Mean	0.00192
95% KM UTL with 95% Coverage	0.0521
95% KM Chebyshev UPL	0.103
95% KM UPL (t)	0.0473
90% Percentile (z)	0.0394
95% Percentile (z)	0.0468
99% Percentile (z)	0.0608

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL	0.0445
95% Hawkins Wixley (HW) Approx. Gamma UPL	0.0515
95% WH Approx. Gamma UTL with 95% Coverage	0.0575
95% HW Approx. Gamma UTL with 95% Coverage	0.0713

Note: DL/2 is not a recommended method.