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FINAL TECHNICAL MEMORANDUM PRE CHARACTERIZATION FOR SOIL REMOVAL
ACTION, TOPSHAM ANNEX SKEET RANGE AT FORMER NAS BRUNSWICK ME
02/26/2014
AQVIQ -CH2M HILL

Pre-Characterization for Soil Removal Action, Topsham Annex Skeet Range at Former Naval Air Station Brunswick, Topsham, Maine

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AGVIQ-CH2M HILL Constructors, Inc. Joint Venture III (AGVIQ-CH2M HILL) was contracted by the Naval Facilities Engineering Command, Mid-Atlantic (NAVFAC MIDLANT) to conduct a pre-characterization soil investigation associated with a removal action for lead at the Topsham Annex Skeet Range (TASKT). This Technical Memorandum was prepared under Response Action Contract No. N62470-08-D-1006, Task Order (TO) No. WE01. The purpose of this Technical Memorandum is to report the results of the investigation and propose a path forward for the removal action. Following acceptance of this technical memorandum, a work plan will be prepared to outline the specific soil removal activities and confirmation sampling.

1.0 Site Background

The site history is detailed in the work plan entitled *Final Technical Approach Work Plan Pre-Characterization for Soil Removal Action, Topsham Annex Skeet Range* (AGVIQ-CH2M HILL, 2013). TASKT located in the northern portion of the Topsham Annex, in Topsham, Maine, approximately four miles north of the former Naval Air Station (NAS) Brunswick Main Base ([Figure 1](#)). The Topsham Annex property is not part of the former NAS Brunswick (NASB) National Priorities List (NPL) site; however, response action activities are subject to the requirements and provisions of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

In 2009-2010, a Site Inspection (SI) investigation was completed to assess the munitions constituents (MC) at the site (Tetra Tech NUS, Inc., 2011). The primary site-related constituent of concern (COC), or risk driver, is considered to be the residual lead contamination in soil leading to potential exposure for terrestrial ecological receptors. Through the SI, arsenic and polycyclic aromatic hydrocarbons (PAHs) were also identified as COCs at a portion of the site. Therefore, through discussion between the Navy and Maine Department of Environmental Protection (DEP), it was agreed the following was necessary:

- Conduct additional surface soil sampling to close data gaps and complete delineation of the site (supplement the SI dataset); and

- Conduct such supplemental investigative work using a Decision Unit (DU) approach.

The risk-based remedial goal for lead is 155 mg/kg based on terrestrial avian receptors. The cleanup goal will be implemented on a DU-specific 95 percent upper confidence limit (95% UCL) basis. The site cleanup objective is a remedial management value between 130 and 155 mg/kg for lead. For the sake of simplicity, however, the Navy has proposed using the lower end of the remedial management range to evaluate the execution of the proposed remediation activities based on DU-specific 95% UCLs. As discussed and agreed with the Maine DEP, the actual lead cleanup will be determined through a rigorous evaluation of area-wide 95% UCLs and is expected to be within the range of 130 to 155 mg/kg.

2.0 Field Investigation Approach

CH2M HILL conducted the soil investigation August 5-16, 2013 applying the approaches discussed in the following sections.

2.1 Decision Units

A DU approach was used to divide the site into smaller areas that could be used to organize the basis for post-investigation data analysis and guide risk management decisions related to the removal action. Therefore, the site was divided into four DUs, three of which are on private property (DU1, DU2 and DU3) and one of which is on Navy property (DU4). [Figure 1](#) shows the location and boundaries of the DUs, as well as SI sample locations.

2.2 Optimized Sampling Grid

An optimized sampling grid was applied to each DU to identify sample locations. The grid was established with 50 by 50 foot squares. The nodes, or points at which grid lines met, established the sampling stations. At each sampling station, surface soil samples (0-3 inches below ground surface [bgs]) were collected for X-ray fluorescence (XRF) screening, or XRF screening and off-site laboratory analyses (i.e., subset analyzed via both methods).

2.3 X-Ray Fluorescence Survey

The primary objective of the 2013 investigation was to conduct a survey of soil-associated lead using XRF screening techniques. The onsite lead survey was performed by CH2M HILL staff at DU1, DU2 and DU3 sample stations using a Niton® XL2 GOLDD series XRF analyzer.

2.4 Laboratory Confirmation Sampling

A subset of soil samples collected for XRF analysis were also submitted to an offsite laboratory for lead analysis to evaluate the accuracy of XRF results. For DU4 samples, all samples were submitted for laboratory analysis of lead, as well as non-XRF analytes (1,4-dioxane, arsenic and PAHs). At DU1, DU2 and DU3, a random 10 percent of all DU samples were submitted for offsite laboratory analysis of lead. Additional samples (a number not to exceed 15 samples) were sent for offsite laboratory analysis of lead from DU1, DU2 and DU3 when XRF lead results were within 25 percent below 130 mg/kg, or the lower end of remedial management range. Therefore, samples qualified for offsite laboratory analysis when XRF results were between 97.5 and 130 mg/kg. The subset of

offsite samples submitted for chemical analysis were sent to Katahdin Analytical Services (Scarborough, Maine), a Department of Defense Environmental Laboratory Accreditation Program (DoD ELAP) accredited and Maine certified laboratory.

The XRF versus laboratory-based lead results were compared on a site-wide basis (across all DUs) to evaluate XRF accuracy and determine if XRF results required adjustments to better predict laboratory results when no laboratory results were available. This evaluation consisted of calculating the relative percent difference (RPD) for all paired XRF (field) and laboratory data and plotting a linear correlation.

Per the work plan, benchmarks for paired XRF results acceptability were as follows:

- RPDs within +/- 20 percent and an $R^2 > 0.65$; and/or
- RPD of > -20 percent (i.e., biased positive for XRF data),

Per the work plan, the following would require XRF result adjustments to better approximate the laboratory value for a given location:

- Poorly correlated data pairs (i.e., $RPD > 20$ percent, and/or linear correlation $R^2 < 0.65$).
- High and low concentrations may be treated differently depending upon how well the data compare.

3.0 Summary of Analytical Results

3.1 Sample Counts

The following is a summary of the final sample counts by area and analysis type, including those generated through the SI Investigation:

Decision Unit (DU)	Locations/Sample Type			TOTAL
	2013		SI (2009/10)	
	XRF	Laboratory		
DU1	56	16	18	90
DU2	57	15	29	101
DU3	61	15	15	91
DU4	--	7	6	13
TOTAL	174	53	68	295

The following is a list of the 53 locations ([Figure 1](#)) at which both XRF results and laboratory confirmation results were generated:

Count	DU1	DU2	DU3	DU4
1	B5	J12	R8	M3
2	D7	K10	S6	M4
3	E7	L13	S10	N4 ¹
4	E8	M6	T7	O2

Count	DU1	DU2	DU3	DU4
5	E11 ¹	M7	T9	O3
6	F10	M11 ¹	T11 ¹	O4
7	F9	M14	U5	P3
8	G11	N8	U9	
9	G5	N13	V5	
10	H7	O11	V11	
11	H10	Q9	W7	
12	H11	Q10	X6	
13	I7	R9	X10	
14	I8	R10	Y4	
15	K5	R13	Y8	
16	K6			

1 - Field duplicate collected

3.2 Decision Unit 4

DU4 is the only DU that is on Navy property. In addition to lead, DU4 samples were analyzed for 1,4-dioxane, arsenic and PAHs. The complete set of 2013 and 2009/2010 SI results are summarized in [Table 1](#). For PAHs in this summary, sub-groups of compounds were defined. These sub-groups consisted of the eight low molecular weight (LMW) compounds or 10 high molecular weight (HMW) compounds. Total LMW and HMW PAH concentrations were calculated as the sum of these compounds in each group. [Figure 2](#) shows these LWM/HMW PAHs, arsenic and lead results by location. Additionally, the lead results are presented in comparison to the lower end of remedial management range (130 mg/kg), while the total LMW PAHs, total HMW PAHs and arsenic concentrations are compared to USEPA Ecological Soil Screening Levels (Eco-SSLs; USEPA 2005; 2007) for a gauge of concentration magnitude.

3.3 Laboratory Confirmation Sampling

[Table 2](#) summarizes the lead results for all samples with paired XRF (field) and laboratory results. This table also includes the calculated RPDs for each pair. There were a total of 53 XRF/laboratory lead data pairs. The RPDs varied widely for these pairs and ranged from -198 to 94 percent, with only four pairs (DU2-K10, DU3-Y4, DU3-Y8 and DU4-M3) resulting in a RPDs between -20 and 20 percent. When evaluating all sample pairs on a site-wide basis, there was a strong correlation with these results ($R^2 = 0.8195$; [Figure 3](#)). However, this relationship changed depending on the magnitude of the XRF result. When only including sample pairs with XRF results above 130 mg/kg, there was also a strong correlation ($R^2 = 0.96$; [Figure 4](#)). Furthermore, when including only sample pairs with XRF results below 130 mg/kg, there was very weak correlation ($R^2 = 0.0599$; [Figure 5](#)). Therefore, using these results, an approach was developed for adjusting XRF results when laboratory results were not available.

The duplicate result (21,200 mg/kg) for DU2 sample M11 was not used for the evaluation because it was considered an outlier (parent sample result was 366 mg/kg). The duplicate result was far higher than any other 2013 laboratory sample and the paired XRF result. It is believed its inclusion would have skewed the correlation analysis and negatively impacted

the evaluation. Since the parent sample was also greater than the lower end of the remedial management range, it was in the sub-dataset of highly correlated XRF/laboratory pairs. Therefore, this result was trusted. Additionally, as discussed below, this location was identified for removal without use of the duplicate result.

3.4 XRF Data Adjustments

The correlation (linear regression) and RPD results were used to develop an approach for adjusting XRF lead results when laboratory lead results were not available. That is, an adjustment was performed that is believed to better and more conservatively approximate laboratory lead results from XRF results. For XRF results greater than 130 mg/kg ([Figure 4](#)), the XRF results were adjusted through application of the regression equation that resulted from this correlation¹ to adjust XRF results in the absence of laboratory results.

The RPD results for XRF/laboratory sample pairs when XRF results were below 130 mg/kg were used to develop an adjustment formula for all XRF results below 130 mg/kg and the absence of laboratory results. This adjustment was performed as follows (support for this analysis is provided as [Attachment A](#)):

1. Calculated average of positive (+) RPDs for data pairs when the XRF result was below 130 mg/kg (*negative RPDs were ignored since these are instances when the XRF result was already below the lower end of remedial management range and over-estimated the laboratory result*); the average of +RPDs was 48 percent.
2. Increased XRF results by 48 percent for 104 samples ([Attachment A](#)) that were below 130 mg/kg (Adjusted XRF/Lab Prediction = [XRF result x 48%] + XRF result)

Following these adjustments, a final correlation was performed for XRF-adjusted/laboratory-predicted results (RPD-adjusted XRF values <130 mg/kg, and regression-adjusted XRF results >130 mg/kg) vs actual laboratory results. This analysis resulted in a strong correlation ($R^2 = 0.8438$; [Figure 6](#)).

Before the adjustment approach proposed above, there were 21 of 53 samples (40%) that had XRF results below 130 mg/kg but actual laboratory results above 130 mg/kg ([Attachment A](#)). Following the adjustments, the incidences of false negatives (XRF predicts lab result <130 mg/kg when it's actually above) and false positives (XRF predicts lab result is >130 mg/kg when it's actually below) was evaluated as follows:

RPD-based adjustments (41 samples with XRF <130 mg/kg):

- A false negative – generated for only 4 of 16 samples (25%) (i.e., the laboratory concentration for 17 of 25 samples [68%] was accurately predicted as greater than 130 mg/kg); and
- A false positive – generated for 8 of 25 samples (32%).

Linear regression-based adjustments (12 samples with XRF >130 mg/kg):

¹ The linear regression equation from Figure 4 is $y = 2.2008x - 89.288$; where, x = XRF result, and y = lab predicted lead results

- A false negative - not applicable since all regression adjustments resulted in higher concentrations; and
- A false positive – generated for 1 of 12 samples (8%)

4.0 Removal Action Strategy

The overall removal strategy is being driven by site-wide lead contamination and PAHs at DU4. As presented above, the DU4 results for arsenic, lead and PAHs are presented in [Figure 2](#). A summary of the site-wide lead results (all DUs) for 2009/2010 SI and 2013 XRF Study sampling are shown in [Figure 7](#). For the 2013 lead results, this includes laboratory results and the adjusted and adjusted field XRF results. All of these data were used for determining the extent of removal necessary to meet the cleanup requirements. These sections describe how this was performed.

4.1 Decision Unit 4

The first step in the site-wide removal strategy was an evaluation of DU4 results, with focus on the PAHs. Apart from the ecological benchmark exceedence for LWM and/or HMW PAHs ([Table 1](#); [Figure 2](#)), human health risks are compound driven. Therefore, a DU4-specific removal strategy was formulated with consideration of PAHs results, both from a LMW/HMW basis (ecological risks) and a compound-specific basis (human health risks), as well as lead results compared to the lower end of the remedial management range (130 mg/kg).

For the human health evaluation, the MEDEP Remedial Action Guidelines (RAGs) Recreational/Park User Risk Calculator (MEDEP, 2014) was used to estimate human health risk from direct exposure to soil at DU4 under both “current conditions” and “post-removal” (theoretical sample removal exercise) scenarios. For this exercise, 95% UCLs² for each PAH compound were used as inputs to the MEDEP Risk Calculator to estimate the Incremental Lifetime Cancer Risks (ILCRs; >1E-05 suggests risk) for carcinogenic constituents and Hazard Quotient (HQ; >1.0 suggests risk) for non-carcinogenic constituents. The ProUCL output for all PAH UCLs is provided as [Attachment B](#) and summarized in [Table 1](#). For the Post-Removal scenario, the laboratory analytical method compound-specific limits of quantitation (LOQs; 20 ug/kg) were used as surrogate/replacement concentrations since background concentrations were not available.

The executed MEDEP Risk Calculators for both Current Conditions and Post-Removal scenarios are provided as [Attachment C](#). Under Current Conditions, potential carcinogenic risks were predicted with an ILCR of 4.6E-04, but all non-cancer HQs were <1.0. Therefore, samples were “removed” to conduct a mathematical Post-Removal scenario under which risks could be re-calculated and ILCR reduced. It was determined that a total of five XRF Study samples (SS-DU4-M4, -N4, -O2, -O3, -P3) and five SI Investigation samples (TASKT-2-SS01, -SS04, -SS05 and -SS06 and TASKT-XRF-SS19) need to be removed to mathematically achieve a reduction in the ILCR. However, because SI sample TASKT-XRF-SS18 and TASKT-XRF-SB01 are located between the identified removal samples noted above, they were also factors into the Post Removal risk calculation. Therefore, with a 12-

² All 95% UCLs will be calculated using USEPA's ProUCL version 4.1

sample removal scenario, the final Recreational Park User ILCR is predicted to be 9.5E-06. This removal strategy also includes all samples with LMW/HMW exceedences of the Eco-SSL as well. The proposed removal boundary for DU4 is shown on [Figure 8](#).

It should be noted that SS-DU4-N4 was already slated for removal due to the concentration of lead (474 mg/kg) and influence on the site-wide 95% UCL (as discussed in Section 4.2). However, eight of the 12 DU4 samples identified for removal for PAH risk reduction, were also analyzed for lead. Therefore, the removal strategy described at DU4 alone would account for a reduction of lead from 155.9 mg/kg (Current Conditions) to 82.7 mg/kg (Post-Removal). However, further reduction in lead is discussed below in regards to the site-wide removal strategy.

4.2 Lead Removal Approach

Starting from the DU4-specific removal strategy for PAHs, a site-wide removal action strategy was formulated for lead. This strategy was formulated by applying an additional theoretical sample removal exercise to identify samples and areas (hotspots) recommended for removal to eliminate DU-specific source areas of lead contamination and potential risks. This approach was performed using the following steps:

1. Apply DU4 Strategy – the samples identified for PAH removal at DU4, and also analyzed for lead, were automatically applied to the site-wide removal strategy.
2. Compile Data – All available sample-specific lead concentration data were compiled and summarized (SI sample data, 2013 laboratory results, and adjusted/unadjusted XRF results);
3. Duplicates – the higher of parent and duplicate concentrations were selected (lower was ignored);
4. Arrange Data – All lead concentrations were arranged from highest to lowest;
5. Calculate Site-Wide and DU-specific UCLs (Current Conditions) – Site-wide and DU-specific datasets were used to calculate a 95 percent upper confidence limits of the mean (95% UCL); These were considered the “current conditions” scenario.
6. Mathematical Removal Exercise – Beginning with the highest concentration of lead, sample data were “removed” (deleted) and replaced with the average background sample concentration³. Then the 95% UCL was re-calculated until the site-wide 95% UCL concentration was below the lower end of remedial management range.
7. Locate Initial Removal Samples – Once all samples that required removal associated with Step 5 were removed to achieve a site-wide UCL below 130 mg/kg, these locations were noted and located on the sample location map within each DU.
8. Identify Additional Boundary Driven Removal Samples – Removal boundaries were drawn around the initial set of locations with results requiring removal to achieve a site-wide UCL below 130 mg/kg. However, the boundaries were conservatively extended to include adjacent samples that were also above 130 mg/kg. Following

³ Three background samples were collected (23.5, 21.7 and 19.2 mg/kg; [Figure 7](#)) with an average lead concentration of 21.5 mg/kg

the establishment of the boundaries, those additional samples also requiring removal were identified in the dataset.

9. Calculate DU-Specific UCLs (Post-Removal) - DU-specific 95% UCLs were calculated as was done for site-wide data (Step 5), except the additional samples identified through Step 7 were also “removed” from each DU-specific dataset and replaced with the average background sample concentration.
10. Re-calculate Final Site-Wide UCL (Post-Removal) - The last step was to calculate a final site-wide 95% UCL. However, instead of only removing samples achieved a UCL below 130 mg/kg based only on mathematics, it also accounted for removal for the samples identified through Step 8.

4.3 Results

Table 3 summarizes all of the lead data and stepwise iterations used for the site-wide and DU-specific 95% UCL calculations necessary to identify and confirm a soil removal strategy. Based on calculation of the site-wide 95% UCL (328.6 mg/kg), it was determined that 53 of the highest concentration samples need to be removed in order to achieve a site-wide 95% UCL that was below 130 mg/kg (129.8 mg/kg). The full ProUCL output is provided as **Attachment D**.

One of the 53 samples identified for removal based on the site-wide lead 95% UCL is located in DU4. The other 52 samples identified for removal based on the site-wide lead 95% UCL in DU1, 2 and 3, were located and removal boundaries were drawn. The boundaries in DUs 1, 2 and 3 were drawn to conservatively include adjacent samples with lead concentrations above 130 mg/kg. This resulted in an additional 94 samples being identified for removal. The site-wide removal boundaries are shown on **Figure 9**. The following summarizes the total proposed sample removal counts by basis and DU.

Decision Unit (DU)	Removal Basis		TOTAL
	Site-wide	Boundary	
DU1	19	30	49
DU2	20	37	57
DU3	15	25	40
DU4	6	2	8
TOTAL	60	94	154

Applying this comprehensive removal strategy, the following 95% UCLs for lead would be achieved:

Decision Unit (DU)	95% UCL ¹ (mg/kg)	
	Current Conditions	Post Removal
Site-Wide (Initial)	328.6	129.8
DU1	513.6	58.1
DU2	292.5	58.0
DU3	359.6	62.2
DU4	155.9	82.7
Site-Wide (Final)	--	51.8

1 - shaded UCLs exceed lower end of remedial management range (130 mg/kg)

5.0 Conclusions

5.1 Removal Area

The removal strategy proposed here based on the UCL approach would result in the following estimated acres of removal area:

Decision Unit (DU)	Area (acres)		Area (square feet)		Removal (%)
	Total	Removal	Total	Removal	
DU1	4.9	2.03	213,643.7	88,547	41.4
DU2	5.1	2.22	220,840.5	96,447	43.5
DU3	5.5	1.91	237,693.5	83,050	34.7
DU4	0.8	0.41	33,748.3	18,048	51.3

5.2 Stream

It was stated in the work plan that exceedances near sensitive ecological areas, such as the small unnamed stream, might also be prioritized over upland area samples (AGVIQ-CH2M HILL, 2013). No removal areas near the stream were considered in this technical memorandum. It is recommended that any removal areas near the stream be discussed with Maine DEP and be included in the soil removal and confirmation sampling work plan to be developed.

6.0 References

AGVIQ-CH2M HILL, 2013. Final Technical Approach Work Plan Pre-Characterization for Soil Removal Action, Topsham Annex Skeet Range, Former Naval Air Station Brunswick Topsham, Maine. July.

Maine Department of Environmental Protection (MEDEP). 2014. Part 4 (Remedial Investigation and Feasibility Study [RI/FS]), Part g (Risk Evaluation & Clean-up Standards), Subpart ii (Remedial Action Guidelines [RAGs], Risk Calculator for Recreational/Park User). http://www.maine.gov/dep/spills/publications/guidance/index.html#new_rag . Accessed in February, 2014.

USEPA. 2005. Ecological Soil Screening Levels for Arsenic. OSWER Directive 9285.7-62. March.

USEPA. 2007. Ecological Soil Screening Levels for Polycyclic Aromatic Hydrocarbons (PAHs). OSWER Directive 9285.7-78. June.

Tables

Table 1

Decision Unit 4 Analytical Results

Topsham Annex Skeet Range, Topsham, Maine

Chemical	Units (dry weight)	Range of Detects		95% UCL		2013 XRF Study								
		Minimum	Maximum	Current Conditions	Post-Removal	SS-DU4-02 8/5/2013	SS-DU4-P3 8/5/2013	SS-DU4-04 8/5/2013	SS-DU4-03 8/5/2013	SS-DU4-N4 8/5/2013	SS-DU4-N4-P duplicate	SS-DU4-M4 8/5/2013	SS-DU4-M3 8/5/2013	
1,4-Dioxane	ug/kg	--	--	--	--	78 R	84 R	74 R	69 R	72 R	70 R	79 R	67 R	
High Molecular Weight (HMW) PAHs	1-Methylnaphthalene	ug/kg	9.3	200.0	96.9	85.9	NA	NA	NA	NA	NA	NA	NA	
	2-Methylnaphthalene	ug/kg	10.0	3,200.0	647.2	25.42	41	12 J	15 U	24 J	14 U	14 U	16 U	13 U
	Acenaphthene	ug/kg	5.3	4,470.0	1,714.0	43.8	270	200	5.3 J	270	6.8 J	11 J	18 J	6.5 J
	Acenaphthylene	ug/kg	2.4	83.2	83.2	22.4	16 U	17 U	15 U	14 U	2.4 J	14 U	16 U	13 U
	Anthracene	ug/kg	8.4	35,600.0	25,470.0	140.6	540 J	310	8.4 J	540 J	12 J	19 J	22 J	10 J
	Fluorene	ug/kg	3.2	16,700.0	12,271.0	84.2	180	100	15 U	160	6 J	8.1 J	9.9 J	13 U
	Naphthalene	ug/kg	5.9	136.0	57.3	28.7	81	46	15 U	72	14 U	14 U	16 U	13 U
	Phenanthrene	ug/kg	59.0	25,300.0	9,989.0	119.6	2000 J	1400 J	64	1800 J	86	110	120	59
	LMW PAHs, total	ug/kg	13.4	85,619.9	62,038.0	--	3,120.0	2,076.5	107.7	2,873.0	127.2	169.1	193.9	101.5
Low Molecular Weight (LMW) PAHs	Benzo(a)anthracene	ug/kg	66.0	14,600.0	6,095.0	110.9	2200 J	1900 J	66	2200	93	110	310	82
	Benzo(a)pyrene	ug/kg	65.0	12,900.0	5,266.0	66.6	1800 J	1700 J	65	1900 J	81	110	310	79
	Benzo(b)fluoranthene	ug/kg	81.9	34,900.0	9,571.0	277.7	2600 J	2500 J	110	2800 J	150	160	470	130
	Benzo(g,h,i)perylene	ug/kg	53.0	25,600.0	18,826.0	287.0	960 J	1000 J	53	1000 J	62	72	190	61
	Benzo(k)fluoranthene	ug/kg	28.0	1,800.0	867.5	34.7	600 J	640 J	29 J	690 J	29 J	54	100	28
	Chrysene	ug/kg	73.0	2,590.0	1,179.0	45.2	2100 J	1900 J	73	2000	93	130	330	74
	Dibenz(a,h)anthracene	ug/kg	20.0	17,700.0	12,754.0	299.2	340 J	400 J	20 J	360 J	30 J	38 J	120 J	26 J
	Fluoranthene	ug/kg	82.5	14,000.0	10,888.0	120.0	3500 J	2900 J	120	3600 J	160	190	310	120
	Indeno(1,2,3-cd)pyrene	ug/kg	6.1	2,700.0	3,124.0	83.2	2700 J	2700 J	120 J	2700 J	160 J	180 J	480 J	150 J
	Pyrene	ug/kg	67.5	8,850.0	7,037.0	101.3	2700 J	2100 J	110	2600	160	200	330	110
HMW PAHs, Total	ug/kg	130.4	133,510.0	41,564.0	--	19,500.0	17,740.0	766.0	19,850.0	1,018.0	1,244.0	2,950.0	860.0	
Arsenic	mg/kg	4.2	7.5	6.3	--	5.8	5.9	7.1	7.5	7	7	5.1	4.2	
Lead	mg/kg	22.9	474.0	155.9	82.7	62.2 J	108	74.7	61.4	474	441	100	38.4	

NA - not analyzed

R - rejected data

J - estimated value

U - undetected

UJ - undetected

Table 1

Decision Unit 4 Analytical Results

Topsham Annex Skeet Range, Topsham, Maine

Chemical		Units (dry weight)	2009/2010 Site Inspection (SI) Investigation								
			TASKT-XRF-SS13 7/1/2009	TASKT-XRF-SS17 7/1/2009	TASKT-XRF-SS18 4/1/2010	TASKT-XRF-SS19 4/1/2010	TASKT-XRF-SS19 duplicate	TASKT-XRF-SS20 4/1/2010	TASKT-XRF-SB01 4/1/2010	TASKT-2-SS01 11/1/2010	
1,4-Dioxane		ug/kg	NA	NA	NA	NA	NA	NA	NA	NA	NA
High Molecular Weight (HMW) PAHs	1-Methylnaphthalene	ug/kg	NA	NA	2.35 U	5.76 UJ	10.3 UJ	2.12 U	5.73 UJ	21.3	
	2-Methylnaphthalene	ug/kg	NA	NA	2.35 U	6.65 UJ	16.1 UJ	2.25 UJ	6.2 UJ	12.7	
	Acenaphthene	ug/kg	NA	NA	2.35 U	45.8	75.7	2.12 U	2.15 U	91.7	
	Acenaphthylene	ug/kg	NA	NA	4.46 UJ	2.06 U	8.46 UJ	12.9 U	2.15 U	83.2	
	Anthracene	ug/kg	NA	NA	2.35 U	2.06 UJ	161 J	2.12 U	19.9	789	
	Fluorene	ug/kg	NA	NA	4.12 J	30.4 J	54.9 J	3.18 J	11.3	445	
	Naphthalene	ug/kg	NA	NA	2.35 U	2.06 U	2.07 U	2.12 U	2.15 U	16.8	
	Phenanthrene	ug/kg	NA	NA	2.35 U	1350 J	561 J	63.3	92.3	632	
	LMW PAHs, total	ug/kg	--	--	13.4	1,435.5	871.1	78.3	132.7	2,091.7	
Low Molecular Weight (LMW) PAHs	Benzo(a)anthracene	ug/kg	NA	NA	2.35 U	306 J	723 J	2.12 U	140 J	613 J	
	Benzo(a)pyrene	ug/kg	NA	NA	2.35 U	682 J	1630 J	106	178	328	
	Benzo(b)fluoranthene	ug/kg	NA	NA	81.9	546 J	1250 J	110	191	1770	
	Benzo(g,h,i)perylene	ug/kg	NA	NA	2.35 U	446 J	929 J	2.12 U	120	1470	
	Benzo(k)fluoranthene	ug/kg	NA	NA	52.3 J	444 J	935 J	94.1 J	103	55.5	
	Chrysene	ug/kg	NA	NA	2.35 U	469 J	941 J	2.12 U	164	4.54 U	
	Dibenz(a,h)anthracene	ug/kg	NA	NA	2.35 U	96.3 J	251	2.12 U	37.6	1340	
	Fluoranthene	ug/kg	NA	NA	82.5	590 J	894 J	207	192	409	
	Indeno(1,2,3-cd)pyrene	ug/kg	NA	NA	2.35 U	528 J	1240	2.12 U	139	121	
	Pyrene	ug/kg	NA	NA	73.6	942	1160	174	180	287 J	
	HMW PAHs, Total	ug/kg			297.4	5,049.3	9,953.0	696.4	1,444.6	6,395.8	
Arsenic		mg/kg	NA	NA	5.03 J	4.79 J	4.68 J	4.82 J	4.99 J	NA	
Lead		mg/kg	37.7	150	22.9 J	52.4 J	47.8 J	23 J	27.6 J	NA	

NA - not analyzed
R - rejected data
J - estimated value
U - undetected
UJ - undetected

Table 1

Decision Unit 4 Analytical Results

Topsham Annex Skeet Range, Topsham, Maine

Chemical	Units (dry weight)	2009/2010 Site Inspection (SI) Investigation						
		TASKT-2-SS02 11/1/2010	TASKT-2-SS03 11/1/2010	TASKT-2-SS03 duplicate	TASKT-2-SS04 11/1/2010	TASKT-2-SS05 11/1/2010	TASKT-2-SS06 11/1/2010	
1,4-Dioxane	ug/kg	NA	NA	NA	NA	NA	NA	
High Molecular Weight (HMW) PAHs	1-Methylnaphthalene	ug/kg	9.25 J	12.4 J	91 J	200 J	84.2	65.6
	2-Methylnaphthalene	ug/kg	36.8	10	4.75 UJ	3200	961	691
	Acenaphthene	ug/kg	79.6	63.6 J	4.75 UJ	4470	1840	1180
	Acenaphthylene	ug/kg	5.14 U	40.4 J	4.75 UJ	27.7 U	26.3 U	6.03 U
	Anthracene	ug/kg	267	291 J	4.75 UJ	35600 J	13000	9250
	Fluorene	ug/kg	176	141 J	4.75 UJ	16700	7000	5050
	Naphthalene	ug/kg	5.88 J	8.18 J	47.7 J	136 J	73.8	39.1
	Phenanthrene	ug/kg	198	237 J	4.75 UJ	25300	10600	8700
	LMW PAHs, total	ug/kg	775.1	803.6	153.0	85,619.9	33,572.2	24,978.7
Low Molecular Weight (LMW) PAHs	Benzo(a)anthracene	ug/kg	208 J	190 J	4.75 UJ	14600 J	7320 J	4600 J
	Benzo(a)pyrene	ug/kg	90.8	4.89 U	4.75 U	12900	5540	3930
	Benzo(b)fluoranthene	ug/kg	449	616 J	4.75 UJ	34900	11300	8590
	Benzo(g,h,i)perylene	ug/kg	371	509 J	4.75 UJ	25600	10400	8090
	Benzo(k)fluoranthene	ug/kg	35.6	32.8 J	4.75 UJ	1800	554	412
	Chrysene	ug/kg	5.14 U	4.89 U	4.75 UJ	2590	1590	1190
	Dibenz(a,h)anthracene	ug/kg	322	581 J	4.75 UJ	17700	6640	4740
	Fluoranthene	ug/kg	99	160 J	4.75 UJ	14000	6250	4460
	Indeno(1,2,3-cd)pyrene	ug/kg	6.07 J	58.3 J	109 J	570	191	148
	Pyrene	ug/kg	127 J	67.5 J	4.75 UJ	8850 J	4200 J	2620 J
	HMW PAHs, Total	ug/kg	1,711.0	2,219.5	130.4	133,510.0	53,985.0	38,780.0
Arsenic	mg/kg	NA	NA	NA	NA	NA	NA	
Lead	mg/kg	NA	NA	NA	NA	NA	NA	

NA - not analyzed
R - rejected data
J - estimated value
U - undetected
UJ - undetected

Table 2
 Comparison of Field XRF and Laboratory Confirmation Lead Results
 Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Sample Location	Result (mg/kg)			Relative Percent Difference (RPD)
		XRF	Laboratory		
			Parent	Duplicate	
DU1	B5	31	10.4		-198%
	D7	118	46.2		-155%
	E7	109	57.3		-90%
	E8	110	42.3		-160%
	E11 ¹	133	203	146	34%
	F10	116	407		71%
	F9	153	126		-21%
	G11	95	328		71%
	G5	122	53.4		-128%
	H7	112	173		35%
	H10	104	36.7		-183%
	H11	102	36.1		-183%
	I7	790	1600		51%
	I8	234	319		27%
	K5	107	184		42%
K6	110	47.6		-131%	
DU2	J12	82	223		63%
	K10	111	138		20%
	L13	57	144		60%
	M6	35	97.7		64%
	M7	104	190		45%
	M11 ¹	231	366	21200	37%
	M14	12	29.1		59%
	N8	117	190		38%
	N13	98	175		44%
	O11	121	184		34%
	Q9	113	190		41%
	Q10	139	233		40%
	R9	134	208		36%
	R10	122	216		44%
R13	136	274		50%	
DU3	R8	100	247		60%
	S6	73	178		59%
	S10	119	201		41%
	T7	98	200		51%
	T9	102	67.2		-52%
	T11 ¹	75	111	93.1	32%
	U5	136	289		53%
	U9	121	187		35%
	V5	110	175		37%
	V11	100	147		32%
	W7	398	974		59%
	X6	174	329		47%
	X10	68	97.6		30%
	Y4	148	183		19%
Y8	32	38.9		18%	

1 - concentration is higher of the parent and field duplicate sample (except DU2-M11; see text)

Table 2
 Comparison of Field XRF and Laboratory Confirmation Lead Results
Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Sample Location	Result (mg/kg)			Relative Percent Difference (RPD)
		XRF	Laboratory		
			Parent	Duplicate	
DU4	M3	31	38.4		19%
	M4	31	100		69%
	N4 ¹	30	474	441	94%
	O2	30	62.2		52%
	O3	30	61.4		51%
	O4	30	74.7		60%
	P3	30	108		72%

1 - concentration is higher of the parent and field duplicate sample (except DU2-M11; see text)

Table 3
 Summary of Data Used for UCL Calculations
 Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Location/Sample ID	Lead Concentration (mg/kg)			ProUCL Dataset Input										
		2013 XRF Study		Site Inspection (SI) Data 2009/2010	Current Conditions Scenario					Removal Scenario					
		XRF	Lab		Lead Value (mg/kg)	Lab - Actual	Lab-Predicted ²		XRF - Unit LOD ³	SI Data (2009/10)	Parent (P) or Duplicate (D)	Lead Value (mg/kg) ⁴	Basis		
							Linear Regression	RPD					Lead - Site-wide UCL	PAHs - DU4 UCL	Removal Boundary
DU1	B5	<LOD	10.4	--	10.4	x						10.4			
DU1	B6	<LOD	NS	--	20.0				x			20.0			
DU1	B7	10.3	NS	--	15.2				x			15.2			
DU1	C5	<LOD	NS	--	20.0					x		20.0			
DU1	C6	<LOD	NS	--	20.0					x		20.0			
DU1	C7	<LOD	NS	--	20.0					x		20.0			
DU1	C8	<LOD	NS	--	20.0					x		20.0			
DU1	C9	<LOD	NS	--	20.0					x		20.0			
DU1	D5	22.6	NS	--	33.4				x			33.4			
DU1	D6	9.6	NS	--	14.3				x			14.3			
DU1	D7	117.8	46.2	--	46.2	x						46.2			
DU1	D8	157.6	NS	--	257.5		x					257.5			
DU1	D9	14.4	NS	--	21.3				x			21.3			
DU1	D10	20.8	NS	--	30.8				x			30.8			
DU1	E5	18.7	NS	--	27.7				x			27.7			
DU1	E6	25.4	NS	--	37.6				x			37.6			
DU1	E7	108.8	57.3	--	57.3	x						57.3			
DU1	E8	109.8	42.3	--	42.3	x						42.3			
DU1	E9	65.5	NS	--	97.0				x			97.0			
DU1	E10	34.5	NS	--	51.1				x			51.1			
DU1	E11	133.2	203	--	203.0	x					P	21.5			x
DU1	E11-dup ¹	--	146	--							D				
DU1	F5	49.3	NS	--	73.0				x			73.0			
DU1	F6	232.4	NS	--							P				
DU1	F6-dup	277.0	NS	--	520.4		x				D	21.5	x		
DU1	F7	162.4	NS	--	268.1		x					21.5			x
DU1	F8	148.9	NS	--	238.4		x					21.5			x
DU1	F9	152.9	126	--		x					P				
DU1	F9-dup	102.0	NS	--	151.0						D	21.5			x
DU1	F10	115.8	407	--	407.0	x						21.5	x		
DU1	F11	32.5	NS	--	48.2				x			21.5			x
DU1	F12	52.5	NS	--	77.7				x			77.7			
DU1	G4	20.6	NS	--	30.4				x			30.4			
DU1	G5	121.7	53.4	--	53.4	x						53.4			
DU1	G6	395.7	NS	--							P				
DU1	G6-dup	403.5	NS	--	798.8		x				D	21.5	x		
DU1	G7	221.7	NS	--	398.5		x					21.5	x		
DU1	G8	133.9	NS	--	205.3		x					21.5			x
DU1	G9	60.5	NS	--	89.5				x			21.5			x
DU1	G10	166.0	NS	--	276.0		x				P	21.5			x
DU1	G10-dup	134.0	NS	--							D				
DU1	G11	94.6	328	--	328.0	x						21.5			x
DU1	G12	17.8	NS	--	26.3				x			26.3			
DU1	G13	289.9	NS	--							P				
DU1	G13-dup	360.6	NS	--	704.3		x				D	21.5	x		
DU1	H5	160.5	NS	--	264.0		x					21.5			x
DU1	H6	725.5	NS	--	1507.4		x				P	21.5	x		
DU1	H6-dup	683.1	NS	--							D				
DU1	H7	112.2	173	--	173.0	x						21.5			x
DU1	H8	316.4	NS	--	607.0		x					21.5	x		
DU1	H9	172.3	NS	--	290.0		x					21.5			x
DU1	H10	104.1	36.7	--	36.7	x						21.5			x
DU1	H11	102.1	36.1	--	36.1	x						36.1			

1-field dup; higher of parent and dup used

2-Lab (predicted) = (XRF x 48%) + XRF

3-XRF unit LOD

4-Shaded replacement conc. are average background (21.5 mg/kg)

5-bold/italic conc. exceed 130 mg/kg

6-DU2-M11 duplicate (see text)

Table 3
 Summary of Data Used for UCL Calculations
 Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Location/Sample ID	Lead Concentration (mg/kg)			ProUCL Dataset Input										
		2013 XRF Study		Site Inspection (SI) Data 2009/2010	Current Conditions Scenario						Removal Scenario				
		XRF	Lab		Lead Value (mg/kg)	Lab - Actual	Lab-Predicted ²		XRF - Unit LOD ³	SI Data (2009/10)	Parent (P) or Duplicate (D)	Lead Value (mg/kg) ⁴	Basis		
							Linear Regression	RPD					Lead - Site-wide UCL	PAHs - DU4 UCL	Removal Boundary
DU1	H12	213.8	NS	--	381.2		x					21.5	x		
DU1	H13	9.0	NS	--	13.4			x				13.4			
DU1	I5	85.4	NS	--	126.3			x				126.3			
DU1	I6	417.3	NS	--	829.1		x					21.5	x		
DU1	I7	734.2	1600	--	1600.0	x					P	21.5	x		
DU1	I7-dup	790.2	NS	--							D				
DU1	I8	234.1	319	--	319.0	x						21.5			x
DU1	I9	211.7	NS	--	376.6		x					21.5	x		
DU1	I10	187.7	NS	--	323.7		x					21.5			x
DU1	I11	161.9	NS	--	267.1		x					21.5			x
DU1	I12	78.9	NS	--	116.7			x				116.7			
DU1	I13	11.0	NS	--	16.2			x				16.2			
DU1	I14	67.8	NS	--	100.3			x				100.3			
DU1	J5	84.0	NS	--	124.4			x				124.4			
DU1	J6	130.9	NS	--	198.7		x					21.5			x
DU1	J7	179.8	NS	--	306.5		x					21.5			x
DU1	J8	24.3	NS	--	36.0			x				36.0			
DU1	J9	204.1	NS	--	359.8		x					21.5	x		
DU1	J10	176.0	NS	--	298.0		x					21.5			x
DU1	J11	57.2	NS	--	84.6			x				21.5			x
DU1	K5	106.5	184	--	184.0	x						184.0			
DU1	K6	110.3	47.6	--	47.6	x						47.6			
DU1	K7	28.0	NS	--	41.4			x				41.4			
DU1	K8	130.2	NS	--	197.2		x					21.5			x
DU1	K9	74.2	NS	--	109.7			x				21.5			x
DU1	L6	85.1	NS	--	125.9			x				125.9			
DU1	L7	133.0	NS	--	203.4		x					21.5			x
DU1	NASB-TASKT-XRF-SS02	--	--	33.1	33.1					x		33.1			
DU1	NASB-TASKT-XRF-SS03	--	--	70.4	70.4					x		70.4			
DU1	NASB-TASKT-XRF-SS04	--	--	960	960.0					x		21.5	x		
DU1	NASB-TASKT-XRF-SS05	--	--	198	198.0					x		198.0			
DU1	NASB-TASKT-XRF-SS11	--	--	ND											
DU1	NASB-TASKT-XRF-SS14	--	--	407	407.0					x		21.5	x		
DU1	NASB-TASKT-XRF-SS15	--	--	232	232.0					x		21.5			x
DU1	TASKT-2-SS07	--	--	285	285.0					x		21.5			x
DU1	TASKT-2-SS08	--	--	239	239.0					x		21.5			x
DU1	TASKT-2-SS09	--	--	160	160.0					x		21.5			x
DU1	TASKT-2-SS27	--	--	384	384.0					x		21.5	x		
DU1	TASKT-2-SS28	--	--	419	419.0					x		21.5	x		
DU1	TASKT-2-SS29	--	--	1790	1790.0					x	P	21.5	x		
DU1	TASKT-2-SS29-dup	--	--	1790							D				
DU1	TASKT-2-SS30	--	--	63.2	63.2					x		21.5			x
DU1	TASKT-2-SS31	--	--	363	363.0					x		21.5	x		
DU1	TASKT-2-SS32	--	--	44100	44100.0					x		21.5	x		
DU1	TASKT-2-SS36	--	--	247	247.0					x	P	21.5			x
DU1	TASKT-2-SS36-dup	--	--	227						x	D	0.0			
DU1	TASKT-2-SS41	--	--	328	328.0					x		21.5			x
DU2	J12	82.7	223	--	223.0	x						21.5			x
DU2	J13	82.2	NS	--	121.7			x				121.7			
DU2	K10	111.5	138	--	138.0	x						21.5			x
DU2	K11	388.7	NS	--	766.1		x					21.5	x		
DU2	K12	299.5	NS	--	569.9		x					21.5	x		
DU2	K13	47.2	NS	--	69.9			x				69.9			
DU2	K14	20.8	NS	--	30.7			x				30.7			

1-field dup; higher of parent and dup used

2-Lab (predicted) = (XRF x 48%) + XRF

3-XRF unit LOD

4-Shaded replacement conc. are average background (21.5 mg/kg)

5-bold/italic conc. exceed 130 mg/kg

6-DU2-M11 duplicate (see text)

Table 3
 Summary of Data Used for UCL Calculations
 Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Location/Sample ID	Lead Concentration (mg/kg)			ProUCL Dataset Input											
		2013 XRF Study		Site Inspection (SI) Data 2009/2010	Current Conditions Scenario						Removal Scenario					
		XRF	Lab		Lead Value (mg/kg)	Lab - Actual	Lab-Predicted ²		XRF - Unit LOD ³	SI Data (2009/10)	Parent (P) or Duplicate (D)	Lead Value (mg/kg) ⁴	Basis			
							Linear Regression	RPD					Lead - Site-wide UCL	PAHs - DU4 UCL	Removal Boundary	
DU2	K15	17.1	NS	--							P					
DU2	K15-dup	20.4	NS	--	30.1			x			D	30.1				
DU2	L8	225.1	NS	--	406.2		x					21.5	x			
DU2	L9	74.6	NS	--	110.4			x				21.5				x
DU2	L10	533.1	NS	--	1084.0		x					21.5	x			
DU2	L11	196.7	NS	--	343.5		x					21.5				x
DU2	L12	45.5	NS	--	67.4			x				67.4				
DU2	L13	57.2	144	--	144.0	x						21.5				x
DU2	L14	26.4	NS	--							P					
DU2	L14-dup	32.1	NS	--	47.6			x			D	47.6				
DU2	L15	16.0	NS	--	23.6			x				23.6				
DU2	M6	34.8	97.7	--	97.7	x						97.7				
DU2	M7	104.1	190	--	190.0	x						21.5				x
DU2	M8	86.0	NS	--	127.3			x				21.5				x
DU2	M9	225.4	NS	--	406.8		x					21.5	x			
DU2	M10	198.9	NS	--	348.4		x					21.5				x
DU2	M11	230.6	366	--	366.0	x					P	21.5	x			
DU2	M11-dup	--	21200	--							D					
DU2	M12	47.7	NS	--	70.5			x				70.5				
DU2	M13	15.7	NS	--	23.2			x				23.2				
DU2	M14	12.3	29.1	--	29.1	x						29.1				
DU2	M15	10.6	NS	--	15.8			x				15.8				
DU2	N6	17.5	NS	--	25.9			x				25.9				
DU2	N7	60.2	NS	--	89.0			x				89.0				
DU2	N8	116.5	190	--	190.0	x						21.5				x
DU2	N9	159.9	NS	--	262.6		x					21.5				x
DU2	N10	201.7	NS	--	354.6		x					21.5				x
DU2	N11	67.5	NS	--	99.9			x				99.9				
DU2	N12	90.0	NS	--	133.3			x				133.3				
DU2	N13	98.5	175	--	175.0	x						21.5				x
DU2	N14	227.3	NS	--							P					
DU2	N14-dup	246.8	NS	--	453.9		x				D	21.5	x			
DU2	N15	48.0	NS	--	71.0			x				71.0				
DU2	O6	22.3	NS	--	33.0			x				33.0				
DU2	O7	61.6	NS	--	91.2			x				91.2				
DU2	O8	71.3	NS	--	105.5			x				105.5				
DU2	O9	174.9	NS	--	295.5		x					21.5				x
DU2	O10	159.8	NS	--	262.4		x					21.5				x
DU2	O11	121.1	184	--	184.0	x						21.5				x
DU2	O12	92.6	NS	--	137.1			x				137.1				
DU2	O13	48.4	NS	--	71.7			x				71.7				
DU2	O14	67.0	NS	--	99.2			x				99.2				
DU2	P6	25.9	NS	--	38.4			x				38.4				
DU2	P7	59.5	NS	--	88.0			x				88.0				
DU2	P8	63.0	NS	--	93.3			x				93.3				
DU2	P9	188.7	NS	--	326.1		x					21.5				x
DU2	P10	192.9	NS	--	335.2		x					21.5				x
DU2	P11	253.4	NS	--	468.3		x					21.5	x			
DU2	P12	53.2	NS	--	78.7			x				78.7				
DU2	P13	44.5	NS	--	65.9			x				65.9				
DU2	P14	50.4	NS	--	74.5			x				74.5				
DU2	Q7	64.5	NS	--	95.4			x				95.4				
DU2	Q8	76.3	NS	--	112.9			x				112.9				
DU2	Q9	112.7	190	--	190.0	x						21.5				x
DU2	Q10	139.2	233	--	233.0	x						21.5				x

1-field dup; higher of parent and dup used

2-Lab (predicted) = (XRF x 48%) + XRF

3-XRF unit LOD

4-Shaded replacement conc. are average background (21.5 mg/kg)

5-bold/italic conc. exceed 130 mg/kg

6-DU2-M11 duplicate (see text)

Table 3
 Summary of Data Used for UCL Calculations
 Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Location/Sample ID	Lead Concentration (mg/kg)			ProUCL Dataset Input										
		2013 XRF Study		Site Inspection (SI) Data 2009/2010	Lead Value (mg/kg)	Current Conditions Scenario					Removal Scenario				
		XRF	Lab			Lab - Actual	Lab-Predicted ²		XRF - Unit LOD ³	SI Data (2009/10)	Parent (P) or Duplicate (D)	Lead Value (mg/kg) ⁴	Basis		
							Linear Regression	RPD					Lead - Site-wide UCL	PAHs - DU4 UCL	Removal Boundary
DU2	Q11	167.2	NS	--	<i>278.7</i>		x					21.5			x
DU2	Q12	192.6	NS	--	<i>334.6</i>		x					21.5			x
DU2	Q13	58.3	NS	--	86.3			x				86.3			
DU2	Q14	49.4	NS	--	73.1			x				73.1			
DU2	R9	134.1	208	--	<i>208.0</i>	x						21.5			x
DU2	R10	122.2	216	--	<i>216.0</i>	x						21.5			x
DU2	R11	380.5	NS	--	<i>748.0</i>		x					21.5	x		
DU2	R12	302.4	NS	--	<i>576.1</i>		x					21.5	x		
DU2	R13	136.0	274	--	<i>274.0</i>	x						21.5			x
DU2	R14	36.3	NS	--	53.7			x				53.7			
DU2	S12	77.7	NS	--	114.9			x				21.5			x
DU2	S13	87.2	NS	--	129.1			x				129.1			
DU2	S14	26.8	NS	--	39.6			x				39.6			
DU2	T14	14.5	NS	--	21.4			x				21.4			
DU2	NASB-TASKT-XRF-SB02	--	--	98.2	98.2					x		21.5			x
DU2	NASB-TASKT-XRF-SB03	--	--	24.3	24.3					x		24.3			
DU2	NASB-TASKT-XRF-SB04	--	--	82.3	82.3					x		82.3			
DU2	NASB-TASKT-XRF-SB05	--	--	453	<i>453.0</i>					x	P	21.5	x		
DU2	NASB-TASKT-XRF-SB05-dup	--	--	299							D				
DU2	NASB-TASKT-XRF-SB06	--	--	135	<i>135.0</i>					x		21.5			x
DU2	NASB-TASKT-XRF-SB08	--	--	1.6	1.6					x		1.6			
DU2	NASB-TASKT-XRF-SS06	--	--	364	<i>364.0</i>					x		21.5	x		
DU2	NASB-TASKT-XRF-SS12	--	--	ND											
DU2	TASKT-2-SS10	--	--	125	125.0					x		21.5			x
DU2	TASKT-2-SS11	--	--	717	<i>717.0</i>					x		21.5	x		
DU2	TASKT-2-SS12	--	--	78.6	78.6					x		78.6			
DU2	TASKT-2-SS13	--	--	93.1	93.1					x		93.1			
DU2	TASKT-2-SS14	--	--	260	<i>260.0</i>					x		21.5			x
DU2	TASKT-2-SS16	--	--	436	<i>436.0</i>					x		21.5	x		
DU2	TASKT-2-SS20	--	--	151	<i>151.0</i>					x		151.0			
DU2	TASKT-2-SS21	--	--	962	<i>962.0</i>					x		21.5	x		
DU2	TASKT-2-SS22	--	--	929	<i>929.0</i>					x		21.5	x		
DU2	TASKT-2-SS23	--	--	476	<i>476.0</i>					x		21.5	x		
DU2	TASKT-2-SS24	--	--	1890	<i>1890.0</i>					x		21.5	x		
DU2	TASKT-2-SS25	--	--	141	<i>141.0</i>					x		21.5			x
DU2	TASKT-2-SS26	--	--	275	<i>275.0</i>					x		21.5			x
DU2	TASKT-2-SS33	--	--	267	<i>267.0</i>					x	P	21.5			x
DU2	TASKT-2-SS33-dup	--	--	210							D				
DU2	TASKT-2-SS34	--	--	334	<i>334.0</i>					x		21.5			x
DU2	TASKT-2-SS35	--	--	544	<i>544.0</i>					x	P	21.5	x		
DU2	TASKT-2-SS35-dup	--	--	326							D				
DU2	TASKT-2-SS37	--	--	279	<i>279.0</i>					x		21.5			x
DU2	TASKT-2-SS38	--	--	243	<i>243.0</i>					x		21.5			x
DU2	TASKT-2-SS39	--	--	222	<i>222.0</i>					x		21.5			x
DU2	TASKT-2-SS40	--	--	798	<i>798.0</i>					x		21.5	x		
DU2	TASKT-2-SS44	--	--	303	<i>303.0</i>					x		21.5			x
DU2	TASKT-2-SS45	--	--	55.7	55.7					x		55.7			
DU3	Q4	26.9	NS	--	39.9			x				39.9			
DU3	Q5	17.8	NS	--	26.3			x				26.3			
DU3	Q6	15.0	NS	--	22.2			x				22.2			
DU3	R5	21.6	NS	--	32.0			x				32.0			
DU3	R6	45.2	NS	--	66.9			x				66.9			
DU3	R7	82.1	NS	--	121.6			x				121.6			
DU3	R8	99.6	247	--	<i>247.0</i>	x						21.5			x

1-field dup; higher of parent and dup used

2-Lab (predicted) = (XRF x 48%) + XRF

3-XRF unit LOD

4-Shaded replacement conc. are average background (21.5 mg/kg)

5-bold/italic conc. exceed 130 mg/kg

6-DU2-M11 duplicate (see text)

Table 3
 Summary of Data Used for UCL Calculations
 Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Location/Sample ID	Lead Concentration (mg/kg)			ProUCL Dataset Input										
		2013 XRF Study		Site Inspection (SI) Data 2009/2010	Current Conditions Scenario						Removal Scenario				
		XRF	Lab		Lead Value (mg/kg)	Lab - Actual	Lab-Predicted ²		XRF - Unit LOD ³	SI Data (2009/10)	Parent (P) or Duplicate (D)	Lead Value (mg/kg) ⁴	Basis		
							Linear Regression	RPD					Lead - Site-wide UCL	PAHs - DU4 UCL	Removal Boundary
DU3	S4	22.3	NS	--	33.0			x				33.0			
DU3	S5	43.8	NS	--	64.8			x				64.8			
DU3	S6	73.3	178	--	178.0	x						178.0			
DU3	S7	61.0	NS	--	90.3			x				90.3			
DU3	S8	131.6	NS	--	200.3		x					21.5			x
DU3	S9	181.3	NS	--						P					
DU3	S9-dup	184.4	NS	--	316.6		x			D		21.5			x
DU3	S10	118.9	201	--	201.0	x						21.5			x
DU3	S11	69.3	NS	--	102.6			x				102.6			
DU3	T4	48.0	NS	--	71.0			x				71.0			
DU3	T5	55.1	NS	--	81.5			x				81.5			
DU3	T6	58.9	NS	--	87.1			x				87.1			
DU3	T7	97.5	200	--	200.0	x						21.5			x
DU3	T8	93.2	NS	--	137.9			x				21.5			x
DU3	T9	102.3	67.2	--	67.2	x						21.5			x
DU3	T10	58.7	NS	--	86.8			x				86.8			
DU3	T11	75.2	111	--	111.0	x				P		111.0			
DU3	T11-dup	--	93.1	--						D					
DU3	T12	70.8	NS	--	104.8			x				104.8			
DU3	T13	42.8	NS	--	63.4			x				63.4			
DU3	U4	215.2	NS	--	384.4		x					21.5	x		
DU3	U5	136.2	289	--	289.0	x						21.5			x
DU3	U6	240.5	NS	--	440.0		x					21.5	x		
DU3	U7	317.7	NS	--	609.9		x					21.5	x		
DU3	U8	184.3	NS	--	316.3		x					21.5			x
DU3	U9	120.8	187	--	187.0	x						21.5			x
DU3	U10	64.5	NS	--	95.4			x				95.4			
DU3	U11	81.8	NS	--	121.0			x				21.5			x
DU3	U12	16.2	NS	--	24.0			x				24.0			
DU3	U13	11.3	NS	--	16.7			x				16.7			
DU3	U14	12.7	NS	--	18.8			x				18.8			
DU3	V4	87.1	NS	--	128.9			x				128.9			
DU3	V5	110.0	175	--	175.0	x						175.0			
DU3	V6	47.8	NS	--	70.7			x				70.7			
DU3	V7	384.5	NS	--	756.8		x					21.5	x		
DU3	V8	233.5	NS	--	424.5		x					21.5	x		
DU3	V9	223.8	NS	--	403.2		x					21.5	x		
DU3	V10	161.7	NS	--	266.6		x					21.5			x
DU3	V11	100.2	147	--	147.0	x						21.5			x
DU3	V12	21.8	NS	--	32.2			x				32.2			
DU3	V13	22.1	NS	--	32.7			x				32.7			
DU3	V14	11.8	NS	--	17.4			x				17.4			
DU3	W4	45.3	NS	--	67.0			x				67.0			
DU3	W5	54.4	NS	--	80.6			x				80.6			
DU3	W6	47.3	NS	--	70.0			x				70.0			
DU3	W7	397.7	974	--	974.0	x						21.5	x		
DU3	W8	148.9	NS	--	238.4		x					21.5			x
DU3	W9	281.9	NS	--	531.1		x					21.5	x		
DU3	W10	161.7	NS	--	266.6		x					21.5			x
DU3	W11	34.6	NS	--	51.3			x				51.3			
DU3	X4	144.9	NS	--	229.7		x					21.5			x
DU3	X5	179.0	NS	--	304.7		x					21.5			x
DU3	X6	173.8	329	--	329.0	x						21.5			x
DU3	X7	273.1	NS	--	511.7		x					21.5	x		
DU3	X8	381.4	NS	--	750.0		x					21.5	x		

1-field dup; higher of parent and dup used

2-Lab (predicted) = (XRF x 48%) + XRF

3-XRF unit LOD

4-Shaded replacement conc. are average background (21.5 mg/kg)

5-bold/italic conc. exceed 130 mg/kg

6-DU2-M11 duplicate (see text)

Table 3
 Summary of Data Used for UCL Calculations
 Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Location/Sample ID	Lead Concentration (mg/kg)			ProUCL Dataset Input							Removal Scenario			
		2013 XRF Study		Site Inspection (SI) Data 2009/2010	Lead Value (mg/kg)	Current Conditions Scenario					Lead Value (mg/kg) ⁴	Basis			
		XRF	Lab			Lab - Actual	Lab-Predicted ²		XRF - Unit LOD ³	SI Data (2009/10)		Parent (P) or Duplicate (D)	Lead - Site-wide UCL	PAHs - DU4 UCL	Removal Boundary
							Linear Regression	RPD							
DU3	X9	145.5	NS	--	231.0		x					21.5			x
DU3	X10	68.5	97.6	--	97.6	x						97.6			
DU3	X11	17.3	NS	--	25.7			x				25.7			
DU3	Y4	147.5	183	--	183.0	x						21.5			x
DU3	Y5	213.2	NS	--	380.0		x					21.5	x		
DU3	Y6	471.0	NS	--	947.4		x					21.5	x		
DU3	Y7	286.0	NS	--	540.2		x					21.5	x		
DU3	Y8	32.0	38.9	--	38.9	x						38.9			
DU3	Y9	33.2	NS	--	49.2			x				49.2			
DU3	Z4	42.7	NS	--	63.3			x				63.3			
DU3	Z5	18.7	NS	--	27.7			x				27.7			
DU3	Z6	32.6	NS	--	48.3			x				48.3			
DU3	Z7	37.2	NS	--	55.1			x				55.1			
DU3	Z8	18.4	NS	--	27.3			x				27.3			
DU3	AA5	29.5	NS	--	43.7			x				43.7			
DU3	AA6	55.9	NS	--	82.7			x				82.7			
DU3	NASB-TASKT-XRF-SB07	--	--	152	152.0					x		21.5			x
DU3	NASB-TASKT-XRF-SB09	--	--	1.6	1.6					x		1.6			
DU3	NASB-TASKT-XRF-SB10	--	--	9.2	9.2					x		9.2			
DU3	NASB-TASKT-XRF-SB11	--	--	39.6	39.6					x		39.6			
DU3	NASB-TASKT-XRF-SS07	--	--	51.7	51.7					x		51.7			
DU3	NASB-TASKT-XRF-SS08	--	--	168	168.0					x		21.5			x
DU3	NASB-TASKT-XRF-SS09	--	--	24300	24300.0					x	P	21.5	x		
DU3	NASB-TASKT-XRF-SS09-dup	--	--	12347.5							D				
DU3	NASB-TASKT-XRF-SS10	--	--	295	295.0					x		21.5			x
DU3	NASB-TASKT-XRF-SS16	--	--	NA						x					
DU3	TASKT-2-SS15	--	--	79.9	79.9					x		79.9			
DU3	TASKT-2-SS17	--	--	367	367.0					x		21.5	x		
DU3	TASKT-2-SS18	--	--	183	183.0					x		21.5			x
DU3	TASKT-2-SS19	--	--	154	154.0					x		21.5			x
DU3	TASKT-2-SS42	--	--	99.1	99.1					x		99.1			
DU3	TASKT-2-SS43	--	--	122	122.0					x		122.0			
DU4	M3	NA	38.4	--	38.4	x						38.4			
DU4	M4	NA	100.0	--	100.0	x						21.5		x	
DU4	N4	NA	474.0	--	474.0	x					P	21.5		x	
DU4	N4-dup	NA	441.0	--	--						D				
DU4	O2	NA	62.2	--	62.2	x						21.5		x	
DU4	O3	NA	61.4	--	61.4	x						21.5		x	
DU4	O4	NA	74.7	--	74.7	x						74.7			
DU4	P3	NA	108.0	--	108.0	x						21.5		x	
DU4	NASB-TASKT-XRF-SB01	--	--	27.6	27.6					x		21.5			x
DU4	NASB-TASKT-XRF-SS13	--	--	37.7	37.7					x		37.7			
DU4	NASB-TASKT-XRF-SS17	--	--	150.0	150.0					x		150.0			
DU4	NASB-TASKT-XRF-SS18	--	--	22.9	22.9					x		21.5			x
DU4	NASB-TASKT-XRF-SS19	--	--	52.4	52.4					x	P	21.5		x	
DU4	NASB-TASKT-XRF-SS19-dup	--	--	47.8							D				
DU4	NASB-TASKT-XRF-SS20	--	--	23.0	23.0					x		23.0			
DU4	TASKT-2-SS01	--	--	NA	NA										
DU4	TASKT-2-SS02	--	--	NA	NA										
DU4	TASKT-2-SS03	--	--	NA	NA										
DU4	TASKT-2-SS04	--	--	NA	NA										
DU4	TASKT-2-SS05	--	--	NA	NA										
DU4	TASKT-2-SS06	--	--	NA	NA										
Counts						53	64	104	6	68	--	--	53	6	94

1-field dup; higher of parent and dup used

2-Lab (predicted) = (XRF x 48%) + XRF

3-XRF unit LOD

4-Shaded replacement conc. are average background (21.5 mg/kg)

5-bold/italic conc. exceed 130 mg/kg

6-DU2-M11 duplicate (see text)

Figures

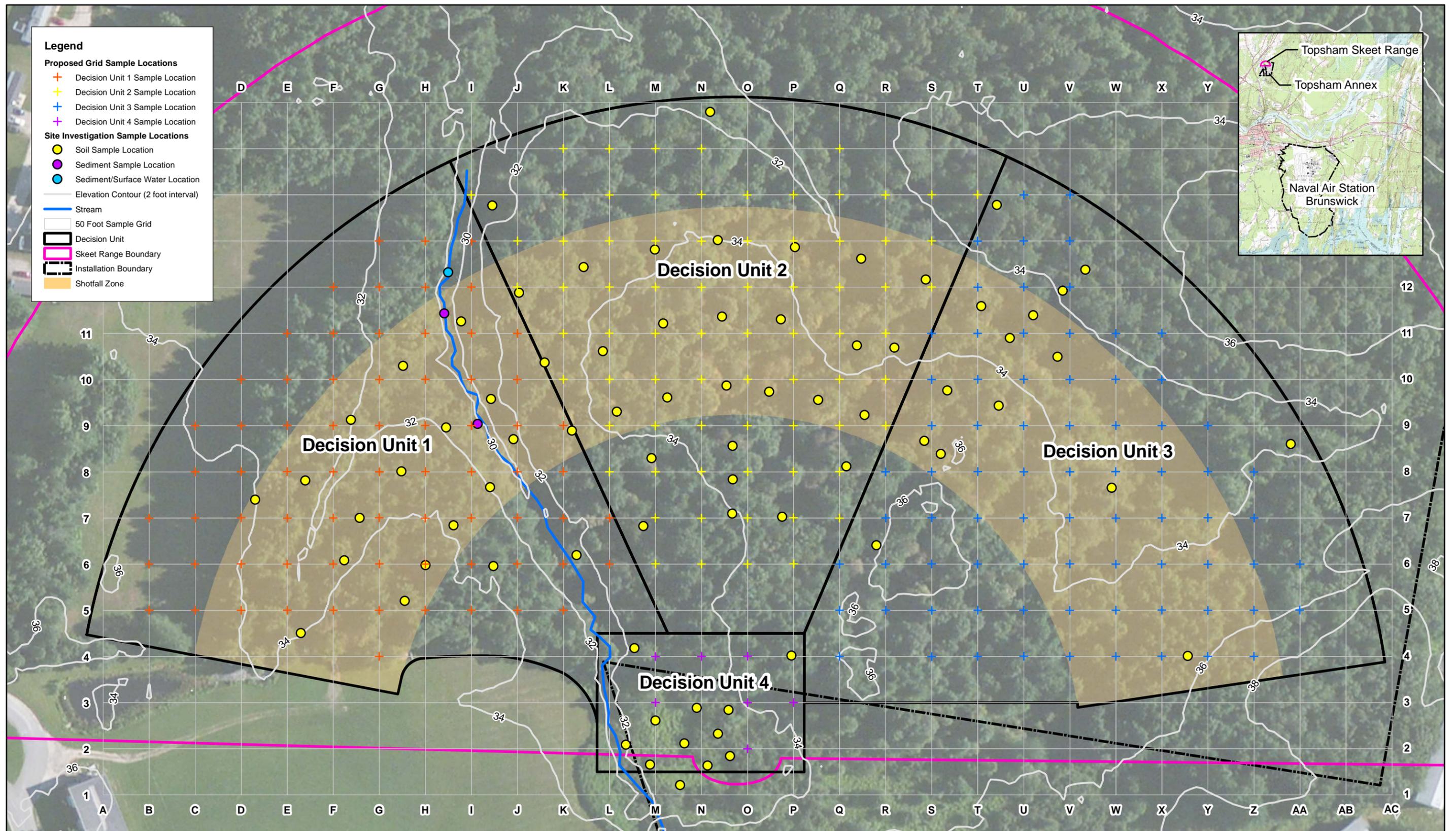


Figure 1
 Sampling Grid and Sample Locations
 Topsham Annex Skेत Range
 Naval Air Station Brunswick
 Topsham, Maine

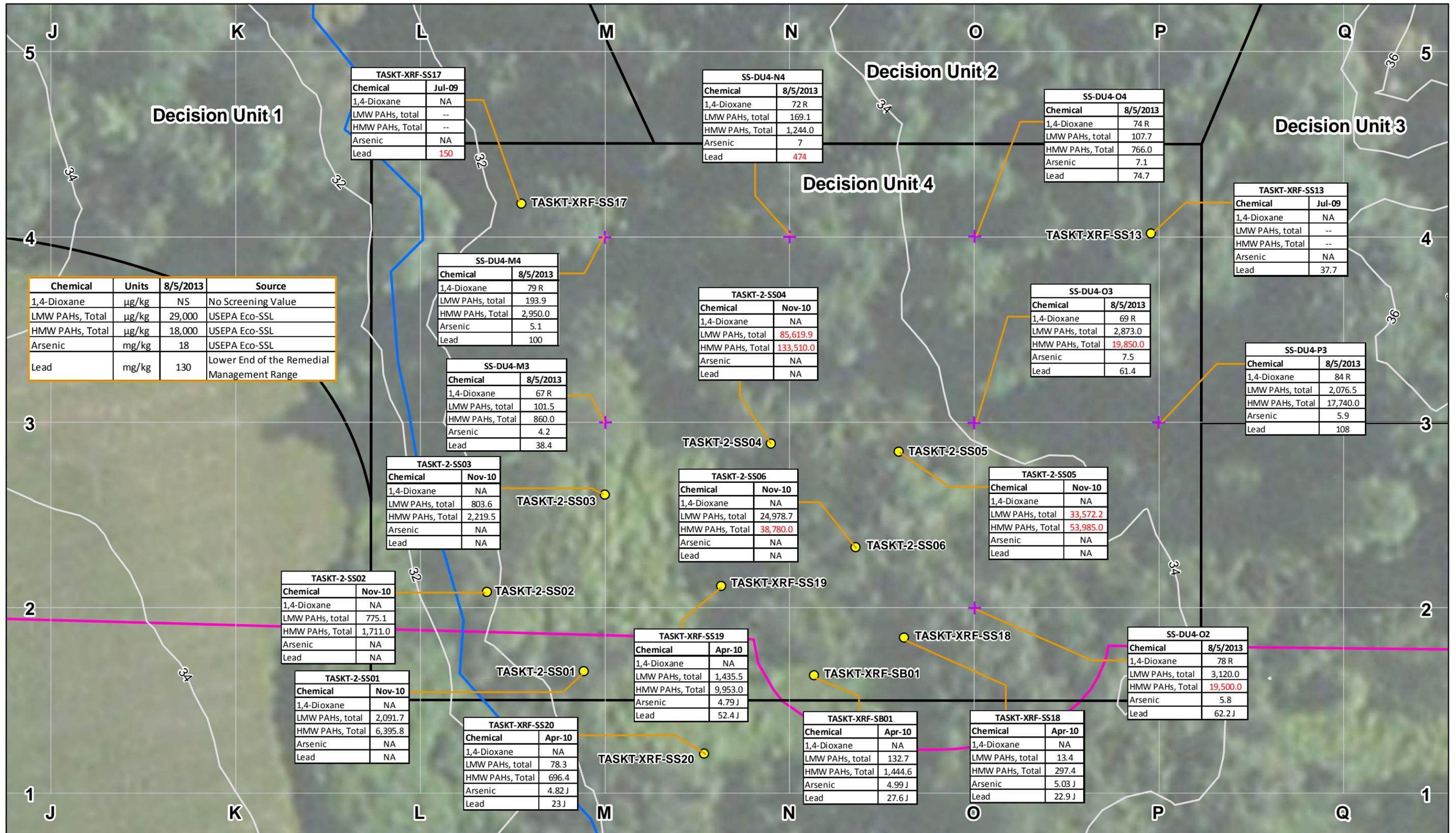


Figure 2
Decision Unit 4 Results
Topsham Annex Skeet Range
Naval Air Station Brunswick
Topsham, Maine

AGVIO
ENVIRONMENTAL SERVICES
CH2M HILL
JOINT VENTURE

0 12.5 25 50 Feet

N

Legend

- Skeet Range Boundary
- Decision Unit
- 50 Foot Sample Grid
- 2013 XRF Study Sample Location
- 2009/10 SI Sample Location
- Elevation Contour (2 foot interval)
- Stream

Notes:

- All grids are 50 by 50 foot.
- LMW = Low Molecular Weight
- HMW = High Molecular Weight
- R = Rejected data
- J = Result is an estimate.
- NA = Not Analyzed
- = Not Sampled
- RED results = Exceeds ecological screening value (PAHs) or lower end of the remedial management range (lead).
- µg/kg = micrograms per kilogram
- mg/kg = milligrams per kilogram

Figure 3. XRF vs. Laboratory Results (All Data Pairs Site-Wide)

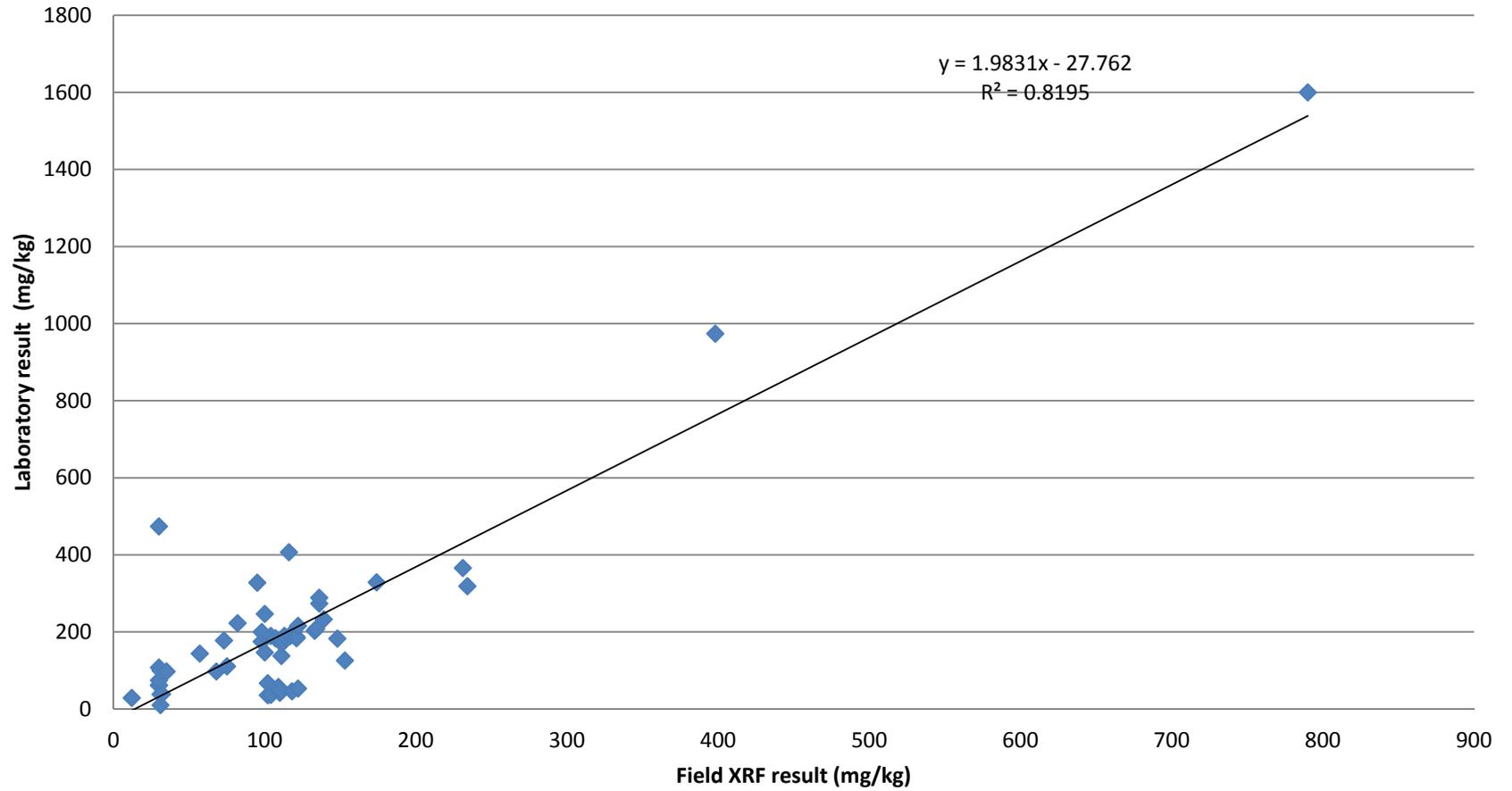


Figure 4. XRF vs. Laboratory (XRF >130 mg/kg)

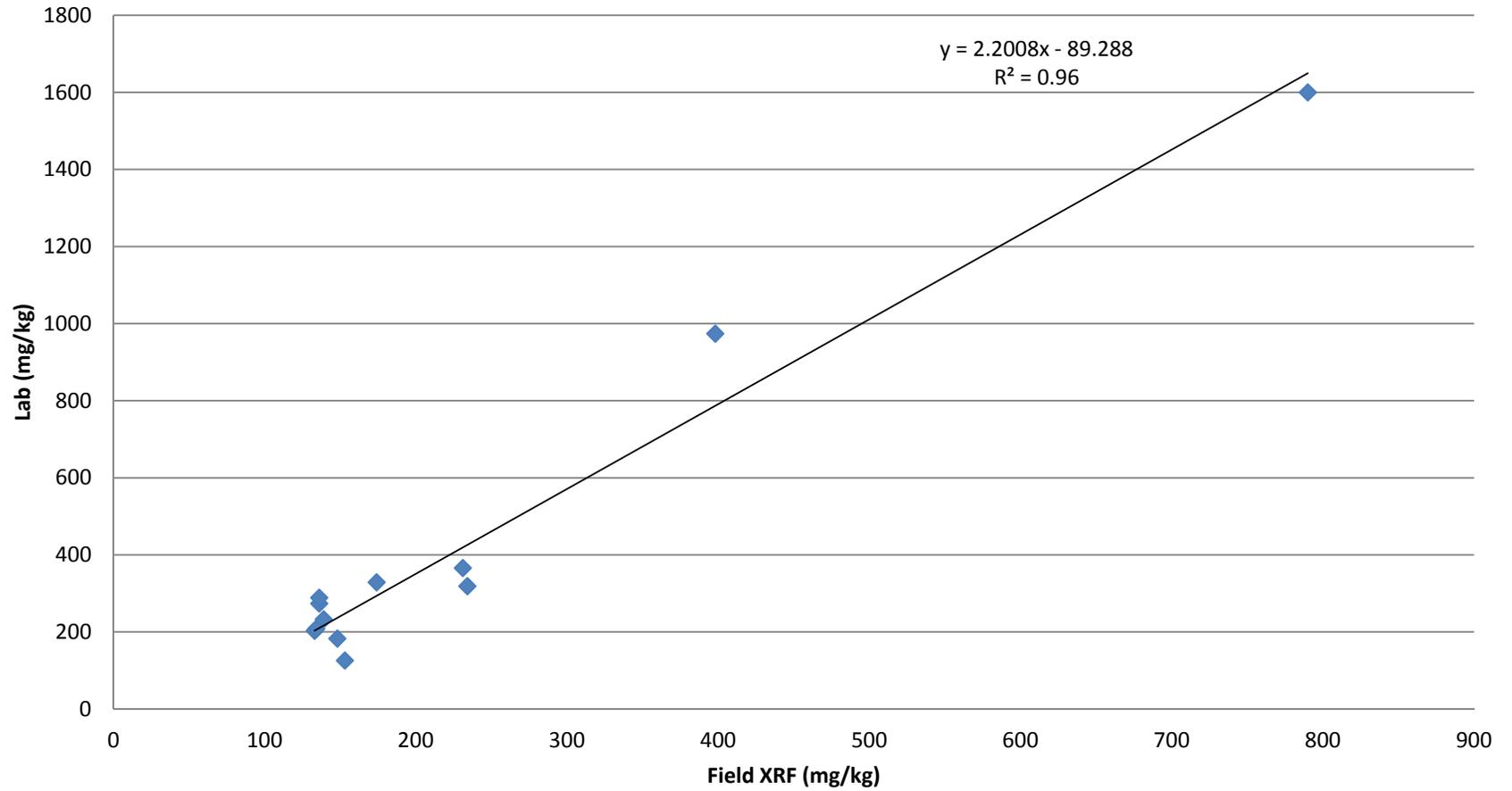


Figure 5. XRF vs. Laboratory (XRF <130 mg/kg)

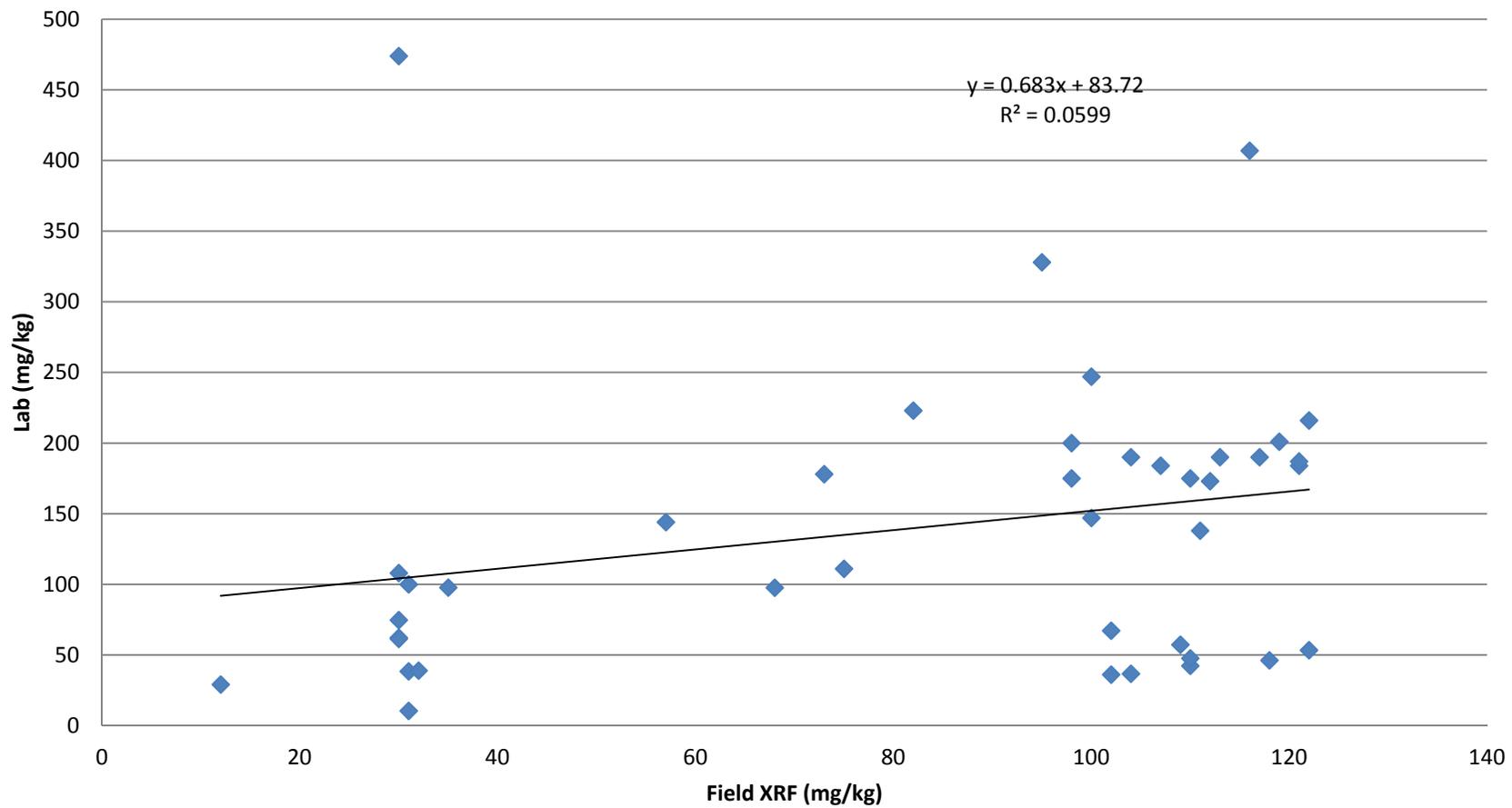
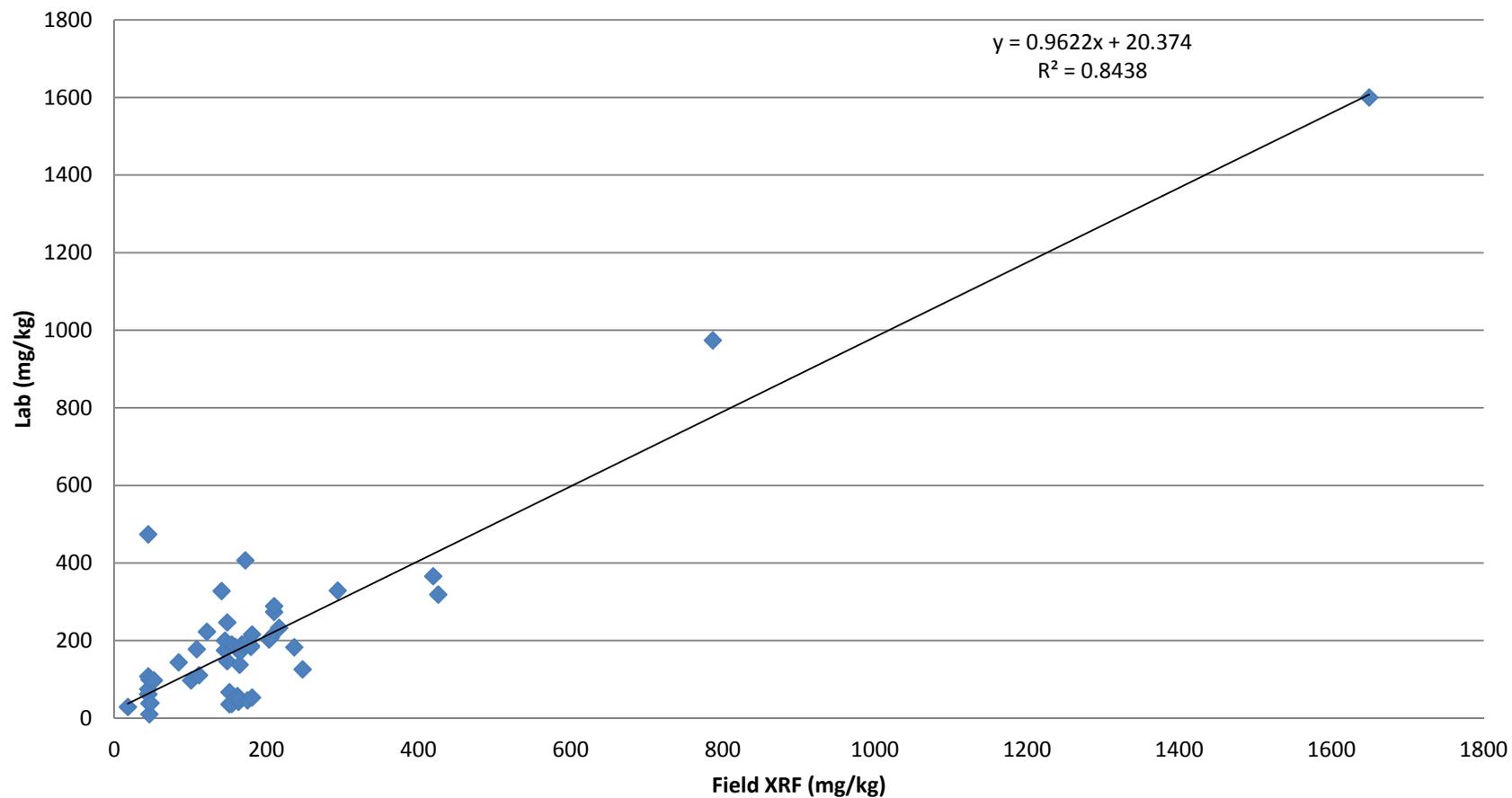
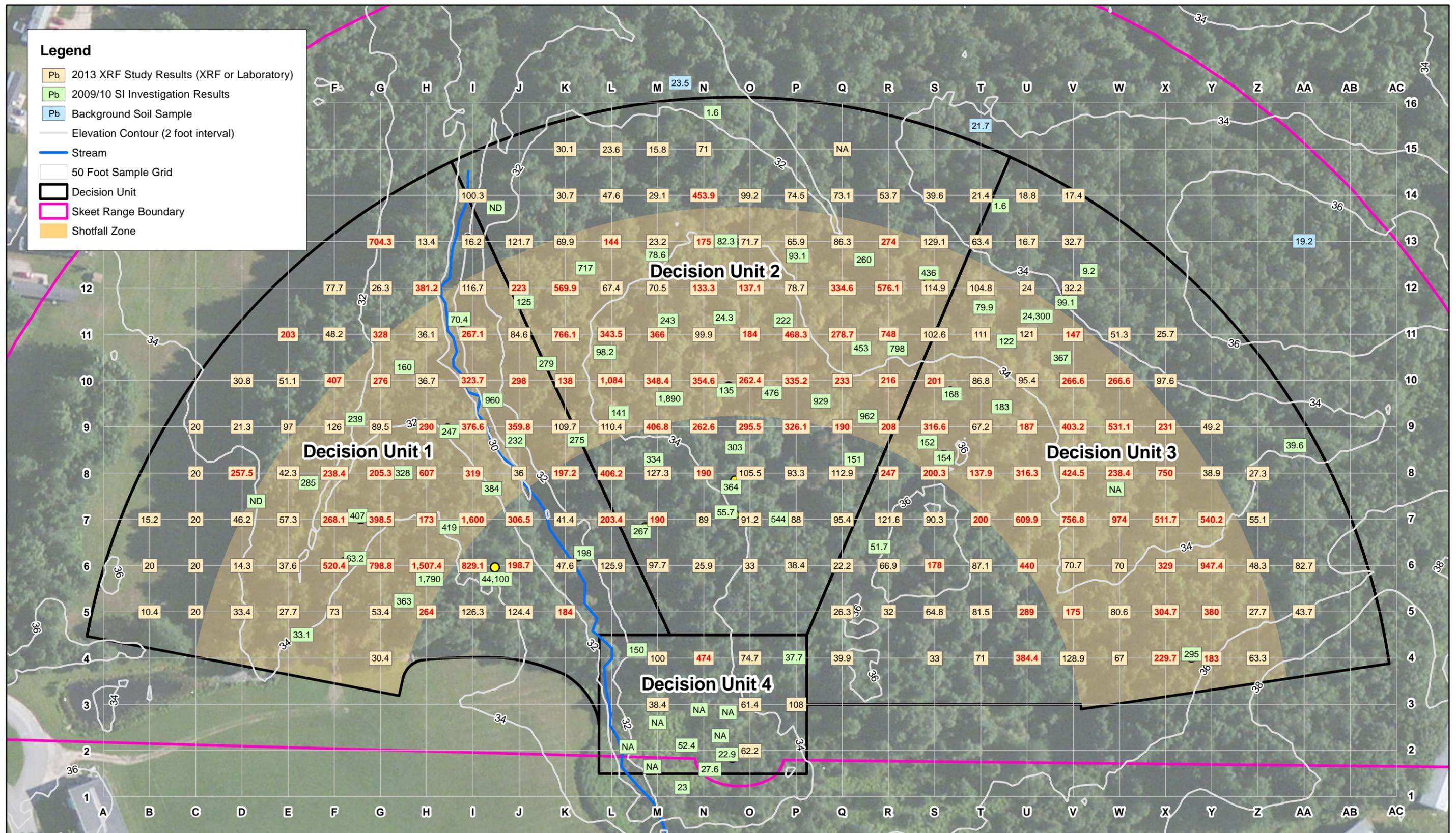


Figure 6. XRF-Adjusted/Lab-Predicted vs. Lab (All Data Pairs Site-Wide)





- Notes:
1. All concentrations are milligrams per kilogram (mg/kg).
 2. Results in **RED BOLD** > lower end of the remedial management range (lead). (130 mg/kg).
 3. XRF results for DUs 1, 2 & 3 are average of three readings.
 4. All 2013 XRF results were adjusted (see text).
 5. NA = not analyzed
 6. ND = not detected
 7. All grids are 50 by 50 foot.

Figure 7
 Sampling Grid and Lead Results
 Topsham Annex Skeet Range
 Naval Air Station Brunswick
 Topsham, Maine



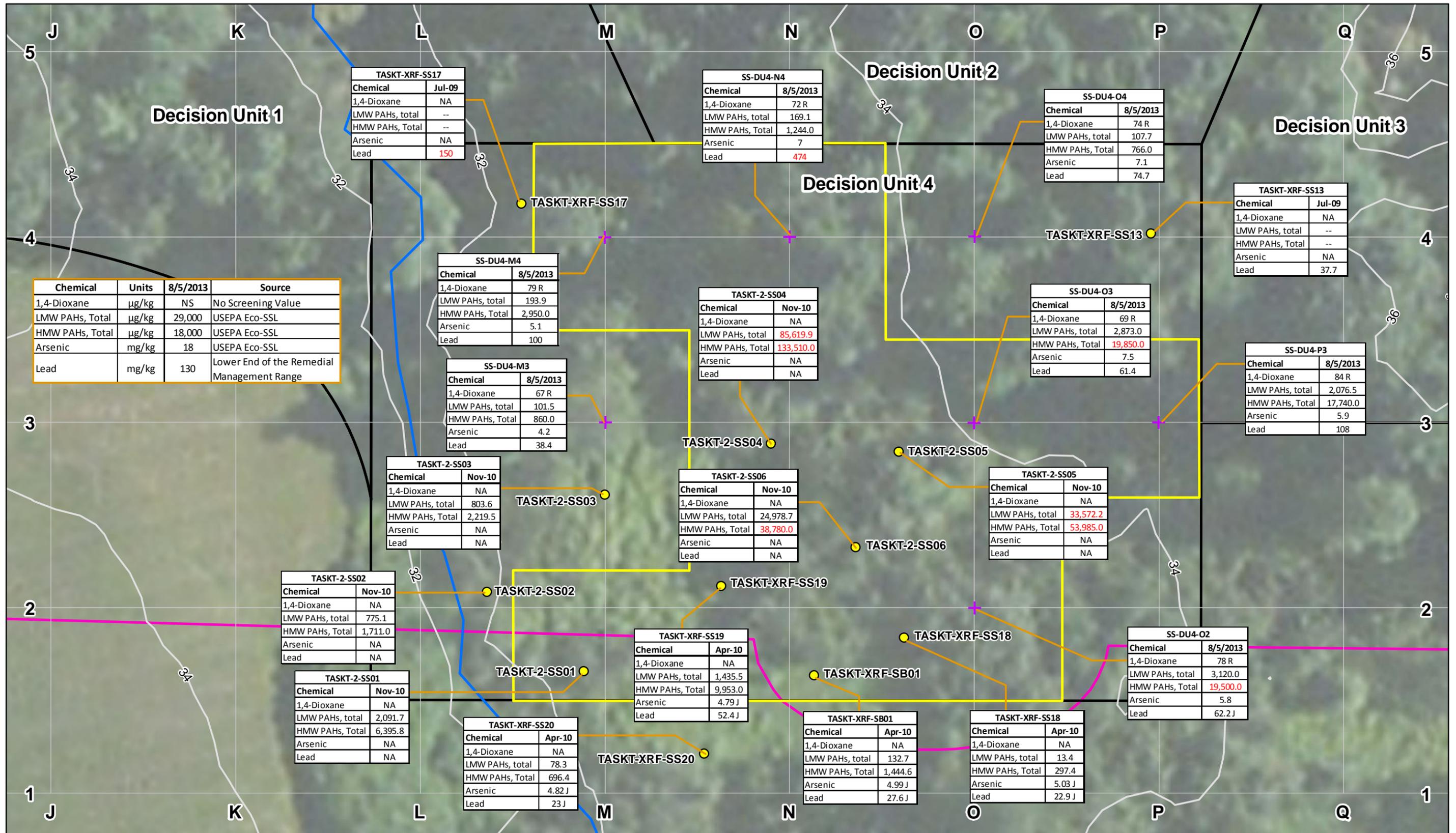


Figure 8
Decision Unit 4 Proposed Removal Boundary
Topsham Annex Skeet Range
Naval Air Station Brunswick
Topsham, Maine

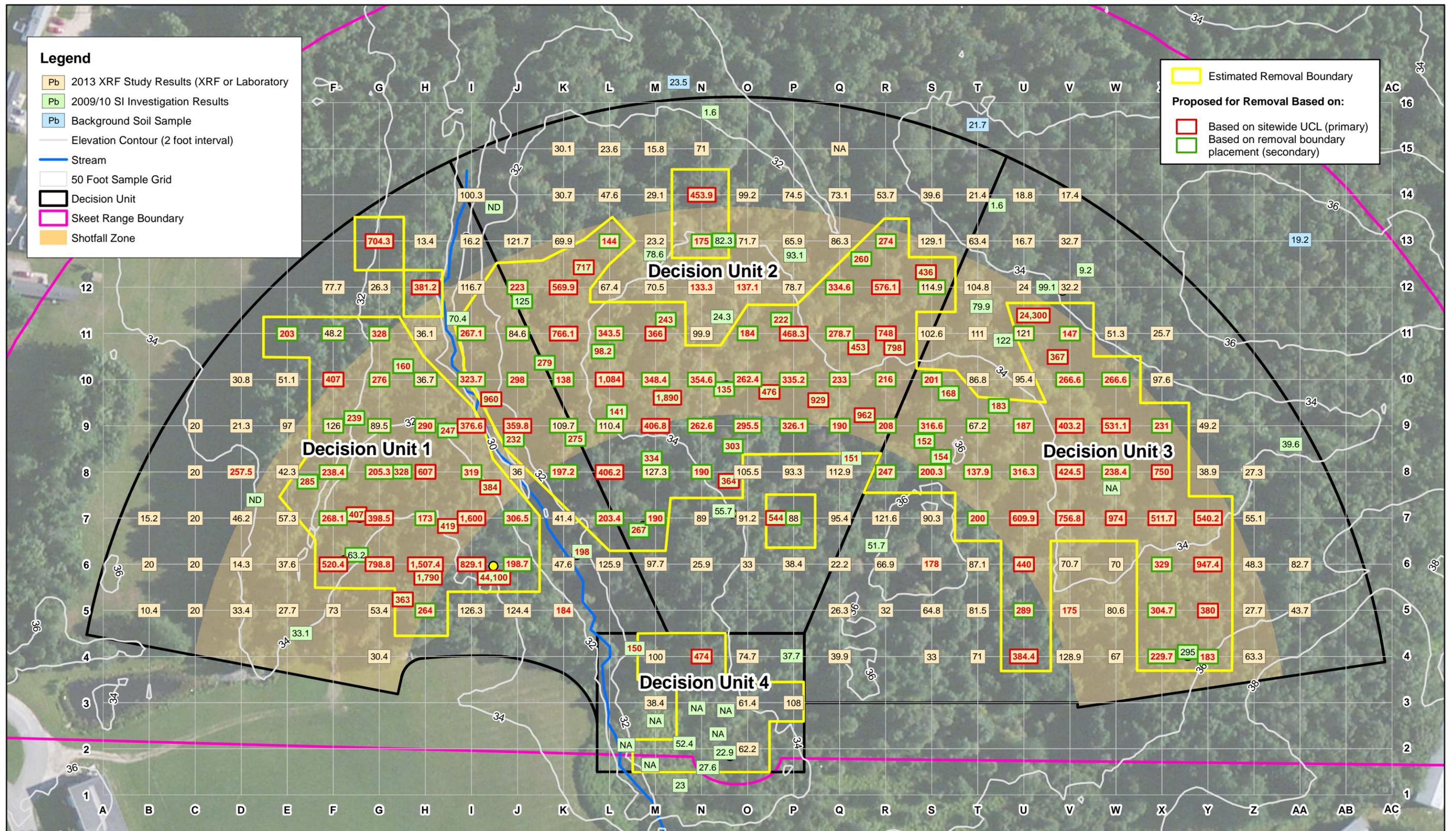
AGVIO ENVIRONMENTAL SERVICES
CH2M HILL

0 12.5 25 50 Feet

Legend

- Skeet Range Boundary
- Decision Unit
- 50 Foot Sample Grid
- Estimated Removal Boundary
- 2013 XRF Study Sample Location
- 2009/10 SI Sample Location
- Elevation Contour (2 foot interval)
- Stream

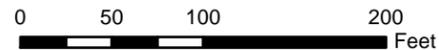
- Notes:
- All grids are 50 by 50 foot.
 - LMW = Low Molecular Weight
 - HMW = High Molecular Weight
 - R = Rejected data
 - J = Result is an estimate.
 - NA = Not Analyzed
 - = Not Sampled
 - RED results = Exceeds ecological screening value (PAHs) or lower end of the remedial management range (lead).
 - µg/kg = micrograms per kilogram
 - mg/kg = milligrams per kilogram



Notes:

1. All concentrations are milligrams per kilogram (mg/kg).
2. Results in **RED BOLD** > lower end of the remedial management range (lead). (130 mg/kg).
3. XRF results for DUs 1, 2 & 3 are average of three readings.
4. All XRF results were adjusted (see text).
5. NA = not analyzed
6. ND = not detected
7. All grids are 50 by 50 foot.

Figure 9
 Proposed Removal Boundaries
 Topsham Annex Skeet Range
 Naval Air Station Brunswick
 Topsham, Maine



Attachment A

XRF Lead Result Adjustment Approach - Working Sheet

Attachment A

XRF Lead Result Adjustment Approach - Working Sheet

Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Sample Location	XRF (mg/kg)	PREDICTED LAB RESULT (ADJUSTED XRF) (mg/kg)	Actual Lab Results (mg/kg)	Relative Percent Difference (RPD)	ADJUSTED - Relative Percent Difference (RPD)
DU2	M14	12	17.8	29.1	59%	39%
DU4	N4*	30	44.5	474	94%	91%
DU4	O2	30	44.5	62.2	52%	28%
DU4	O3	30	44.5	61.4	51%	27%
DU4	O4	30	44.5	74.7	60%	40%
DU4	P3	30	44.5	108	72%	59%
DU1	B5	31	46.0	10.4	-198%	--
DU4	M3	31	46.0	38.4	19%	-20%
DU4	M4	31	46.0	100	69%	54%
DU3	Y8	32	47.5	38.9	18%	-22%
DU2	M6	35	51.9	97.7	64%	47%
DU2	L13	57	84.6	144	60%	41%
DU3	X10	68	100.9	97.6	30%	-3%
DU3	S6	73	108.3	178	59%	39%
DU3	T11*	75	111.3	111	32%	0%
DU2	J12	82	121.7	223	63%	45%
DU1	G11	95	141.0	328	71%	57%
DU2	N13	98	145.4	175	44%	17%
DU3	T7	98	145.4	200	51%	27%
DU3	R8	100	148.4	247	60%	40%
DU3	V11	100	148.4	147	32%	-1%
DU1	H11	102	151.4	36.1	-183%	--
DU3	T9	102	151.4	67.2	-52%	--
DU1	H10	104	154.3	36.7	-183%	--
DU2	M7	104	154.3	190	45%	19%
DU1	K5	107	158.8	184	42%	14%
DU1	E7	109	161.8	57.3	-90%	--
DU1	E8	110	163.2	42.3	-160%	--
DU1	K6	110	163.2	47.6	-131%	--
DU3	V5	110	163.2	175	37%	7%
DU2	K10	111	164.7	138	20%	-19%
DU1	H7	112	166.2	173	35%	4%
DU2	Q9	113	167.7	190	41%	12%
DU1	F10	116	172.1	407	71%	58%
DU2	N8	117	173.6	190	38%	9%
DU1	D7	118	175.1	46.2	-155%	--
DU3	S10	119	176.6	201	41%	12%
DU2	O11	121	179.6	184	34%	2%
DU3	U9	121	179.6	187	35%	4%
DU1	G5	122	181.0	53.4	-128%	--
DU2	R10	122	181.0	216	44%	16%
DU1	E11*	133	203.4	203	34%	
DU2	R9	134	205.6	208	36%	

Attachment A
XRF Lead Result Adjustment Approach - Working Sheet
Topsham Annex Skeet Range, Topsham, Maine

Decision Unit (DU)	Sample Location	XRF (mg/kg)	PREDICTED LAB RESULT (ADJUSTED XRF) (mg/kg)	Actual Lab Results (mg/kg)	Relative Percent Difference (RPD)	ADJUSTED - Relative Percent Difference (RPD)
DU2	R13	136	210.0	274	50%	
DU3	U5	136	210.0	289	53%	
DU2	Q10	139	216.6	233	40%	
DU3	Y4	148	236.4	183	19%	
DU1	F9	153	247.4	126	-21%	
DU3	X6	174	293.7	329	47%	
DU2	M11*	231	419.1	366	37%	
DU1	I8	234	425.7	319	27%	
DU3	W7	398	786.6	974	59%	
DU1	I7	790	1649.3	1600	51%	

*Lab concentration is higher of the parent and field duplicate sample (except M11)

Concentration >130 mg/kg

RPD between -20% and <20%

Average	Dataset
140.7	All lab data when XRF <130 mg/kg
83.4	All XRF data when XRF <130 mg/kg
48%	Positive (+) RPDs for paired groupings when XRF <130 mg/kg
6%	Overall RPDs of paired grouping when XRF <130 mg/kg

Regression Adjustment Equation used for XRF >130 mg/kg

$$y = (2.200803419 * X) - 89.28786621$$

XRF	=	Action Level
99.65 mg/kg		147.9 mg/kg

Attachment B
USEPA ProUCL Output – Decision Unit 4 Surface Soil
PAHs

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

General UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
From File	C:\Users\dlavoie\Desktop\Temp\Current\TASKT_DU4-PAHs_Current_data-import_021714_v2.wst		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
1-Methylnaphthalene			
General Statistics			
Number of Valid Data	10	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	4
Number of Missing Values	9	Percent Non-Detects	40.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	9.25	Minimum Detected	2.225
Maximum Detected	200	Maximum Detected	5.298
Mean of Detected	78.56	Mean of Detected	3.952
SD of Detected	68.1	SD of Detected	1.113
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	10.3	Maximum Non-Detect	2.332
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		Number treated as Non-Detect	5
		Number treated as Detected	5
		Single DL Non-Detect Percentage	50.00%
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.893	Shapiro Wilk Test Statistic	0.935
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
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	48.16	Mean	2.662
SD	64.17	SD	1.91
95% DL/2 (t) UCL	85.36	95% H-Stat (DL/2) UCL	2401
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	11.39	Mean in Log Scale	2.854

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

SD	100.7	SD in Log Scale	1.646
95% MLE (t) UCL	69.76	Mean in Original Scale	48.5
95% MLE (Tiku) UCL	83.25	SD in Original Scale	63.89
		95% t UCL	85.54
		95% Percentile Bootstrap UCL	81.39
		95% BCA Bootstrap UCL	91.02
		95% H UCL	815.3
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.789	Data appear Normal at 5% Significance Level	
Theta Star	99.6		
nu star	9.464		
A-D Test Statistic	0.263	Nonparametric Statistics	
5% A-D Critical Value	0.71	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.71	Mean	50.84
5% K-S Critical Value	0.338	SD	58.92
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	20.41
Assuming Gamma Distribution		95% KM (t) UCL	88.25
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	84.41
Minimum	0.000001	95% KM (jackknife) UCL	85.05
Maximum	200	95% KM (bootstrap t) UCL	105.3
Mean	47.14	95% KM (BCA) UCL	98.74
Median	15.28	95% KM (Percentile Bootstrap) UCL	96.2
SD	64.98	95% KM (Chebyshev) UCL	139.8
k star	0.146	97.5% KM (Chebyshev) UCL	178.3
Theta star	321.9	99% KM (Chebyshev) UCL	253.9
Nu star	2.929	Potential UCLs to Use	
AppChi2	0.352	95% KM (t) UCL	88.25
95% Gamma Approximate UCL (Use when n >= 40)	392.6	95% KM (Percentile Bootstrap) UCL	96.2
95% Adjusted Gamma UCL (Use when n < 40)	573.7		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
2-Methylnaphthalene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	8
Number of Distinct Detected Data	8	Number of Non-Detect Data	9
Number of Missing Values	2	Percent Non-Detects	52.94%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	10	Minimum Detected	2.303

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Maximum Detected	3200	Maximum Detected	8.071
Mean of Detected	620.6	Mean of Detected	4.516
SD of Detected	1106	SD of Detected	2.288
Minimum Non-Detect	2.25	Minimum Non-Detect	0.811
Maximum Non-Detect	24	Maximum Non-Detect	3.178
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	12
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	5
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	70.59%
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.645	Shapiro Wilk Test Statistic	0.85
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	295.2	Mean	2.942
SD	797	SD	2.238
95% DL/2 (t) UCL	632.7	95% H-Stat (DL/2) UCL	3461
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	2.153
		SD in Log Scale	2.833
		Mean in Original Scale	292.8
		SD in Original Scale	797.9
		95% t UCL	630.7
		95% Percentile Bootstrap UCL	643.5
		95% BCA Bootstrap UCL	854.5
		95% H-UCL	32538
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.303	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	2050		
nu star	4.843		
A-D Test Statistic	0.722	Nonparametric Statistics	
5% A-D Critical Value	0.788	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.788	Mean	297.6
5% K-S Critical Value	0.315	SD	772.3

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Data follow Appr. Gamma Distribution at 5% Significance Level			
		SE of Mean	200.2
		95% KM (t) UCL	647.2
Assuming Gamma Distribution		95% KM (z) UCL	627
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	634
Minimum	0.000001	95% KM (bootstrap t) UCL	1466
Maximum	3200	95% KM (BCA) UCL	670.4
Mean	292	95% KM (Percentile Bootstrap) UCL	656.3
Median	0.000001	95% KM (Chebyshev) UCL	1170
SD	798.2	97.5% KM (Chebyshev) UCL	1548
k star	0.103	99% KM (Chebyshev) UCL	2290
Theta star	2843		
Nu star	3.492	Potential UCLs to Use	
AppChi2	0.532	95% KM (t) UCL	647.2
95% Gamma Approximate UCL (Use when n >= 40)		1917	
95% Adjusted Gamma UCL (Use when n < 40)		2371	
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Acenaphthene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	14
Number of Distinct Detected Data	13	Number of Non-Detect Data	3
Number of Missing Values	2	Percent Non-Detects	17.65%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.3	Minimum Detected	1.668
Maximum Detected	4470	Maximum Detected	8.405
Mean of Detected	613	Mean of Detected	4.692
SD of Detected	1231	SD of Detected	2.068
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.35	Maximum Non-Detect	0.854
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	14
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	17.65%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.559	Shapiro Wilk Test Statistic	0.959
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

DL/2 Substitution Method		DL/2 Substitution Method	
Mean	505	Mean	3.882
SD	1136	SD	2.596
95% DL/2 (t) UCL	985.9	95% H-Stat (DL/2) UCL	50289
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	349.3	Mean in Log Scale	3.842
SD	1253	SD in Log Scale	2.658
95% MLE (t) UCL	879.7	Mean in Original Scale	504.9
95% MLE (Tiku) UCL	860.7	SD in Original Scale	1136
		95% t UCL	985.8
		95% Percentile Bootstrap UCL	1018
		95% BCA Bootstrap UCL	1256
		95% H UCL	67188
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.349	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	1755		
nu star	9.778		
		Nonparametric Statistics	
A-D Test Statistic	0.706	Kaplan-Meier (KM) Method	
5% A-D Critical Value	0.816	Mean	505.7
K-S Test Statistic	0.816	SD	1101
5% K-S Critical Value	0.245	SE of Mean	277.2
Data appear Gamma Distributed at 5% Significance Level		95% KM (t) UCL	989.7
Assuming Gamma Distribution		95% KM (z) UCL	961.7
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	986.3
Minimum	0.000001	95% KM (bootstrap t) UCL	2003
Maximum	4470	95% KM (BCA) UCL	1022
Mean	504.8	95% KM (Percentile Bootstrap) UCL	1002
Median	75.7	95% KM (Chebyshev) UCL	1714
SD	1136	97.5% KM (Chebyshev) UCL	2237
k star	0.17	99% KM (Chebyshev) UCL	3264
Theta star	2969		
Nu star	5.781	Potential UCLs to Use	
AppChi2	1.529	95% KM (Chebyshev) UCL	1714
95% Gamma Approximate UCL (Use when n >= 40)	1909		
95% Adjusted Gamma UCL (Use when n < 40)	2223		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Acenaphthylene			

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

General Statistics			
Number of Valid Data	17	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	14
Number of Missing Values	2	Percent Non-Detects	82.35%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	2.4	Minimum Detected	0.875
Maximum Detected	83.2	Maximum Detected	4.421
Mean of Detected	42	Mean of Detected	2.999
SD of Detected	40.42	SD of Detected	1.874
Minimum Non-Detect	2.15	Minimum Non-Detect	0.765
Maximum Non-Detect	27.7	Maximum Non-Detect	3.321
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	15
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	2
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	88.24%
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.999	Shapiro Wilk Test Statistic	0.895
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	12.83	Mean	1.915
SD	20.24	SD	1.063
95% DL/2 (t) UCL	21.4	95% H-Stat (DL/2) UCL	24.88
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-0.0762
		SD in Log Scale	1.698
		Mean in Original Scale	7.866
		SD in Original Scale	21.67
		95% t UCL	17.04
		95% Percentile Bootstrap UCL	17.51
		95% BCA Bootstrap UCL	22.58
		95% H-UCL	19.96

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data appear Normal at 5% Significance Level	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	9.388
5% K-S Critical Value	N/A	SD	20.5
Data not Gamma Distributed at 5% Significance Level		SE of Mean	6.089
		95% KM (t) UCL	20.02
		95% KM (z) UCL	19.4
Assuming Gamma Distribution		95% KM (jackknife) UCL	34.21
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	14.01
Minimum	N/A	95% KM (BCA) UCL	83.2
Maximum	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Mean	N/A	95% KM (Chebyshev) UCL	35.93
Median	N/A	97.5% KM (Chebyshev) UCL	47.41
SD	N/A	99% KM (Chebyshev) UCL	69.97
k star	N/A		
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	20.02
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	N/A
95% Adjusted Gamma UCL (Use when n < 40)	N/A		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Anthracene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	14	Number of Non-Detect Data	2
Number of Missing Values	2	Percent Non-Detects	11.76%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	8.4	Minimum Detected	2.128
Maximum Detected	35600	Maximum Detected	10.48
Mean of Detected	4055	Mean of Detected	5.592
SD of Detected	9550	SD of Detected	2.629
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.35	Maximum Non-Detect	0.854
		Number treated as Non-Detect	2
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Detected	15
For all methods (except KM, DL/2, and ROS Methods),			

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage		11.76%
UCL Statistics				
Normal Distribution Test with Detected Values Only			Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.496	Shapiro Wilk Test Statistic	0.923	
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881	
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	3578	Mean	4.947	
SD	9034	SD	3.06	
95% DL/2 (t) UCL	7403	95% H-Stat (DL/2) UCL	2045085	
Maximum Likelihood Estimate(MLE) Method		Log ROS Method		
Mean	2796	Mean in Log Scale	4.873	
SD	9498	SD in Log Scale	3.188	
95% MLE (t) UCL	6818	Mean in Original Scale	3578	
95% MLE (Tiku) UCL	6547	SD in Original Scale	9034	
		95% t UCL	7403	
		95% Percentile Bootstrap UCL	7505	
		95% BCA Bootstrap UCL	9500	
		95% H UCL	4257974	
Gamma Distribution Test with Detected Values Only			Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.252	Data appear Lognormal at 5% Significance Level		
Theta Star	16070			
nu star	7.57			
A-D Test Statistic	1.183	Nonparametric Statistics		
5% A-D Critical Value	0.852	Kaplan-Meier (KM) Method		
K-S Test Statistic	0.852	Mean	3579	
5% K-S Critical Value	0.242	SD	8764	
Data not Gamma Distributed at 5% Significance Level			SE of Mean	2200
Assuming Gamma Distribution			95% KM (t) UCL	7420
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	7198	
Minimum	0.000001	95% KM (jackknife) UCL	7404	
Maximum	35600	95% KM (bootstrap t) UCL	15301	
Mean	3578	95% KM (BCA) UCL	7329	
Median	267	95% KM (Percentile Bootstrap) UCL	7734	
SD	9034	95% KM (Chebyshev) UCL	13169	
k star	0.168	97.5% KM (Chebyshev) UCL	17319	
Theta star	21267	99% KM (Chebyshev) UCL	25470	
Nu star	5.72	Potential UCLs to Use		
AppChi2	1.499	99% KM (Chebyshev) UCL	25470	
95% Gamma Approximate UCL (Use when n >= 40)	13657			
95% Adjusted Gamma UCL (Use when n < 40)	15923			

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Fluorene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	2
Number of Missing Values	2	Percent Non-Detects	11.76%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.18	Minimum Detected	1.157
Maximum Detected	16700	Maximum Detected	9.723
Mean of Detected	2003	Mean of Detected	4.772
SD of Detected	4579	SD of Detected	2.69
Minimum Non-Detect	13	Minimum Non-Detect	2.565
Maximum Non-Detect	15	Maximum Non-Detect	2.708
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	7
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	10
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	41.18%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.514	Shapiro Wilk Test Statistic	0.927
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
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	1768	Mean	4.439
SD	4334	SD	2.686
95% DL/2 (t) UCL	3603	95% H-Stat (DL/2) UCL	141810
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	4.446
		SD in Log Scale	2.679
		Mean in Original Scale	1768
		SD in Original Scale	4334
		95% t UCL	3603
		95% Percentile Bootstrap UCL	3588
		95% BCA Bootstrap UCL	4584
		95% H-UCL	137847

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.245	Data appear Lognormal at 5% Significance Level	
Theta Star	8171		
nu star	7.353		
A-D Test Statistic	1.236	Nonparametric Statistics	
5% A-D Critical Value	0.856	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.856	Mean	1768
5% K-S Critical Value	0.243	SD	4205
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1056
		95% KM (t) UCL	3611
		95% KM (z) UCL	3504
Assuming Gamma Distribution		95% KM (jackknife) UCL	3603
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	6795
Minimum	0.000001	95% KM (BCA) UCL	3453
Maximum	16700	95% KM (Percentile Bootstrap) UCL	3450
Mean	1767	95% KM (Chebyshev) UCL	6369
Median	100	97.5% KM (Chebyshev) UCL	8360
SD	4335	99% KM (Chebyshev) UCL	12271
k star	0.168		
Theta star	10529		
Nu star	5.707	Potential UCLs to Use	
AppChi2	1.492	99% KM (Chebyshev) UCL	12271
95% Gamma Approximate UCL (Use when n >= 40)	6760		
95% Adjusted Gamma UCL (Use when n < 40)	7884		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Naphthalene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	8
Number of Missing Values	2	Percent Non-Detects	47.06%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.88	Minimum Detected	1.772
Maximum Detected	136	Maximum Detected	4.913
Mean of Detected	57.59	Mean of Detected	3.76
SD of Detected	38.86	SD of Detected	0.945
Minimum Non-Detect	2.07	Minimum Non-Detect	0.728
Maximum Non-Detect	16	Maximum Non-Detect	2.773
		Number treated as Non-Detect	9
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Detected	8
For all methods (except KM, DL/2, and ROS Methods),			

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage		52.94%
Warning: There are only 9 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.				
UCL Statistics				
Normal Distribution Test with Detected Values Only			Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.944	Shapiro Wilk Test Statistic	0.894	
5% Shapiro Wilk Critical Value	0.829	5% Shapiro Wilk Critical Value	0.829	
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	32.45	Mean	2.475	
SD	38.92	SD	1.694	
95% DL/2 (t) UCL	48.93	95% H-Stat (DL/2) UCL	252.8	
Maximum Likelihood Estimate(MLE) Method		Log ROS Method		
Mean	12.57	Mean in Log Scale	2.694	
SD	60.06	SD in Log Scale	1.347	
95% MLE (t) UCL	38	Mean in Original Scale	32.6	
95% MLE (Tiku) UCL	44.95	SD in Original Scale	38.74	
		95% t UCL	49.01	
		95% Percentile Bootstrap UCL	47.75	
		95% BCA Bootstrap UCL	50.87	
		95% H UCL	108.5	
Gamma Distribution Test with Detected Values Only			Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.309	Data appear Normal at 5% Significance Level		
Theta Star	43.99			
nu star	23.56			
A-D Test Statistic	0.306	Nonparametric Statistics		
5% A-D Critical Value	0.731	Kaplan-Meier (KM) Method		
K-S Test Statistic	0.731	Mean	33.25	
5% K-S Critical Value	0.283	SD	37.1	
Data appear Gamma Distributed at 5% Significance Level			SE of Mean	9.544
Assuming Gamma Distribution			95% KM (t) UCL	49.92
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	48.95	
Minimum	0.000001	95% KM (jackknife) UCL	48.02	
Maximum	136	95% KM (bootstrap t) UCL	54.34	
Mean	30.49	95% KM (BCA) UCL	60.74	
Median	5.88	95% KM (Percentile Bootstrap) UCL	56.76	
		95% KM (Chebyshev) UCL	74.86	

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

SD	40.41	97.5% KM (Chebyshev) UCL	92.86
k star	0.123	99% KM (Chebyshev) UCL	128.2
Theta star	247.2		
Nu star	4.194	Potential UCLs to Use	
AppChi2	0.8	95% KM (t) UCL	49.92
95% Gamma Approximate UCL (Use when n >= 40)	159.9	95% KM (Percentile Bootstrap) UCL	56.76
95% Adjusted Gamma UCL (Use when n < 40)	193.4		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Phenanthrene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	16	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	5.88%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	59	Minimum Detected	4.078
Maximum Detected	25300	Maximum Detected	10.14
Mean of Detected	3295	Mean of Detected	6.352
SD of Detected	6663	SD of Detected	1.999
Minimum Non-Detect	2.35	Minimum Non-Detect	0.854
Maximum Non-Detect	2.35	Maximum Non-Detect	0.854
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.555	Shapiro Wilk Test Statistic	0.906
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
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	3102	Mean	5.988
SD	6501	SD	2.449
95% DL/2 (t) UCL	5854	95% H-Stat (DL/2) UCL	196802
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2847	Mean in Log Scale	6.066
SD	6565	SD in Log Scale	2.266
95% MLE (t) UCL	5627	Mean in Original Scale	3102
95% MLE (Tiku) UCL	5383	SD in Original Scale	6501
		95% t UCL	5854

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

		95% Percentile Bootstrap UCL	5786
		95% BCA Bootstrap UCL	7286
		95% H UCL	89368
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.35	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	9414		
nu star	11.2		
A-D Test Statistic	1.044	Nonparametric Statistics	
5% A-D Critical Value	0.821	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.821	Mean	3105
5% K-S Critical Value	0.231	SD	6305
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	1579
		95% KM (t) UCL	5862
Assuming Gamma Distribution		95% KM (z) UCL	5703
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	5857
Minimum	0.000001	95% KM (bootstrap t) UCL	9604
Maximum	25300	95% KM (BCA) UCL	6053
Mean	3102	95% KM (Percentile Bootstrap) UCL	6069
Median	237	95% KM (Chebyshev) UCL	9989
SD	6501	97.5% KM (Chebyshev) UCL	12968
k star	0.243	99% KM (Chebyshev) UCL	18819
Theta star	12760		
Nu star	8.264	Potential UCLs to Use	
AppChi2	2.889	95% KM (Chebyshev) UCL	9989
95% Gamma Approximate UCL (Use when n >= 40)	8872		
95% Adjusted Gamma UCL (Use when n < 40)	9990		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
LMW PAHs			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	17
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	13.4	Minimum of Log Data	2.595
Maximum	85620	Maximum of Log Data	11.36
Mean	9303	Mean of log Data	6.785
Geometric Mean	884.7	SD of log Data	2.387
Median	803.6		
SD	21853		

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Std. Error of Mean	5300		
Coefficient of Variation	2.349		
Skewness	3.083		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.49	Shapiro Wilk Test Statistic	0.958
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	18556	95% H-UCL	323468
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	
95% Adjusted-CLT UCL (Chen-1995)	22255	97.5% Chebyshev (MVUE) UCL	50199
95% Modified-t UCL (Johnson-1978)	19216	99% Chebyshev (MVUE) UCL	74301
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.281	Data appear Lognormal at 5% Significance Level	
Theta Star	33061		
MLE of Mean	9303		
MLE of Standard Deviation	17537		
nu star	9.567		
Approximate Chi Square Value (.05)	3.673	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	18020
Adjusted Chi Square Value	3.299	95% Jackknife UCL	18556
		95% Standard Bootstrap UCL	17605
Anderson-Darling Test Statistic	1.187	95% Bootstrap-t UCL	34889
Anderson-Darling 5% Critical Value	0.844	95% Hall's Bootstrap UCL	41614
Kolmogorov-Smirnov Test Statistic	0.273	95% Percentile Bootstrap UCL	18835
Kolmogorov-Smirnov 5% Critical Value	0.227	95% BCA Bootstrap UCL	23888
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	32405
		97.5% Chebyshev(Mean, Sd) UCL	42402
		99% Chebyshev(Mean, Sd) UCL	62038
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	24231		
95% Adjusted Gamma UCL (Use when n < 40)	26978		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	
			62038
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Benzo(a)anthracene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	14	Number of Non-Detect Data	2

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Number of Missing Values		2	Percent Non-Detects		11.76%
Raw Statistics			Log-transformed Statistics		
Minimum Detected	66	Minimum Detected	4.19		
Maximum Detected	14600	Maximum Detected	9.589		
Mean of Detected	2351	Mean of Detected	6.495		
SD of Detected	3959	SD of Detected	1.73		
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751		
Maximum Non-Detect	2.35	Maximum Non-Detect	0.854		
Note: Data have multiple DLs - Use of KM Method is recommended			Number treated as Non-Detect	2	
For all methods (except KM, DL/2, and ROS Methods),			Number treated as Detected	15	
Observations < Largest ND are treated as NDs			Single DL Non-Detect Percentage	11.76%	
UCL Statistics					
Normal Distribution Test with Detected Values Only			Lognormal Distribution Test with Detected Values Only		
Shapiro Wilk Test Statistic	0.637	Shapiro Wilk Test Statistic	0.94		
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881		
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	2074	Mean	5.744		
SD	3784	SD	2.668		
95% DL/2 (t) UCL	3677	95% H-Stat (DL/2) UCL	473879		
Maximum Likelihood Estimate(MLE) Method		Log ROS Method			
Mean	1765	Mean in Log Scale	6.016		
SD	4000	SD in Log Scale	2.109		
95% MLE (t) UCL	3459	Mean in Original Scale	2076		
95% MLE (Tiku) UCL	3362	SD in Original Scale	3784		
		95% t UCL	3678		
		95% Percentile Bootstrap UCL	3653		
		95% BCA Bootstrap UCL	4542		
		95% H UCL	42569		
Gamma Distribution Test with Detected Values Only			Data Distribution Test with Detected Values Only		
k star (bias corrected)	0.445	Data appear Gamma Distributed at 5% Significance Level			
Theta Star	5280				
nu star	13.36				
A-D Test Statistic	0.647	Nonparametric Statistics			
5% A-D Critical Value	0.793	Kaplan-Meier (KM) Method			
K-S Test Statistic	0.793	Mean	2082		
5% K-S Critical Value	0.234	SD	3667		
Data appear Gamma Distributed at 5% Significance Level			SE of Mean	920.7	
Assuming Gamma Distribution			95% KM (t) UCL	3689	
			95% KM (z) UCL	3596	

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3681
Minimum	0.000001	95% KM (bootstrap t) UCL	6353
Maximum	14600	95% KM (BCA) UCL	3851
Mean	2074	95% KM (Percentile Bootstrap) UCL	3646
Median	310	95% KM (Chebyshev) UCL	6095
SD	3785	97.5% KM (Chebyshev) UCL	7831
k star	0.21	99% KM (Chebyshev) UCL	11242
Theta star	9884		
Nu star	7.135	Potential UCLs to Use	
AppChi2	2.245	95% KM (Chebyshev) UCL	6095
95% Gamma Approximate UCL (Use when n >= 40)		6592	
95% Adjusted Gamma UCL (Use when n < 40)		7518	
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Benzo(a)pyrene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	2
Number of Missing Values	2	Percent Non-Detects	11.76%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	65	Minimum Detected	4.174
Maximum Detected	12900	Maximum Detected	9.465
Mean of Detected	2044	Mean of Detected	6.358
SD of Detected	3407	SD of Detected	1.758
Minimum Non-Detect	2.35	Minimum Non-Detect	0.854
Maximum Non-Detect	4.89	Maximum Non-Detect	1.587
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	15
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	11.76%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.631	Shapiro Wilk Test Statistic	0.906
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
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	1804	Mean	5.672
SD	3259	SD	2.544

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

95% DL/2 (t) UCL	3184	95% H-Stat (DL/2) UCL	230405
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1539	Mean in Log Scale	5.879
SD	3445	SD in Log Scale	2.129
95% MLE (t) UCL	2997	Mean in Original Scale	1805
95% MLE (Tiku) UCL	2915	SD in Original Scale	3258
		95% t UCL	3185
		95% Percentile Bootstrap UCL	3201
		95% BCA Bootstrap UCL	3820
		95% H UCL	40515
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.446	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	4585		
nu star	13.38		
A-D Test Statistic	0.74	Nonparametric Statistics	
5% A-D Critical Value	0.793	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.793	Mean	1812
5% K-S Critical Value	0.234	SD	3157
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	792.6
		95% KM (t) UCL	3195
Assuming Gamma Distribution		95% KM (z) UCL	3115
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3188
Minimum	0.000001	95% KM (bootstrap t) UCL	5259
Maximum	12900	95% KM (BCA) UCL	3287
Mean	1804	95% KM (Percentile Bootstrap) UCL	3160
Median	310	95% KM (Chebyshev) UCL	5266
SD	3259	97.5% KM (Chebyshev) UCL	6761
k star	0.211	99% KM (Chebyshev) UCL	9698
Theta star	8564		
Nu star	7.162	Potential UCLs to Use	
AppChi2	2.26	95% KM (Chebyshev) UCL	5266
95% Gamma Approximate UCL (Use when n >= 40)	5717		
95% Adjusted Gamma UCL (Use when n < 40)	6517		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Benzo(b)fluoranthene			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Number of Missing Values	2		

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Raw Statistics		Log-transformed Statistics	
Minimum	81.9	Minimum of Log Data	4.405
Maximum	34900	Maximum of Log Data	10.46
Mean	4002	Mean of log Data	6.751
Geometric Mean	855.1	SD of log Data	1.83
Median	616		
SD	8565		
Std. Error of Mean	2077		
Coefficient of Variation	2.14		
Skewness	3.322		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.507	Shapiro Wilk Test Statistic	0.937
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	7628	95% H-UCL	29472
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	12142
95% Adjusted-CLT UCL (Chen-1995)	9207	97.5% Chebyshev (MVUE) UCL	15800
95% Modified-t UCL (Johnson-1978)	7907	99% Chebyshev (MVUE) UCL	22986
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.387	Data Follow Appr. Gamma Distribution at 5% Significance Level	
Theta Star	10333		
MLE of Mean	4002		
MLE of Standard Deviation	6430		
nu star	13.17		
Approximate Chi Square Value (.05)	6.005	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	7418
Adjusted Chi Square Value	5.505	95% Jackknife UCL	7628
		95% Standard Bootstrap UCL	7419
Anderson-Darling Test Statistic	0.934	95% Bootstrap-t UCL	15317
Anderson-Darling 5% Critical Value	0.815	95% Hall's Bootstrap UCL	17908
Kolmogorov-Smirnov Test Statistic	0.204	95% Percentile Bootstrap UCL	7463
Kolmogorov-Smirnov 5% Critical Value	0.223	95% BCA Bootstrap UCL	9760
Data follow Appr. Gamma Distribution at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	13056
		97.5% Chebyshev(Mean, Sd) UCL	16974
		99% Chebyshev(Mean, Sd) UCL	24670
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	8774		
95% Adjusted Gamma UCL (Use when n < 40)	9571		
Potential UCL to Use		Use 95% Adjusted Gamma UCL	
			9571
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			

and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Benzo(g,h,i)perylene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	14	Number of Non-Detect Data	2
Number of Missing Values	2	Percent Non-Detects	11.76%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	53	Minimum Detected	3.97
Maximum Detected	25600	Maximum Detected	10.15
Mean of Detected	3388	Mean of Detected	6.517
SD of Detected	6882	SD of Detected	1.895
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.35	Maximum Non-Detect	0.854
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	15
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	11.76%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.545	Shapiro Wilk Test Statistic	0.938
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
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	2990	Mean	5.763
SD	6536	SD	2.77
95% DL/2 (t) UCL	5757	95% H-Stat (DL/2) UCL	844037
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	2437	Mean in Log Scale	5.996
SD	6887	SD in Log Scale	2.304
95% MLE (t) UCL	5353	Mean in Original Scale	2991
95% MLE (Tiku) UCL	5168	SD in Original Scale	6535
		95% t UCL	5758
		95% Percentile Bootstrap UCL	5792
		95% BCA Bootstrap UCL	6988
		95% H UCL	98944
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.37	Data appear Lognormal at 5% Significance Level	
Theta Star	9153		
nu star	11.11		

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

A-D Test Statistic		0.992	Nonparametric Statistics	
5% A-D Critical Value		0.813	Kaplan-Meier (KM) Method	
K-S Test Statistic		0.813	Mean	2996
5% K-S Critical Value		0.237	SD	6338
Data not Gamma Distributed at 5% Significance Level			SE of Mean	1591
			95% KM (t) UCL	5774
Assuming Gamma Distribution			95% KM (z) UCL	5613
Gamma ROS Statistics using Extrapolated Data			95% KM (jackknife) UCL	5761
Minimum	0.000001		95% KM (bootstrap t) UCL	10310
Maximum	25600		95% KM (BCA) UCL	5853
Mean	2990		95% KM (Percentile Bootstrap) UCL	5778
Median	509		95% KM (Chebyshev) UCL	9931
SD	6536		97.5% KM (Chebyshev) UCL	12932
k star	0.197		99% KM (Chebyshev) UCL	18826
Theta star	15208			
Nu star	6.684		Potential UCLs to Use	
AppChi2	1.999		99% KM (Chebyshev) UCL	18826
95% Gamma Approximate UCL (Use when n >= 40)		9997		
95% Adjusted Gamma UCL (Use when n < 40)		11471		
Note: DL/2 is not a recommended method.				
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.				
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).				
For additional insight, the user may want to consult a statistician.				
Benzo(k)fluoranthene				
General Statistics				
Number of Valid Observations		17	Number of Distinct Observations	
Number of Missing Values		2		
Raw Statistics			Log-transformed Statistics	
Minimum	28		Minimum of Log Data	3.332
Maximum	1800		Maximum of Log Data	7.496
Mean	365.6		Mean of log Data	5.034
Geometric Mean	153.5		SD of log Data	1.418
Median	100			
SD	474.8			
Std. Error of Mean	115.1			
Coefficient of Variation	1.299			
Skewness	1.928			
Relevant UCL Statistics				
Normal Distribution Test			Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.736		Shapiro Wilk Test Statistic	0.884
Shapiro Wilk Critical Value	0.892		Shapiro Wilk Critical Value	0.892

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	566.6	95% H-UCL	1372
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	1035
95% Adjusted-CLT UCL (Chen-1995)	612.5	97.5% Chebyshev (MVUE) UCL	1319
95% Modified-t UCL (Johnson-1978)	575.6	99% Chebyshev (MVUE) UCL	1877
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.613	Data do not follow a Discernable Distribution (0.05)	
Theta Star	596.2		
MLE of Mean	365.6		
MLE of Standard Deviation	466.9		
nu star	20.85		
Approximate Chi Square Value (.05)	11.48	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	555
Adjusted Chi Square Value	10.76	95% Jackknife UCL	566.6
		95% Standard Bootstrap UCL	540.7
Anderson-Darling Test Statistic	1.002	95% Bootstrap-t UCL	683.3
Anderson-Darling 5% Critical Value	0.781	95% Hall's Bootstrap UCL	814.5
Kolmogorov-Smirnov Test Statistic	0.261	95% Percentile Bootstrap UCL	554.8
Kolmogorov-Smirnov 5% Critical Value	0.218	95% BCA Bootstrap UCL	621.6
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	867.5
		97.5% Chebyshev(Mean, Sd) UCL	1085
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	1511
95% Approximate Gamma UCL (Use when n >= 40)	664		
95% Adjusted Gamma UCL (Use when n < 40)	708.7		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	867.5
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Chrysene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	12
Number of Distinct Detected Data	12	Number of Non-Detect Data	5
Number of Missing Values	2	Percent Non-Detects	29.41%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	73	Minimum Detected	4.29
Maximum Detected	2590	Maximum Detected	7.859
Mean of Detected	1090	Mean of Detected	6.36
SD of Detected	927.3	SD of Detected	1.391
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Maximum Non-Detect	5.14	Maximum Non-Detect	1.637
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	5
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	12
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	29.41%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.883	Shapiro Wilk Test Statistic	0.848
5% Shapiro Wilk Critical Value	0.859	5% Shapiro Wilk Critical Value	0.859
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	770.1	Mean	4.659
SD	923.3	SD	2.959
95% DL/2 (t) UCL	1161	95% H-Stat (DL/2) UCL	834556
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	545.9	Mean in Log Scale	5.447
SD	1174	SD in Log Scale	1.859
95% MLE (t) UCL	1043	Mean in Original Scale	777.2
95% MLE (Tiku) UCL	1071	SD in Original Scale	917.1
		95% t UCL	1165
		95% Percentile Bootstrap UCL	1131
		95% BCA Bootstrap UCL	1198
		95% H UCL	8902
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.745	Data appear Normal at 5% Significance Level	
Theta Star	1463		
nu star	17.89		
A-D Test Statistic	0.697	Nonparametric Statistics	
5% A-D Critical Value	0.76	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.76	Mean	791
5% K-S Critical Value	0.253	SD	878.2
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	222.5
Assuming Gamma Distribution		95% KM (t) UCL	1179
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	1157
Minimum	0.000001	95% KM (jackknife) UCL	1174
Maximum	2590	95% KM (bootstrap t) UCL	1244
Mean	769.5	95% KM (BCA) UCL	1202
Median	164	95% KM (Percentile Bootstrap) UCL	1151
SD	923.8	95% KM (Chebyshev) UCL	1761
k star	0.143	97.5% KM (Chebyshev) UCL	2180
Theta star	5364	99% KM (Chebyshev) UCL	3005

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Nu star	4.878	Potential UCLs to Use	
AppChi2	1.096	95% KM (t) UCL	1179
95% Gamma Approximate UCL (Use when n >= 40)	3425	95% KM (Percentile Bootstrap) UCL	1151
95% Adjusted Gamma UCL (Use when n < 40)	4066		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Dibenz(a,h)anthracene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	15	Number of Non-Detect Data	2
Number of Missing Values	2	Percent Non-Detects	11.76%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	20	Minimum Detected	2.996
Maximum Detected	17700	Maximum Detected	9.781
Mean of Detected	2194	Mean of Detected	5.862
SD of Detected	4708	SD of Detected	2.054
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.35	Maximum Non-Detect	0.854
		Number treated as Non-Detect	2
		Number treated as Detected	15
		Single DL Non-Detect Percentage	11.76%
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			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.527	Shapiro Wilk Test Statistic	0.943
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
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	1936	Mean	5.185
SD	4464	SD	2.709
95% DL/2 (t) UCL	3827	95% H-Stat (DL/2) UCL	339300
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	1556	Mean in Log Scale	5.297
SD	4700	SD in Log Scale	2.497
95% MLE (t) UCL	3546	Mean in Original Scale	1937
95% MLE (Tiku) UCL	3416	SD in Original Scale	4464
		95% t UCL	3827

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

		95% Percentile Bootstrap UCL	3827
		95% BCA Bootstrap UCL	4698
		95% H UCL	124972
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.336	Data appear Lognormal at 5% Significance Level	
Theta Star	6528		
nu star	10.08		
		Nonparametric Statistics	
A-D Test Statistic	0.989	Kaplan-Meier (KM) Method	
5% A-D Critical Value	0.822	Mean	1939
K-S Test Statistic	0.822	SD	4330
5% K-S Critical Value	0.238	SE of Mean	1087
Data not Gamma Distributed at 5% Significance Level		95% KM (t) UCL	3836
Assuming Gamma Distribution		95% KM (z) UCL	3726
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	3828
Minimum	0.000001	95% KM (bootstrap t) UCL	7632
Maximum	17700	95% KM (BCA) UCL	3708
Mean	1936	95% KM (Percentile Bootstrap) UCL	3707
Median	322	95% KM (Chebyshev) UCL	6677
SD	4464	97.5% KM (Chebyshev) UCL	8727
k star	0.192	99% KM (Chebyshev) UCL	12754
Theta star	10100		
Nu star	6.518	Potential UCLs to Use	
AppChi2	1.91	99% KM (Chebyshev) UCL	12754
95% Gamma Approximate UCL (Use when n >= 40)	6607		
95% Adjusted Gamma UCL (Use when n < 40)	7600		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Fluoranthene			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	16
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	82.5	Minimum of Log Data	4.413
Maximum	14000	Maximum of Log Data	9.547
Mean	2206	Mean of log Data	6.415
Geometric Mean	610.9	SD of log Data	1.711
Median	310		
SD	3598		

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Std. Error of Mean	872.6		
Coefficient of Variation	1.631		
Skewness	2.492		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.648	Shapiro Wilk Test Statistic	0.877
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	3729	95% H-UCL	13754
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	6942
95% Adjusted-CLT UCL (Chen-1995)	4204	97.5% Chebyshev (MVUE) UCL	8987
95% Modified-t UCL (Johnson-1978)	3817	99% Chebyshev (MVUE) UCL	13005
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.447	Data do not follow a Discernable Distribution (0.05)	
Theta Star	4931		
MLE of Mean	2206		
MLE of Standard Deviation	3298		
nu star	15.21		
Approximate Chi Square Value (.05)	7.405	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	3641
Adjusted Chi Square Value	6.84	95% Jackknife UCL	3729
		95% Standard Bootstrap UCL	3614
Anderson-Darling Test Statistic	1.18	95% Bootstrap-t UCL	4873
Anderson-Darling 5% Critical Value	0.799	95% Hall's Bootstrap UCL	9267
Kolmogorov-Smirnov Test Statistic	0.253	95% Percentile Bootstrap UCL	3713
Kolmogorov-Smirnov 5% Critical Value	0.221	95% BCA Bootstrap UCL	4439
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	6009
		97.5% Chebyshev(Mean, Sd) UCL	7655
		99% Chebyshev(Mean, Sd) UCL	10888
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	4529		
95% Adjusted Gamma UCL (Use when n < 40)	4903		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Indeno(1,2,3-cd)pyrene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	13	Number of Non-Detect Data	2

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Number of Missing Values	2	Percent Non-Detects	11.76%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	6.07	Minimum Detected	1.803
Maximum Detected	2700	Maximum Detected	7.901
Mean of Detected	770.3	Mean of Detected	5.654
SD of Detected	1043	SD of Detected	1.626
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.35	Maximum Non-Detect	0.854
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	2
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	15
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	11.76%
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.667	Shapiro Wilk Test Statistic	0.884
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
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	679.8	Mean	5.002
SD	1009	SD	2.389
95% DL/2 (t) UCL	1107	95% H-Stat (DL/2) UCL	54663
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	601.2	Mean in Log Scale	5.234
SD	1070	SD in Log Scale	1.929
95% MLE (t) UCL	1054	Mean in Original Scale	680.6
95% MLE (Tiku) UCL	1033	SD in Original Scale	1008
		95% t UCL	1107
		95% Percentile Bootstrap UCL	1099
		95% BCA Bootstrap UCL	1135
		95% H UCL	9382
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.54	Data appear Lognormal at 5% Significance Level	
Theta Star	1426		
nu star	16.2		
A-D Test Statistic	1.054	Nonparametric Statistics	
5% A-D Critical Value	0.784	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.784	Mean	680.4
5% K-S Critical Value	0.232	SD	978.2
Data not Gamma Distributed at 5% Significance Level		SE of Mean	245.6
Assuming Gamma Distribution		95% KM (t) UCL	1109
		95% KM (z) UCL	1084

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1099
Minimum	0.000001	95% KM (bootstrap t) UCL	1302
Maximum	2700	95% KM (BCA) UCL	1117
Mean	679.7	95% KM (Percentile Bootstrap) UCL	1107
Median	150	95% KM (Chebyshev) UCL	1751
SD	1009	97.5% KM (Chebyshev) UCL	2214
k star	0.227	99% KM (Chebyshev) UCL	3124
Theta star	2992		
Nu star	7.724	Potential UCLs to Use	
AppChi2	2.576	99% KM (Chebyshev) UCL	3124
95% Gamma Approximate UCL (Use when n >= 40)		2038	
95% Adjusted Gamma UCL (Use when n < 40)		2308	
Warning: Recommended UCL exceeds the maximum observation			
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Pyrene			
General Statistics			
Number of Valid Observations		17	Number of Distinct Observations
Number of Missing Values		2	16
Raw Statistics		Log-transformed Statistics	
Minimum	67.5	Minimum of Log Data	4.212
Maximum	8850	Maximum of Log Data	9.088
Mean	1523	Mean of log Data	6.214
Geometric Mean	499.7	SD of log Data	1.61
Median	287		
SD	2285		
Std. Error of Mean	554.2		
Coefficient of Variation	1.501		
Skewness	2.325		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.68	Shapiro Wilk Test Statistic	0.891
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	2491	95% H-UCL	8029
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4725
95% Adjusted-CLT UCL (Chen-1995)	2768	97.5% Chebyshev (MVUE) UCL	6087
95% Modified-t UCL (Johnson-1978)	2543	99% Chebyshev (MVUE) UCL	8764

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.501	Data do not follow a Discernable Distribution (0.05)	
Theta Star	3043		
MLE of Mean	1523		
MLE of Standard Deviation	2153		
nu star	17.02		
Approximate Chi Square Value (.05)	8.685	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	2435
Adjusted Chi Square Value	8.066	95% Jackknife UCL	2491
		95% Standard Bootstrap UCL	2392
Anderson-Darling Test Statistic	1.04	95% Bootstrap-t UCL	3189
Anderson-Darling 5% Critical Value	0.793	95% Hall's Bootstrap UCL	6183
Kolmogorov-Smirnov Test Statistic	0.258	95% Percentile Bootstrap UCL	2506
Kolmogorov-Smirnov 5% Critical Value	0.22	95% BCA Bootstrap UCL	2765
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3939
		97.5% Chebyshev(Mean, Sd) UCL	4984
		99% Chebyshev(Mean, Sd) UCL	7037
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	2984		
95% Adjusted Gamma UCL (Use when n < 40)	3213		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL 7037	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
HMW PAHs			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	17
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	297.4	Minimum of Log Data	5.695
Maximum	133510	Maximum of Log Data	11.8
Mean	18347	Mean of log Data	8.469
Geometric Mean	4764	SD of log Data	1.777
Median	2950		
SD	33328		
Std. Error of Mean	8083		
Coefficient of Variation	1.816		
Skewness	2.936		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.59	Shapiro Wilk Test Statistic	0.954

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	32459	95% H-UCL	135322
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	61205
95% Adjusted-CLT UCL (Chen-1995)	37793	97.5% Chebyshev (MVUE) UCL	79470
95% Modified-t UCL (Johnson-1978)	33419	99% Chebyshev (MVUE) UCL	115348
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.43	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	42639		
MLE of Mean	18347		
MLE of Standard Deviation	27970		
nu star	14.63		
Approximate Chi Square Value (.05)	7.005	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	31643
Adjusted Chi Square Value	6.458	95% Jackknife UCL	32459
		95% Standard Bootstrap UCL	31056
Anderson-Darling Test Statistic	0.722	95% Bootstrap-t UCL	51794
Anderson-Darling 5% Critical Value	0.803	95% Hall's Bootstrap UCL	82008
Kolmogorov-Smirnov Test Statistic	0.205	95% Percentile Bootstrap UCL	32234
Kolmogorov-Smirnov 5% Critical Value	0.222	95% BCA Bootstrap UCL	38919
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	53581
		97.5% Chebyshev(Mean, Sd) UCL	68826
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	98773
95% Approximate Gamma UCL (Use when n >= 40)	38319		
95% Adjusted Gamma UCL (Use when n < 40)	41564		
Potential UCL to Use		Use 95% Adjusted Gamma UCL	
		41564	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Arsenic			
General Statistics			
Number of Valid Observations	11	Number of Distinct Observations	11
Number of Missing Values	8		
Raw Statistics		Log-transformed Statistics	
Minimum	4.2	Minimum of Log Data	1.435
Maximum	7.5	Maximum of Log Data	2.015
Mean	5.657	Mean of log Data	1.716
Geometric Mean	5.564	SD of log Data	0.189
Median	5.1		

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)
 Topsham Annex Skeet Range, Topsham, Maine

SD	1.099		
Std. Error of Mean	0.331		
Coefficient of Variation	0.194		
Skewness	0.612		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.896	Shapiro Wilk Test Statistic	0.918
Shapiro Wilk Critical Value	0.85	Shapiro Wilk Critical Value	0.85
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	6.258	95% H-UCL	6.329
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	7.067
95% Adjusted-CLT UCL (Chen-1995)	6.268	97.5% Chebyshev (MVUE) UCL	7.678
95% Modified-t UCL (Johnson-1978)	6.268	99% Chebyshev (MVUE) UCL	8.877
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	22.14	Data appear Normal at 5% Significance Level	
Theta Star	0.256		
MLE of Mean	5.657		
MLE of Standard Deviation	1.202		
nu star	487.1		
Approximate Chi Square Value (.05)	436.9	Nonparametric Statistics	
Adjusted Level of Significance	0.0278	95% CLT UCL	6.202
Adjusted Chi Square Value	429.2	95% Jackknife UCL	6.258
		95% Standard Bootstrap UCL	6.18
Anderson-Darling Test Statistic	0.536	95% Bootstrap-t UCL	6.383
Anderson-Darling 5% Critical Value	0.729	95% Hall's Bootstrap UCL	6.204
Kolmogorov-Smirnov Test Statistic	0.237	95% Percentile Bootstrap UCL	6.211
Kolmogorov-Smirnov 5% Critical Value	0.255	95% BCA Bootstrap UCL	6.216
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	7.102
		97.5% Chebyshev(Mean, Sd) UCL	7.727
		99% Chebyshev(Mean, Sd) UCL	8.955
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	6.307		
95% Adjusted Gamma UCL (Use when n < 40)	6.421		
Potential UCL to Use		Use 95% Student's-t UCL	
			6.258
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Lead			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	13

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Number of Missing Values		6	
Raw Statistics		Log-transformed Statistics	
Minimum	22.9	Minimum of Log Data	3.131
Maximum	474	Maximum of Log Data	6.161
Mean	94.79	Mean of log Data	4.142
Geometric Mean	62.91	SD of log Data	0.848
Median	61.4		
SD	120		
Std. Error of Mean	33.27		
Coefficient of Variation	1.266		
Skewness	3.031		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.587	Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	154.1	95% H-UCL	170
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	181.7
95% Adjusted-CLT UCL (Chen-1995)	179.4	97.5% Chebyshev (MVUE) UCL	222.7
95% Modified-t UCL (Johnson-1978)	158.8	99% Chebyshev (MVUE) UCL	303.2
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.099	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	86.26		
MLE of Mean	94.79		
MLE of Standard Deviation	90.42		
nu star	28.57		
Approximate Chi Square Value (.05)	17.37	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	149.5
Adjusted Chi Square Value	16.14	95% Jackknife UCL	154.1
		95% Standard Bootstrap UCL	146.2
Anderson-Darling Test Statistic	0.747	95% Bootstrap-t UCL	263
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	360.8
Kolmogorov-Smirnov Test Statistic	0.182	95% Percentile Bootstrap UCL	153.7
Kolmogorov-Smirnov 5% Critical Value	0.242	95% BCA Bootstrap UCL	187.3
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	239.8
		97.5% Chebyshev(Mean, Sd) UCL	302.6
		99% Chebyshev(Mean, Sd) UCL	425.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	155.9		
95% Adjusted Gamma UCL (Use when n < 40)	167.8		
Potential UCL to Use		Use 95% Approximate Gamma UCL	
			155.9
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

Attachment B-1

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Current Conditions Scenario)

Topsham Annex Skeet Range, Topsham, Maine

<p>These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.</p>

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

General UCL Statistics for Data Sets with Non-Detects			
User Selected Options			
From File	C:\Users\dlavoie\Desktop\Temp\Post Removal\TASKT_DU4-PAHs_Post-Removal_dataset_022414.wst		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
1-Methylnaphthalene			
General Statistics			
Number of Valid Data	10	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	8
Number of Missing Values	9	Percent Non-Detects	80.00%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	9.25	Minimum Detected	2.225
Maximum Detected	91	Maximum Detected	4.511
Mean of Detected	50.13	Mean of Detected	3.368
SD of Detected	57.81	SD of Detected	1.617
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	20	Maximum Non-Detect	2.996
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	9
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	1
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	90.00%
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.			
UCL 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	

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

DL/2 Substitution Method		DL/2 Substitution Method	
Mean	17.13	Mean	2.291
SD	26.1	SD	1.05
95% DL/2 (t) UCL	32.26	95% H-Stat (DL/2) UCL	52.67
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	N/A
		SD in Log Scale	N/A
		Mean in Original Scale	N/A
		SD in Original Scale	N/A
		95% t UCL	N/A
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H-UCL	N/A
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	N/A	Data do not follow a Discernable Distribution (0.05)	
Theta Star	N/A		
nu star	N/A		
A-D Test Statistic	N/A	Nonparametric Statistics	
5% A-D Critical Value	N/A	Kaplan-Meier (KM) Method	
K-S Test Statistic	N/A	Mean	17.43
5% K-S Critical Value	N/A	SD	24.53
Data not Gamma Distributed at 5% Significance Level		SE of Mean	10.97
		95% KM (t) UCL	37.53
Assuming Gamma Distribution		95% KM (z) UCL	35.47
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	74.48
Minimum	N/A	95% KM (bootstrap t) UCL	17.43
Maximum	N/A	95% KM (BCA) UCL	91
Mean	N/A	95% KM (Percentile Bootstrap) UCL	91
Median	N/A	95% KM (Chebyshev) UCL	65.23
SD	N/A	97.5% KM (Chebyshev) UCL	85.92
k star	N/A	99% KM (Chebyshev) UCL	126.6
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	97.5% KM (Chebyshev) UCL	85.92
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
2-Methylnaphthalene			

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

General Statistics			
Number of Valid Data	17	Number of Detected Data	14
Number of Distinct Detected Data	3	Number of Non-Detect Data	3
Number of Missing Values	2	Percent Non-Detects	17.65%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	10	Minimum Detected	2.303
Maximum Detected	36.8	Maximum Detected	3.605
Mean of Detected	20.49	Mean of Detected	2.99
SD of Detected	5.399	SD of Detected	0.256
Minimum Non-Detect	2.25	Minimum Non-Detect	0.811
Maximum Non-Detect	15	Maximum Non-Detect	2.708
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	23.53%
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.523	Shapiro Wilk Test Statistic	0.55
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
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	17.76	Mean	2.698
SD	7.873	SD	0.785
95% DL/2 (t) UCL	21.09	95% H-Stat (DL/2) UCL	31.98
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	18.99	Mean in Log Scale	2.921
SD	5.877	SD in Log Scale	0.278
95% MLE (t) UCL	21.48	Mean in Original Scale	19.24
95% MLE (Tiku) UCL	21.57	SD in Original Scale	5.603
		95% t UCL	21.62
		95% Percentile Bootstrap UCL	21.54
		95% BCA Bootstrap UCL	22.02
		95% H UCL	21.92

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	13.29	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.541		
nu star	372.2		
A-D Test Statistic	3.44	Nonparametric Statistics	
5% A-D Critical Value	0.734	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.734	Mean	18.64
5% K-S Critical Value	0.228	SD	6.186
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.557
		95% KM (t) UCL	21.35
		95% KM (z) UCL	21.2
Assuming Gamma Distribution		95% KM (jackknife) UCL	21.62
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	21.43
Minimum	8.041	95% KM (BCA) UCL	22.78
Maximum	36.8	95% KM (Percentile Bootstrap) UCL	21.98
Mean	18.67	95% KM (Chebyshev) UCL	25.42
Median	20	97.5% KM (Chebyshev) UCL	28.36
SD	6.361	99% KM (Chebyshev) UCL	34.13
k star	7.382		
Theta star	2.529		
Nu star	251	Potential UCLs to Use	
AppChi2	215.3	95% KM (Chebyshev) UCL	25.42
95% Gamma Approximate UCL (Use when n >= 40)	21.76		
95% Adjusted Gamma UCL (Use when n < 40)	22.12		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Acenaphthene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	5.88%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.3	Minimum Detected	1.668
Maximum Detected	79.6	Maximum Detected	4.377
Mean of Detected	24.69	Mean of Detected	3.001
SD of Detected	19.15	SD of Detected	0.647
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.12	Maximum Non-Detect	0.751
UCL Statistics			

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.577	Shapiro Wilk Test Statistic	0.717
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
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	23.3	Mean	2.828
SD	19.41	SD	0.949
95% DL/2 (t) UCL	31.51	95% H-Stat (DL/2) UCL	49.18
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	22.76	Mean in Log Scale	2.924
SD	19.68	SD in Log Scale	0.702
95% MLE (t) UCL	31.1	Mean in Original Scale	23.56
95% MLE (Tiku) UCL	30.84	SD in Original Scale	19.12
		95% t UCL	31.65
		95% Percentile Bootstrap UCL	31.49
		95% BCA Bootstrap UCL	34.87
		95% H UCL	35.41
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	2.147	Data do not follow a Discernable Distribution (0.05)	
Theta Star	11.5		
nu star	68.71		
A-D Test Statistic	2.738	Nonparametric Statistics	
5% A-D Critical Value	0.747	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.747	Mean	23.55
5% K-S Critical Value	0.217	SD	18.56
Data not Gamma Distributed at 5% Significance Level		SE of Mean	4.648
Assuming Gamma Distribution		95% KM (t) UCL	31.66
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	31.19
Minimum	0.000001	95% KM (jackknife) UCL	31.61
Maximum	79.6	95% KM (bootstrap t) UCL	45.46
Mean	23.24	95% KM (BCA) UCL	32.04
Median	20	95% KM (Percentile Bootstrap) UCL	32.14
SD	19.48	95% KM (Chebyshev) UCL	43.81
k star	0.494	97.5% KM (Chebyshev) UCL	52.57
Theta star	47.07	99% KM (Chebyshev) UCL	69.8
Nu star	16.78	Potential UCLs to Use	
AppChi2	8.519	95% KM (Chebyshev) UCL	43.81
95% Gamma Approximate UCL (Use when n >= 40)	45.78		
95% Adjusted Gamma UCL (Use when n < 40)	49.32		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Acenaphthylene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	13
Number of Distinct Detected Data	2	Number of Non-Detect Data	4
Number of Missing Values	2	Percent Non-Detects	23.53%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	20	Minimum Detected	2.996
Maximum Detected	40.4	Maximum Detected	3.699
Mean of Detected	21.57	Mean of Detected	3.05
SD of Detected	5.658	SD of Detected	0.195
Minimum Non-Detect	5.14	Minimum Non-Detect	1.637
Maximum Non-Detect	15	Maximum Non-Detect	2.708
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	23.53%
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.311	Shapiro Wilk Test Statistic	0.311
5% Shapiro Wilk Critical Value	0.866	5% Shapiro Wilk Critical Value	0.866
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	17.85	Mean	2.726
SD	8.527	SD	0.66
95% DL/2 (t) UCL	21.46	95% H-Stat (DL/2) UCL	27.35

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	19.04	Mean in Log Scale	2.988
SD	6.796	SD in Log Scale	0.205
95% MLE (t) UCL	21.92	Mean in Original Scale	20.31
95% MLE (Tiku) UCL	22	SD in Original Scale	5.432
		95% t UCL	22.61
		95% Percentile Bootstrap UCL	N/A
		95% BCA Bootstrap UCL	N/A
		95% H UCL	22.21
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	18.11	Data do not follow a Discernable Distribution (0.05)	
Theta Star	1.191		
nu star	470.8		
A-D Test Statistic	4.487	Nonparametric Statistics	
5% A-D Critical Value	0.733	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.733	Mean	21.2
5% K-S Critical Value	0.236	SD	4.8
Data not Gamma Distributed at 5% Significance Level		SE of Mean	1.212
		95% KM (t) UCL	23.32
Assuming Gamma Distribution		95% KM (z) UCL	23.19
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	23.3
Minimum	13.14	95% KM (bootstrap t) UCL	N/A
Maximum	40.4	95% KM (BCA) UCL	22.4
Mean	19.59	95% KM (Percentile Bootstrap) UCL	23.6
Median	20	95% KM (Chebyshev) UCL	26.48
SD	6.132	97.5% KM (Chebyshev) UCL	28.77
k star	11.44	99% KM (Chebyshev) UCL	33.26
Theta star	1.713		
Nu star	388.8	Potential UCLs to Use	
AppChi2	344.1	95% KM (BCA) UCL	22.4
95% Gamma Approximate UCL (Use when n >= 40)	22.13		
95% Adjusted Gamma UCL (Use when n < 40)	22.42		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Anthracene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	5.88%

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Raw Statistics		Log-transformed Statistics	
Minimum Detected	8.4	Minimum Detected	2.128
Maximum Detected	291	Maximum Detected	5.673
Mean of Detected	51.03	Mean of Detected	3.228
SD of Detected	89.18	SD of Detected	0.975
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.12	Maximum Non-Detect	0.751
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.434	Shapiro Wilk Test Statistic	0.579
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
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	48.09	Mean	3.041
SD	87.19	SD	1.217
95% DL/2 (t) UCL	85.01	95% H-Stat (DL/2) UCL	109.7
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	44.8	Mean in Log Scale	3.12
SD	88.09	SD in Log Scale	1.042
95% MLE (t) UCL	82.1	Mean in Original Scale	48.26
95% MLE (Tiku) UCL	79	SD in Original Scale	87.09
		95% t UCL	85.14
		95% Percentile Bootstrap UCL	81.89
		95% BCA Bootstrap UCL	94.58
		95% H UCL	79.5
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.722	Data do not follow a Discernable Distribution (0.05)	
Theta Star	70.69		
nu star	23.1		
A-D Test Statistic	4.081	Nonparametric Statistics	
5% A-D Critical Value	0.771	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.771	Mean	48.52
5% K-S Critical Value	0.223	SD	84.36
Data not Gamma Distributed at 5% Significance Level		SE of Mean	21.13
		95% KM (t) UCL	85.41
		95% KM (z) UCL	83.28
		95% KM (jackknife) UCL	85.27
Assuming Gamma Distribution		95% KM (bootstrap t) UCL	717.2
Gamma ROS Statistics using Extrapolated Data		95% KM (BCA) UCL	81.18
Minimum	0.000001	95% KM (Percentile Bootstrap) UCL	81.18
Maximum	291		
Mean	48.02		

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Median	20	95% KM (Chebyshev) UCL	140.6
SD	87.23	97.5% KM (Chebyshev) UCL	180.5
k star	0.368	99% KM (Chebyshev) UCL	258.8
Theta star	130.4		
Nu star	12.52	Potential UCLs to Use	
AppChi2	5.574	95% KM (Chebyshev) UCL	140.6
95% Gamma Approximate UCL (Use when n >= 40)	107.9		
95% Adjusted Gamma UCL (Use when n < 40)	118		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Fluorene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	15
Number of Distinct Detected Data	4	Number of Non-Detect Data	2
Number of Missing Values	2	Percent Non-Detects	11.76%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	3.18	Minimum Detected	1.157
Maximum Detected	176	Maximum Detected	5.17
Mean of Detected	37.35	Mean of Detected	3.148
SD of Detected	49.82	SD of Detected	0.909
Minimum Non-Detect	13	Minimum Non-Detect	2.565
Maximum Non-Detect	15	Maximum Non-Detect	2.708
		Number treated as Non-Detect	3
		Number treated as Detected	14
Note: Data have multiple DLs - Use of KM Method is recommended		Single DL Non-Detect Percentage	17.65%
For all methods (except KM, DL/2, and ROS Methods),			
Observations < Largest ND are treated as NDs			
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.479	Shapiro Wilk Test Statistic	0.636
5% Shapiro Wilk Critical Value	0.881	5% Shapiro Wilk Critical Value	0.881
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

DL/2 Substitution Method		DL/2 Substitution Method	
Mean	33.78	Mean	3.007
SD	47.68	SD	0.94
95% DL/2 (t) UCL	53.96	95% H-Stat (DL/2) UCL	57.76
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	28.98	Mean in Log Scale	2.985
SD	51.58	SD in Log Scale	0.968
95% MLE (t) UCL	50.82	Mean in Original Scale	33.64
95% MLE (Tiku) UCL	50.03	SD in Original Scale	47.76
		95% t UCL	53.86
		95% Percentile Bootstrap UCL	53.81
		95% BCA Bootstrap UCL	59.11
		95% H UCL	59.61
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.003	Data do not follow a Discernable Distribution (0.05)	
Theta Star	37.22		
nu star	30.1		
		Nonparametric Statistics	
A-D Test Statistic	3.446	Kaplan-Meier (KM) Method	
5% A-D Critical Value	0.759	Mean	33.33
K-S Test Statistic	0.759	SD	46.53
5% K-S Critical Value	0.227	SE of Mean	11.68
Data not Gamma Distributed at 5% Significance Level		95% KM (t) UCL	53.72
Assuming Gamma Distribution		95% KM (z) UCL	52.54
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	52.49
Minimum	0.000001	95% KM (bootstrap t) UCL	165
Maximum	176	95% KM (BCA) UCL	58.88
Mean	32.95	95% KM (Percentile Bootstrap) UCL	54.65
Median	20	95% KM (Chebyshev) UCL	84.24
SD	48.22	97.5% KM (Chebyshev) UCL	106.3
k star	0.282	99% KM (Chebyshev) UCL	149.6
Theta star	116.7		
Nu star	9.598	Potential UCLs to Use	
AppChi2	3.692	95% KM (Chebyshev) UCL	84.24
95% Gamma Approximate UCL (Use when n >= 40)	85.66		
95% Adjusted Gamma UCL (Use when n < 40)	95.35		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Naphthalene			

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

General Statistics			
Number of Valid Data	17	Number of Detected Data	14
Number of Distinct Detected Data	3	Number of Non-Detect Data	3
Number of Missing Values	2	Percent Non-Detects	17.65%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	5.88	Minimum Detected	1.772
Maximum Detected	47.7	Maximum Detected	3.865
Mean of Detected	20.97	Mean of Detected	2.97
SD of Detected	8.564	SD of Detected	0.416
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	15	Maximum Non-Detect	2.708
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	4
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	13
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	23.53%
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.506	Shapiro Wilk Test Statistic	0.538
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
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	18.16	Mean	2.678
SD	10.02	SD	0.844
95% DL/2 (t) UCL	22.4	95% H-Stat (DL/2) UCL	34.64
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	19.12	Mean in Log Scale	2.86
SD	8.713	SD in Log Scale	0.449
95% MLE (t) UCL	22.81	Mean in Original Scale	19.11
95% MLE (Tiku) UCL	22.87	SD in Original Scale	8.763
		95% t UCL	22.82
		95% Percentile Bootstrap UCL	22.64
		95% BCA Bootstrap UCL	23.53
		95% H UCL	24.14

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	5.578	Data do not follow a Discernable Distribution (0.05)	
Theta Star	3.759		
nu star	156.2		
A-D Test Statistic	3.438	Nonparametric Statistics	
5% A-D Critical Value	0.737	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.737	Mean	18.31
5% K-S Critical Value	0.229	SD	9.444
Data not Gamma Distributed at 5% Significance Level		SE of Mean	2.377
		95% KM (t) UCL	22.46
		95% KM (z) UCL	22.22
Assuming Gamma Distribution		95% KM (jackknife) UCL	22.72
Gamma ROS Statistics using Extrapolated Data		95% KM (bootstrap t) UCL	22.9
Minimum	3.068	95% KM (BCA) UCL	23.26
Maximum	47.7	95% KM (Percentile Bootstrap) UCL	23.26
Mean	18.32	95% KM (Chebyshev) UCL	28.67
Median	20	97.5% KM (Chebyshev) UCL	33.15
SD	9.758	99% KM (Chebyshev) UCL	41.96
k star	2.733		
Theta star	6.702		
Nu star	92.93	Potential UCLs to Use	
AppChi2	71.7	95% KM (Chebyshev) UCL	28.67
95% Gamma Approximate UCL (Use when n >= 40)	23.74		
95% Adjusted Gamma UCL (Use when n < 40)	24.41		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Phenanthrene			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	6
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	20	Minimum of Log Data	2.996
Maximum	237	Maximum of Log Data	5.468
Mean	50.66	Mean of log Data	3.476
Geometric Mean	32.33	SD of log Data	0.84
Median	20		
SD	65.25		
Std. Error of Mean	15.83		
Coefficient of Variation	1.288		
Skewness	2.378		

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.54	Shapiro Wilk Test Statistic	0.63
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	78.29	95% H-UCL	76.43
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	87.83
95% Adjusted-CLT UCL (Chen-1995)	86.45	97.5% Chebyshev (MVUE) UCL	106.4
95% Modified-t UCL (Johnson-1978)	79.82	99% Chebyshev (MVUE) UCL	143
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.071	Data do not follow a Discernable Distribution (0.05)	
Theta Star	47.3		
MLE of Mean	50.66		
MLE of Standard Deviation	48.95		
nu star	36.42		
Approximate Chi Square Value (.05)	23.61	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	76.69
Adjusted Chi Square Value	22.53	95% Jackknife UCL	78.29
		95% Standard Bootstrap UCL	76.08
Anderson-Darling Test Statistic	3.164	95% Bootstrap-t UCL	142.9
Anderson-Darling 5% Critical Value	0.761	95% Hall's Bootstrap UCL	200.2
Kolmogorov-Smirnov Test Statistic	0.426	95% Percentile Bootstrap UCL	76.19
Kolmogorov-Smirnov 5% Critical Value	0.214	95% BCA Bootstrap UCL	86.66
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	119.6
		97.5% Chebyshev(Mean, Sd) UCL	149.5
		99% Chebyshev(Mean, Sd) UCL	208.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	78.16		
95% Adjusted Gamma UCL (Use when n < 40)	81.91		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	
			119.6
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Benzo(a)anthracene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	5.88%
Raw Statistics		Log-transformed Statistics	

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Minimum Detected	20	Minimum Detected	2.996
Maximum Detected	208	Maximum Detected	5.338
Mean of Detected	49.13	Mean of Detected	3.446
SD of Detected	61.44	SD of Detected	0.846
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.12	Maximum Non-Detect	0.751
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.544	Shapiro Wilk Test Statistic	0.588
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
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	46.3	Mean	3.246
SD	60.62	SD	1.16
95% DL/2 (t) UCL	71.97	95% H-Stat (DL/2) UCL	117.3
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	44.21	Mean in Log Scale	3.347
SD	61.4	SD in Log Scale	0.913
95% MLE (t) UCL	70.21	Mean in Original Scale	46.58
95% MLE (Tiku) UCL	68.53	SD in Original Scale	60.41
		95% t UCL	72.16
		95% Percentile Bootstrap UCL	72.12
		95% BCA Bootstrap UCL	80.23
		95% H UCL	77.14
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.061	Data do not follow a Discernable Distribution (0.05)	
Theta Star	46.3		
nu star	33.95		
A-D Test Statistic	3.374	Nonparametric Statistics	
5% A-D Critical Value	0.759	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.759	Mean	47.41
5% K-S Critical Value	0.22	SD	58.12
Data not Gamma Distributed at 5% Significance Level		SE of Mean	14.56
Assuming Gamma Distribution		95% KM (t) UCL	72.83
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	71.36
Minimum	0.000001	95% KM (jackknife) UCL	72.78
Maximum	208	95% KM (bootstrap t) UCL	116.9
Mean	46.24	95% KM (BCA) UCL	71.53
Median	20	95% KM (Percentile Bootstrap) UCL	73.18
SD	60.67	95% KM (Chebyshev) UCL	110.9
		97.5% KM (Chebyshev) UCL	138.3

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USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

k star	0.417	99% KM (Chebyshev) UCL	192.3
Theta star	110.9		
Nu star	14.18	Potential UCLs to Use	
AppChi2	6.693	95% KM (Chebyshev) UCL	110.9
95% Gamma Approximate UCL (Use when n >= 40)	97.94		
95% Adjusted Gamma UCL (Use when n < 40)	106.4		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Benzo(a)pyrene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	5.88%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	20	Minimum Detected	2.996
Maximum Detected	106	Maximum Detected	4.663
Mean of Detected	36.3	Mean of Detected	3.354
SD of Detected	30.18	SD of Detected	0.648
Minimum Non-Detect	4.89	Minimum Non-Detect	1.587
Maximum Non-Detect	4.89	Maximum Non-Detect	1.587
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.598	Shapiro Wilk Test Statistic	0.583
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
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	34.31	Mean	3.209
SD	30.35	SD	0.866
95% DL/2 (t) UCL	47.16	95% H-Stat (DL/2) UCL	61.3
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	33.48	Mean in Log Scale	3.279
SD	30.7	SD in Log Scale	0.7
95% MLE (t) UCL	46.48	Mean in Original Scale	34.63
95% MLE (Tiku) UCL	45.94	SD in Original Scale	30.02
		95% t UCL	47.34
		95% Percentile Bootstrap UCL	47.14

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

		95% BCA Bootstrap UCL	48.46
		95% H UCL	50.32
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.874	Data do not follow a Discernable Distribution (0.05)	
Theta Star	19.37		
nu star	59.97		
A-D Test Statistic	3.479	Nonparametric Statistics	
5% A-D Critical Value	0.749	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.749	Mean	35.34
5% K-S Critical Value	0.218	SD	28.61
Data not Gamma Distributed at 5% Significance Level		SE of Mean	7.166
Assuming Gamma Distribution		95% KM (t) UCL	47.85
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	47.13
Minimum	0.000001	95% KM (jackknife) UCL	47.83
Maximum	106	95% KM (bootstrap t) UCL	54.53
Mean	34.16	95% KM (BCA) UCL	48.93
Median	20	95% KM (Percentile Bootstrap) UCL	47.34
SD	30.52	95% KM (Chebyshev) UCL	66.58
k star	0.476	97.5% KM (Chebyshev) UCL	80.09
Theta star	71.79	99% KM (Chebyshev) UCL	106.6
Nu star	16.18	Potential UCLs to Use	
AppChi2	8.089	95% KM (Chebyshev) UCL	66.58
95% Gamma Approximate UCL (Use when n >= 40)	68.34		
95% Adjusted Gamma UCL (Use when n < 40)	73.75		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Benzo(b)fluoranthene			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	5
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	20	Minimum of Log Data	2.996
Maximum	616	Maximum of Log Data	6.423
Mean	97.35	Mean of log Data	3.691
Geometric Mean	40.09	SD of log Data	1.187
Median	20		
SD	170.6		
Std. Error of Mean	41.38		

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Coefficient of Variation	1.753		
Skewness	2.531		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.528	Shapiro Wilk Test Statistic	0.639
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	169.6	95% H-UCL	194.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	183.9
95% Adjusted-CLT UCL (Chen-1995)	192.6	97.5% Chebyshev (MVUE) UCL	230.5
95% Modified-t UCL (Johnson-1978)	173.8	99% Chebyshev (MVUE) UCL	322.2
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.602	Data do not follow a Discernable Distribution (0.05)	
Theta Star	161.7		
MLE of Mean	97.35		
MLE of Standard Deviation	125.5		
nu star	20.47		
Approximate Chi Square Value (.05)	11.2	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	165.4
Adjusted Chi Square Value	10.48	95% Jackknife UCL	169.6
		95% Standard Bootstrap UCL	163.3
Anderson-Darling Test Statistic	3.123	95% Bootstrap-t UCL	366.6
Anderson-Darling 5% Critical Value	0.782	95% Hall's Bootstrap UCL	485.9
Kolmogorov-Smirnov Test Statistic	0.433	95% Percentile Bootstrap UCL	171.1
Kolmogorov-Smirnov 5% Critical Value	0.218	95% BCA Bootstrap UCL	191.5
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	277.7
		97.5% Chebyshev(Mean, Sd) UCL	355.8
		99% Chebyshev(Mean, Sd) UCL	509.1
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	178		
95% Adjusted Gamma UCL (Use when n < 40)	190.1		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	277.7
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Benzo(g,h,i)perylene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	5	Number of Non-Detect Data	1

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Number of Missing Values		2	Percent Non-Detects		5.88%
Raw Statistics			Log-transformed Statistics		
Minimum Detected	20	Minimum Detected	2.996		
Maximum Detected	509	Maximum Detected	6.232		
Mean of Detected	77.13	Mean of Detected	3.511		
SD of Detected	144.4	SD of Detected	1.063		
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751		
Maximum Non-Detect	2.12	Maximum Non-Detect	0.751		
UCL Statistics					
Normal Distribution Test with Detected Values Only			Lognormal Distribution Test with Detected Values Only		
Shapiro Wilk Test Statistic	0.46	Shapiro Wilk Test Statistic	0.555		
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887		
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	72.65	Mean	3.308		
SD	141.1	SD	1.327		
95% DL/2 (t) UCL	132.4	95% H-Stat (DL/2) UCL	189.8		
Maximum Likelihood Estimate(MLE) Method		Log ROS Method			
Mean	67.24	Mean in Log Scale	3.392		
SD	142.5	SD in Log Scale	1.14		
95% MLE (t) UCL	127.6	Mean in Original Scale	72.85		
95% MLE (Tiku) UCL	122.4	SD in Original Scale	140.9		
		95% t UCL	132.5		
		95% Percentile Bootstrap UCL	130.4		
		95% BCA Bootstrap UCL	149.5		
		95% H UCL	129.5		
Gamma Distribution Test with Detected Values Only			Data Distribution Test with Detected Values Only		
k star (bias corrected)	0.628	Data do not follow a Discernable Distribution (0.05)			
Theta Star	122.9				
nu star	20.09				
A-D Test Statistic	3.796	Nonparametric Statistics			
5% A-D Critical Value	0.777	Kaplan-Meier (KM) Method			
K-S Test Statistic	0.777	Mean	73.76		
5% K-S Critical Value	0.224	SD	136.3		
Data not Gamma Distributed at 5% Significance Level			SE of Mean	34.15	
Assuming Gamma Distribution			95% KM (t) UCL	133.4	
Gamma ROS Statistics using Extrapolated Data			95% KM (z) UCL	129.9	
Minimum	0.000001	95% KM (jackknife) UCL	133.3		
Maximum	509	95% KM (bootstrap t) UCL	636.2		
		95% KM (BCA) UCL	141.4		

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Mean	72.59	95% KM (Percentile Bootstrap) UCL	131.8
Median	20	95% KM (Chebyshev) UCL	222.6
SD	141.1	97.5% KM (Chebyshev) UCL	287
k star	0.345	99% KM (Chebyshev) UCL	413.5
Theta star	210.3		
Nu star	11.73	Potential UCLs to Use	
AppChi2	5.052	97.5% KM (Chebyshev) UCL	287
95% Gamma Approximate UCL (Use when n >= 40)	168.6		
95% Adjusted Gamma UCL (Use when n < 40)	185.2		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Benzo(k)fluoranthene			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	6
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	20	Minimum of Log Data	2.996
Maximum	94.1	Maximum of Log Data	4.544
Mean	27.03	Mean of log Data	3.191
Geometric Mean	24.32	SD of log Data	0.401
Median	20		
SD	18.03		
Std. Error of Mean	4.374		
Coefficient of Variation	0.667		
Skewness	3.604		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.446	Shapiro Wilk Test Statistic	0.567
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	34.67	95% H-UCL	32.04
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	37.6
95% Adjusted-CLT UCL (Chen-1995)	38.31	97.5% Chebyshev (MVUE) UCL	42.52
95% Modified-t UCL (Johnson-1978)	35.3	99% Chebyshev (MVUE) UCL	52.18
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	4.077	Data do not follow a Discernable Distribution (0.05)	

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Theta Star	6.63		
MLE of Mean	27.03		
MLE of Standard Deviation	13.39		
nu star	138.6		
Approximate Chi Square Value (.05)	112.4	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	34.22
Adjusted Chi Square Value	109.9	95% Jackknife UCL	34.67
		95% Standard Bootstrap UCL	33.93
Anderson-Darling Test Statistic	3.224	95% Bootstrap-t UCL	51.58
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	58.03
Kolmogorov-Smirnov Test Statistic	0.39	95% Percentile Bootstrap UCL	34.83
Kolmogorov-Smirnov 5% Critical Value	0.21	95% BCA Bootstrap UCL	39.64
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	46.09
		97.5% Chebyshev(Mean, Sd) UCL	54.34
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	70.55
95% Approximate Gamma UCL (Use when n >= 40)	33.33		
95% Adjusted Gamma UCL (Use when n < 40)	34.08		
Potential UCL to Use		Use 95% Student's-t UCL	34.67
		or 95% Modified-t UCL	35.3
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Chrysene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	14
Number of Distinct Detected Data	3	Number of Non-Detect Data	3
Number of Missing Values	2	Percent Non-Detects	17.65%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	20	Minimum Detected	2.996
Maximum Detected	74	Maximum Detected	4.304
Mean of Detected	27.64	Mean of Detected	3.182
SD of Detected	19.43	SD of Detected	0.473
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	5.14	Maximum Non-Detect	1.637
Note: Data have multiple DLs - Use of KM Method is recommended		Number treated as Non-Detect	3
For all methods (except KM, DL/2, and ROS Methods),		Number treated as Detected	14
Observations < Largest ND are treated as NDs		Single DL Non-Detect Percentage	17.65%
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.43	Shapiro Wilk Test Statistic	0.429
5% Shapiro Wilk Critical Value	0.874	5% Shapiro Wilk Critical Value	0.874
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	23.12	Mean	2.732
SD	20.2	SD	1.103
95% DL/2 (t) UCL	31.68	95% H-Stat (DL/2) UCL	61.49
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	21.39	Mean in Log Scale	3.046
SD	22.16	SD in Log Scale	0.522
95% MLE (t) UCL	30.78	Mean in Original Scale	24.73
95% MLE (Tiku) UCL	30.82	SD in Original Scale	18.67
		95% t UCL	32.64
		95% Percentile Bootstrap UCL	32.07
		95% BCA Bootstrap UCL	34.78
		95% H UCL	31.53
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	3.025	Data do not follow a Discernable Distribution (0.05)	
Theta Star	9.138		
nu star	84.71		
A-D Test Statistic	4.242	Nonparametric Statistics	
5% A-D Critical Value	0.741	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.741	Mean	26.29
5% K-S Critical Value	0.23	SD	17.24
Data not Gamma Distributed at 5% Significance Level		SE of Mean	4.339
Assuming Gamma Distribution		95% KM (t) UCL	33.87
Gamma ROS Statistics using Extrapolated Data		95% KM (z) UCL	33.43
Minimum	0.000001	95% KM (jackknife) UCL	33.82
Maximum	74	95% KM (bootstrap t) UCL	N/A
Mean	22.76	95% KM (BCA) UCL	32.53
Median	20	95% KM (Percentile Bootstrap) UCL	32.65
SD	20.61	95% KM (Chebyshev) UCL	45.21
k star	0.239	97.5% KM (Chebyshev) UCL	53.39
Theta star	95.27	99% KM (Chebyshev) UCL	69.46

Attachment B-2
 USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)
 Topsham Annex Skeet Range, Topsham, Maine

Nu star	8.124	Potential UCLs to Use	
AppChi2	2.807	95% KM (Chebyshev) UCL	45.21
95% Gamma Approximate UCL (Use when n >= 40)	65.88		
95% Adjusted Gamma UCL (Use when n < 40)	74.29		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Dibenz(a,h)anthracene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	4	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	5.88%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	20	Minimum Detected	2.996
Maximum Detected	581	Maximum Detected	6.365
Mean of Detected	74.31	Mean of Detected	3.396
SD of Detected	154.7	SD of Detected	1.051
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.12	Maximum Non-Detect	0.751
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.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.412	Shapiro Wilk Test Statistic	0.435
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
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	70	Mean	3.2
SD	150.8	SD	1.3
95% DL/2 (t) UCL	133.9	95% H-Stat (DL/2) UCL	158.9
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	64.1	Mean in Log Scale	3.294

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

SD	152.2	SD in Log Scale	1.102
95% MLE (t) UCL	128.5	Mean in Original Scale	70.25
95% MLE (Tiku) UCL	122.8	SD in Original Scale	150.7
		95% t UCL	134.1
		95% Percentile Bootstrap UCL	136.2
		95% BCA Bootstrap UCL	153.1
		95% H UCL	107.6
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.584	Data do not follow a Discernable Distribution (0.05)	
Theta Star	127.3		
nu star	18.68		
A-D Test Statistic	4.795	Nonparametric Statistics	
5% A-D Critical Value	0.782	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.782	Mean	71.12
5% K-S Critical Value	0.225	SD	145.8
Data not Gamma Distributed at 5% Significance Level		SE of Mean	36.53
		95% KM (t) UCL	134.9
Assuming Gamma Distribution		95% KM (z) UCL	131.2
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	134.8
Minimum	0.000001	95% KM (bootstrap t) UCL	5303
Maximum	581	95% KM (BCA) UCL	139.3
Mean	69.94	95% KM (Percentile Bootstrap) UCL	137.5
Median	20	95% KM (Chebyshev) UCL	230.3
SD	150.8	97.5% KM (Chebyshev) UCL	299.2
k star	0.335	99% KM (Chebyshev) UCL	434.6
Theta star	208.7		
Nu star	11.39	Potential UCLs to Use	
AppChi2	4.83	97.5% KM (Chebyshev) UCL	299.2
95% Gamma Approximate UCL (Use when n >= 40)	165		
95% Adjusted Gamma UCL (Use when n < 40)	181.5		
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Fluoranthene			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	5
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	20	Minimum of Log Data	2.996
Maximum	207	Maximum of Log Data	5.333

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Mean	55.65	Mean of log Data	3.56
Geometric Mean	35.18	SD of log Data	0.913
Median	20		
SD	60.83		
Std. Error of Mean	14.75		
Coefficient of Variation	1.093		
Skewness	1.471		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.649	Shapiro Wilk Test Statistic	0.629
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	81.41	95% H-UCL	95.4
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	
95% Adjusted-CLT UCL (Chen-1995)	85.54	97.5% Chebyshev (MVUE) UCL	129.7
95% Modified-t UCL (Johnson-1978)	82.28	99% Chebyshev (MVUE) UCL	176
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.052	Data do not follow a Discernable Distribution (0.05)	
Theta Star	52.88		
MLE of Mean	55.65		
MLE of Standard Deviation	54.25		
nu star	35.78		
Approximate Chi Square Value (.05)	23.09	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	79.91
Adjusted Chi Square Value	22.02	95% Jackknife UCL	81.41
		95% Standard Bootstrap UCL	79.09
Anderson-Darling Test Statistic	3.199	95% Bootstrap-t UCL	92.16
Anderson-Darling 5% Critical Value	0.761	95% Hall's Bootstrap UCL	80.87
Kolmogorov-Smirnov Test Statistic	0.448	95% Percentile Bootstrap UCL	81.24
Kolmogorov-Smirnov 5% Critical Value	0.214	95% BCA Bootstrap UCL	83.53
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	
		120	
Assuming Gamma Distribution		97.5% Chebyshev(Mean, Sd) UCL	
95% Approximate Gamma UCL (Use when n >= 40)	86.23	147.8	
95% Adjusted Gamma UCL (Use when n < 40)	90.4	99% Chebyshev(Mean, Sd) UCL	
		202.4	
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	
		120	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

Indeno(1,2,3-cd)pyrene			
General Statistics			
Number of Valid Data	17	Number of Detected Data	16
Number of Distinct Detected Data	5	Number of Non-Detect Data	1
Number of Missing Values	2	Percent Non-Detects	5.88%
Raw Statistics		Log-transformed Statistics	
Minimum Detected	6.07	Minimum Detected	1.803
Maximum Detected	150	Maximum Detected	5.011
Mean of Detected	39.07	Mean of Detected	3.265
SD of Detected	44.12	SD of Detected	0.833
Minimum Non-Detect	2.12	Minimum Non-Detect	0.751
Maximum Non-Detect	2.12	Maximum Non-Detect	0.751
UCL Statistics			
Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.562	Shapiro Wilk Test Statistic	0.669
5% Shapiro Wilk Critical Value	0.887	5% Shapiro Wilk Critical Value	0.887
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	36.83	Mean	3.076
SD	43.7	SD	1.12
95% DL/2 (t) UCL	55.34	95% H-Stat (DL/2) UCL	90.32
Maximum Likelihood Estimate(MLE) Method		Log ROS Method	
Mean	35.39	Mean in Log Scale	3.167
SD	44.28	SD in Log Scale	0.903
95% MLE (t) UCL	54.14	Mean in Original Scale	37.06
95% MLE (Tiku) UCL	53.04	SD in Original Scale	43.51
		95% t UCL	55.48
		95% Percentile Bootstrap UCL	54.88
		95% BCA Bootstrap UCL	58.17
		95% H UCL	63.08
Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	1.173	Data do not follow a Discernable Distribution (0.05)	
Theta Star	33.3		
nu star	37.54		
A-D Test Statistic	3.34	Nonparametric Statistics	
5% A-D Critical Value	0.757	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.757	Mean	37.13
5% K-S Critical Value	0.219	SD	42.16
Data not Gamma Distributed at 5% Significance Level		SE of Mean	10.56

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

		95% KM (t) UCL	55.57
Assuming Gamma Distribution		95% KM (z) UCL	54.5
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	55.03
Minimum	0.000001	95% KM (bootstrap t) UCL	64.39
Maximum	150	95% KM (BCA) UCL	55.12
Mean	36.77	95% KM (Percentile Bootstrap) UCL	55.76
Median	20	95% KM (Chebyshev) UCL	83.16
SD	43.76	97.5% KM (Chebyshev) UCL	103.1
k star	0.431	99% KM (Chebyshev) UCL	142.2
Theta star	85.25		
Nu star	14.66	Potential UCLs to Use	
AppChi2	7.029	95% KM (Chebyshev) UCL	83.16
95% Gamma Approximate UCL (Use when n >= 40)		76.71	
95% Adjusted Gamma UCL (Use when n < 40)		83.2	
Note: DL/2 is not a recommended method.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).			
For additional insight, the user may want to consult a statistician.			
Pyrene			
General Statistics			
Number of Valid Observations	17	Number of Distinct Observations	5
Number of Missing Values	2		
Raw Statistics		Log-transformed Statistics	
Minimum	20	Minimum of Log Data	2.996
Maximum	174	Maximum of Log Data	5.159
Mean	48.74	Mean of log Data	3.504
Geometric Mean	33.24	SD of log Data	0.829
Median	20		
SD	49.74		
Std. Error of Mean	12.06		
Coefficient of Variation	1.021		
Skewness	1.512		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.643	Shapiro Wilk Test Statistic	0.632
Shapiro Wilk Critical Value	0.892	Shapiro Wilk Critical Value	0.892
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	69.8	95% H-UCL	77.06
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	88.9

Attachment B-2

USEPA ProUCL Output - Surface Soil UCLs for PAH Compounds at Decision Unit 4 (Post-Removal Scenario)

Topsham Annex Skeet Range, Topsham, Maine

95% Adjusted-CLT UCL (Chen-1995)	73.31	97.5% Chebyshev (MVUE) UCL	107.6
95% Modified-t UCL (Johnson-1978)	70.53	99% Chebyshev (MVUE) UCL	144.3
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.234	Data do not follow a Discernable Distribution (0.05)	
Theta Star	39.49		
MLE of Mean	48.74		
MLE of Standard Deviation	43.87		
nu star	41.96		
Approximate Chi Square Value (.05)	28.11	Nonparametric Statistics	
Adjusted Level of Significance	0.0346	95% CLT UCL	68.58
Adjusted Chi Square Value	26.93	95% Jackknife UCL	69.8
		95% Standard Bootstrap UCL	67.49
Anderson-Darling Test Statistic	3.177	95% Bootstrap-t UCL	78.93
Anderson-Darling 5% Critical Value	0.757	95% Hall's Bootstrap UCL	67.44
Kolmogorov-Smirnov Test Statistic	0.445	95% Percentile Bootstrap UCL	68.85
Kolmogorov-Smirnov 5% Critical Value	0.213	95% BCA Bootstrap UCL	71.24
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	101.3
		97.5% Chebyshev(Mean, Sd) UCL	124.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	168.8
95% Approximate Gamma UCL (Use when n >= 40)	72.74		
95% Adjusted Gamma UCL (Use when n < 40)	75.95		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	101.3
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Lead			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	6
Number of Missing Values	6		
Raw Statistics		Log-transformed Statistics	
Minimum	21.5	Minimum of Log Data	3.068
Maximum	150	Maximum of Log Data	5.011
Mean	38.14	Mean of log Data	3.406
Geometric Mean	30.15	SD of log Data	0.612
Median	21.5		
SD	36.85		
Std. Error of Mean	10.22		
Coefficient of Variation	0.966		
Skewness	2.772		

Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.537	Shapiro Wilk Test Statistic	0.642
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	56.35	95% H-UCL	54.11
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	63.21
95% Adjusted-CLT UCL (Chen-1995)	63.34	97.5% Chebyshev (MVUE) UCL	75.09
95% Modified-t UCL (Johnson-1978)	57.66	99% Chebyshev (MVUE) UCL	98.41
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.806	Data do not follow a Discernable Distribution (0.05)	
Theta Star	21.12		
MLE of Mean	38.14		
MLE of Standard Deviation	28.38		
nu star	46.95		
Approximate Chi Square Value (.05)	32.23	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	54.95
Adjusted Chi Square Value	30.5	95% Jackknife UCL	56.35
		95% Standard Bootstrap UCL	54.08
Anderson-Darling Test Statistic	2.31	95% Bootstrap-t UCL	121.7
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	124
Kolmogorov-Smirnov Test Statistic	0.375	95% Percentile Bootstrap UCL	56.42
Kolmogorov-Smirnov 5% Critical Value	0.239	95% BCA Bootstrap UCL	67.73
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	82.69
		97.5% Chebyshev(Mean, Sd) UCL	102
		99% Chebyshev(Mean, Sd) UCL	139.8
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	55.56		
95% Adjusted Gamma UCL (Use when n < 40)	58.72		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	
			82.69
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			

Attachment C
MEDEP RAGS Human Health Risk Calculator Results

Attachment D
USEPA ProUCL Output –Site-Wide and DU-Specific
Surface Soil Lead

Attachment D
 USEPA ProUCL Output - Surface Soil UCLs for Lead
 Topsham Annex Skeet Range, Topsham, Maine

General UCL Statistics for Full Data Sets			
User Selected Options			
From File	C:\Users\dlavoie\Documents\Work Professional\Projects\Navy\NAS Brunswick\Topsham Annex\Skeet Range\Soil Delin		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Site-Wide Current Conditions			
General Statistics			
Number of Valid Observations	293	Number of Distinct Observations	268
Raw Statistics		Log-transformed Statistics	
Minimum	1.6	Minimum of Log Data	0.47
Maximum	44100	Maximum of Log Data	10.69
Mean	454	Mean of log Data	4.847
Geometric Mean	127.3	SD of log Data	1.246
Median	126.3		
SD	2932		
Std. Error of Mean	171.3		
Coefficient of Variation	6.458		
Skewness	13.23		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.439	Lilliefors Test Statistic	0.0426
Lilliefors Critical Value	0.0518	Lilliefors Critical Value	0.0518
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	736.7	95% H-UCL	328.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	390.6
95% Adjusted-CLT UCL (Chen-1995)	877.2	97.5% Chebyshev (MVUE) UCL	440.5
95% Modified-t UCL (Johnson-1978)	758.7	99% Chebyshev (MVUE) UCL	538.3
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.497	Data appear Lognormal at 5% Significance Level	
Theta Star	913.8		
MLE of Mean	454		
MLE of Standard Deviation	644.1		
nu star	291.1		
Approximate Chi Square Value (.05)	252.6	Nonparametric Statistics	
Adjusted Level of Significance	0.0492	95% CLT UCL	735.8
Adjusted Chi Square Value	252.4	95% Jackknife UCL	736.7
		95% Standard Bootstrap UCL	740.5
Anderson-Darling Test Statistic	3.413E+28	95% Bootstrap-t UCL	2996
Anderson-Darling 5% Critical Value	0.822	95% Hall's Bootstrap UCL	2147

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Kolmogorov-Smirnov Test Statistic	0.211	95% Percentile Bootstrap UCL	766.9
Kolmogorov-Smirnov 5% Critical Value	0.0559	95% BCA Bootstrap UCL	952.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1201
		97.5% Chebyshev(Mean, Sd) UCL	1524
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	2158
95% Approximate Gamma UCL (Use when n >= 40)	523.2		
95% Adjusted Gamma UCL (Use when n < 40)	523.6		
Potential UCL to Use		Use 95% H-UCL	328.6
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Site-Wide Post-Removal (Initial)			
General Statistics			
Number of Valid Observations	293	Number of Distinct Observations	208
Raw Statistics		Log-transformed Statistics	
Minimum	1.6	Minimum of Log Data	0.47
Maximum	354.6	Maximum of Log Data	5.871
Mean	105.1	Mean of log Data	4.177
Geometric Mean	65.15	SD of log Data	1.039
Median	70.4		
SD	96.89		
Std. Error of Mean	5.66		
Coefficient of Variation	0.922		
Skewness	1.009		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.158	Lilliefors Test Statistic	0.137
Lilliefors Critical Value	0.0518	Lilliefors Critical Value	0.0518
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	114.5	95% H-UCL	127.5
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	147.7
95% Adjusted-CLT UCL (Chen-1995)	114.8	97.5% Chebyshev (MVUE) UCL	163.4
95% Modified-t UCL (Johnson-1978)	114.5	99% Chebyshev (MVUE) UCL	194.3

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 Topsham Annex Skeet Range, Topsham, Maine

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.174	Data do not follow a Discernable Distribution (0.05)	
Theta Star	89.55		
MLE of Mean	105.1		
MLE of Standard Deviation	97.03		
nu star	688		
Approximate Chi Square Value (.05)	628.1	Nonparametric Statistics	
Adjusted Level of Significance	0.0492	95% CLT UCL	114.4
Adjusted Chi Square Value	627.8	95% Jackknife UCL	114.5
		95% Standard Bootstrap UCL	114.5
Anderson-Darling Test Statistic	8.493	95% Bootstrap-t UCL	114.7
Anderson-Darling 5% Critical Value	0.78	95% Hall's Bootstrap UCL	115
Kolmogorov-Smirnov Test Statistic	0.13	95% Percentile Bootstrap UCL	114.4
Kolmogorov-Smirnov 5% Critical Value	0.0543	95% BCA Bootstrap UCL	113.8
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	129.8
		97.5% Chebyshev(Mean, Sd) UCL	140.5
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	161.4
95% Approximate Gamma UCL (Use when n >= 40)	115.1		
95% Adjusted Gamma UCL (Use when n < 40)	115.2		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	129.8
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
DU1 Current Conditions			
General Statistics			
Number of Valid Observations	89	Number of Distinct Observations	82
Raw Statistics		Log-transformed Statistics	
Minimum	10.4	Minimum of Log Data	2.342
Maximum	44100	Maximum of Log Data	10.69
Mean	738.6	Mean of log Data	4.866
Geometric Mean	129.8	SD of log Data	1.399
Median	160		
SD	4660		
Std. Error of Mean	493.9		
Coefficient of Variation	6.309		
Skewness	9.364		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.438	Lilliefors Test Statistic	0.0894
Lilliefors Critical Value	0.0939	Lilliefors Critical Value	0.0939
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

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Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	1560	95% H-UCL	513.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	631.2
95% Adjusted-CLT UCL (Chen-1995)	2075	97.5% Chebyshev (MVUE) UCL	758
95% Modified-t UCL (Johnson-1978)	1641	99% Chebyshev (MVUE) UCL	1007
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.376	Data appear Lognormal at 5% Significance Level	
Theta Star	1964		
MLE of Mean	738.6		
MLE of Standard Deviation	1205		
nu star	66.94		
Approximate Chi Square Value (.05)	49.11	Nonparametric Statistics	
Adjusted Level of Significance	0.0473	95% CLT UCL	1551
Adjusted Chi Square Value	48.86	95% Jackknife UCL	1560
		95% Standard Bootstrap UCL	1521
Anderson-Darling Test Statistic	9.904	95% Bootstrap-t UCL	10018
Anderson-Darling 5% Critical Value	0.848	95% Hall's Bootstrap UCL	4971
Kolmogorov-Smirnov Test Statistic	0.295	95% Percentile Bootstrap UCL	1723
Kolmogorov-Smirnov 5% Critical Value	0.102	95% BCA Bootstrap UCL	2268
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	2892
		97.5% Chebyshev(Mean, Sd) UCL	3823
		99% Chebyshev(Mean, Sd) UCL	5653
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	1007		
95% Adjusted Gamma UCL (Use when n < 40)	1012		
Potential UCL to Use		Use 95% H-UCL 513.6	
<p>ProUCL computes and outputs H-statistic based UCLs for historical reasons only.</p> <p>H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.</p> <p>It is therefore recommended to avoid the use of H-statistic based 95% UCLs.</p> <p>Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.</p>			
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.</p> <p>These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.</p>			
DU1 Post Removal			
General Statistics			
Number of Valid Observations	89	Number of Distinct Observations	36
Raw Statistics		Log-transformed Statistics	
Minimum	10.4	Minimum of Log Data	2.342
Maximum	257.5	Maximum of Log Data	5.551
Mean	38.72	Mean of log Data	3.373

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Geometric Mean	29.18	SD of log Data	0.641
Median	21.5		
SD	42.01		
Std. Error of Mean	4.453		
Coefficient of Variation	1.085		
Skewness	3.169		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.344	Lilliefors Test Statistic	0.368
Lilliefors Critical Value	0.0939	Lilliefors Critical Value	0.0939
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	46.12	95% H-UCL	40.94
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	47.25
95% Adjusted-CLT UCL (Chen-1995)	47.64	97.5% Chebyshev (MVUE) UCL	52.23
95% Modified-t UCL (Johnson-1978)	46.37	99% Chebyshev (MVUE) UCL	62.02
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.859	Data do not follow a Discernable Distribution (0.05)	
Theta Star	20.83		
MLE of Mean	38.72		
MLE of Standard Deviation	28.4		
nu star	330.9		
Approximate Chi Square Value (.05)	289.8	Nonparametric Statistics	
Adjusted Level of Significance	0.0473	95% CLT UCL	46.05
Adjusted Chi Square Value	289.1	95% Jackknife UCL	46.12
		95% Standard Bootstrap UCL	46.05
Anderson-Darling Test Statistic	13.39	95% Bootstrap-t UCL	48.26
Anderson-Darling 5% Critical Value	0.766	95% Hall's Bootstrap UCL	48.41
Kolmogorov-Smirnov Test Statistic	0.373	95% Percentile Bootstrap UCL	46.19
Kolmogorov-Smirnov 5% Critical Value	0.0961	95% BCA Bootstrap UCL	47.47
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	58.13
		97.5% Chebyshev(Mean, Sd) UCL	66.53
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	83.03
95% Approximate Gamma UCL (Use when n >= 40)	44.22		
95% Adjusted Gamma UCL (Use when n < 40)	44.32		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	
			58.13
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
DU2 Current Conditions			

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 USEPA ProUCL Output - Surface Soil UCLs for Lead
 Topsham Annex Skeet Range, Topsham, Maine

General Statistics					
Number of Valid Observations		101	Number of Distinct Observations		99
Raw Statistics			Log-transformed Statistics		
Minimum		1.6	Minimum of Log Data		0.47
Maximum		1890	Maximum of Log Data		7.544
Mean		248.3	Mean of log Data		5.005
Geometric Mean		149.2	SD of log Data		1.099
Median		141			
SD		277			
Std. Error of Mean		27.56			
Coefficient of Variation		1.116			
Skewness		2.921			
Relevant UCL Statistics					
Normal Distribution Test			Lognormal Distribution Test		
Lilliefors Test Statistic		0.191	Lilliefors Test Statistic		0.0702
Lilliefors Critical Value		0.0882	Lilliefors Critical Value		0.0882
Data not Normal at 5% Significance Level			Data appear Lognormal at 5% Significance Level		
Assuming Normal Distribution			Assuming Lognormal Distribution		
95% Student's-t UCL		294	95% H-UCL		351.5
95% UCLs (Adjusted for Skewness)			95% Chebyshev (MVUE) UCL		429.7
95% Adjusted-CLT UCL (Chen-1995)		302.2	97.5% Chebyshev (MVUE) UCL		498.6
95% Modified-t UCL (Johnson-1978)		295.4	99% Chebyshev (MVUE) UCL		634
Gamma Distribution Test			Data Distribution		
k star (bias corrected)		1.093	Data Follow Appr. Gamma Distribution at 5% Significance Level		
Theta Star		227.2			
MLE of Mean		248.3			
MLE of Standard Deviation		237.5			
nu star		220.7			
Approximate Chi Square Value (.05)		187.3	Nonparametric Statistics		
Adjusted Level of Significance		0.0476	95% CLT UCL		293.6
Adjusted Chi Square Value		186.9	95% Jackknife UCL		294
			95% Standard Bootstrap UCL		294.1
Anderson-Darling Test Statistic		0.739	95% Bootstrap-t UCL		303
Anderson-Darling 5% Critical Value		0.78	95% Hall's Bootstrap UCL		310.1
Kolmogorov-Smirnov Test Statistic		0.0936	95% Percentile Bootstrap UCL		295.1
Kolmogorov-Smirnov 5% Critical Value		0.0916	95% BCA Bootstrap UCL		302.7
Data follow Appr. Gamma Distribution at 5% Significance Level			95% Chebyshev(Mean, Sd) UCL		368.4
			97.5% Chebyshev(Mean, Sd) UCL		420.4
			99% Chebyshev(Mean, Sd) UCL		522.5
Assuming Gamma Distribution					
95% Approximate Gamma UCL (Use when n >= 40)		292.5			
95% Adjusted Gamma UCL (Use when n < 40)		293.2			
Potential UCL to Use			Use 95% Approximate Gamma UCL		
					292.5

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 USEPA ProUCL Output - Surface Soil UCLs for Lead
 Topsham Annex Skeet Range, Topsham, Maine

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
DU2 Post Removal			
General Statistics			
Number of Valid Observations		101	Number of Distinct Observations
			45
Raw Statistics		Log-transformed Statistics	
	Minimum	1.6	Minimum of Log Data
	Maximum	151	Maximum of Log Data
	Mean	43.03	Mean of log Data
	Geometric Mean	33.02	SD of log Data
	Median	21.5	
	SD	34.41	
	Std. Error of Mean	3.424	
	Coefficient of Variation	0.8	
	Skewness	1.366	
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
	Lilliefors Test Statistic	0.331	Lilliefors Test Statistic
	Lilliefors Critical Value	0.0882	Lilliefors Critical Value
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
	95% Student's-t UCL	48.72	95% H-UCL
	95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL
	95% Adjusted-CLT UCL (Chen-1995)	49.16	97.5% Chebyshev (MVUE) UCL
	95% Modified-t UCL (Johnson-1978)	48.8	99% Chebyshev (MVUE) UCL
Gamma Distribution Test		Data Distribution	
	k star (bias corrected)	1.985	Data do not follow a Discernable Distribution (0.05)
	Theta Star	21.68	
	MLE of Mean	43.03	
	MLE of Standard Deviation	30.54	
	nu star	401	
	Approximate Chi Square Value (.05)	355.6	Nonparametric Statistics
	Adjusted Level of Significance	0.0476	95% CLT UCL
	Adjusted Chi Square Value	355	95% Jackknife UCL
			95% Standard Bootstrap UCL
	Anderson-Darling Test Statistic	12.61	95% Bootstrap-t UCL
	Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL
	Kolmogorov-Smirnov Test Statistic	0.334	95% Percentile Bootstrap UCL
	Kolmogorov-Smirnov 5% Critical Value	0.0904	95% BCA Bootstrap UCL
Data not Gamma Distributed at 5% Significance Level			95% Chebyshev(Mean, Sd) UCL
			57.96

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		97.5% Chebyshev(Mean, Sd) UCL	64.42
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	77.1
95% Approximate Gamma UCL (Use when n >= 40)	48.53		
95% Adjusted Gamma UCL (Use when n < 40)	48.62		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	57.96
<p>Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.</p>			
DU3 Current Conditions			
General Statistics			
Number of Valid Observations	90	Number of Distinct Observations	88
Raw Statistics		Log-transformed Statistics	
Minimum	1.6	Minimum of Log Data	0.47
Maximum	24300	Maximum of Log Data	10.1
Mean	455.3	Mean of log Data	4.751
Geometric Mean	115.7	SD of log Data	1.263
Median	107.9		
SD	2550		
Std. Error of Mean	268.8		
Coefficient of Variation	5.6		
Skewness	9.397		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.429	Lilliefors Test Statistic	0.0497
Lilliefors Critical Value	0.0934	Lilliefors Critical Value	0.0934
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	902	95% H-UCL	359.6
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	442.3
95% Adjusted-CLT UCL (Chen-1995)	1182	97.5% Chebyshev (MVUE) UCL	524.2
95% Modified-t UCL (Johnson-1978)	946.4	99% Chebyshev (MVUE) UCL	685.1
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	0.46	Data appear Lognormal at 5% Significance Level	
Theta Star	989.2		
MLE of Mean	455.3		
MLE of Standard Deviation	671.1		
nu star	82.85		
Approximate Chi Square Value (.05)	62.87	Nonparametric Statistics	
Adjusted Level of Significance	0.0473	95% CLT UCL	897.4

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Adjusted Chi Square Value	62.59	95% Jackknife UCL	902
		95% Standard Bootstrap UCL	885.8
Anderson-Darling Test Statistic	8.844	95% Bootstrap-t UCL	4691
Anderson-Darling 5% Critical Value	0.826	95% Hall's Bootstrap UCL	2633
Kolmogorov-Smirnov Test Statistic	0.22	95% Percentile Bootstrap UCL	993.7
Kolmogorov-Smirnov 5% Critical Value	0.1	95% BCA Bootstrap UCL	1293
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	1627
		97.5% Chebyshev(Mean, Sd) UCL	2134
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	3129
95% Approximate Gamma UCL (Use when n >= 40)	600		
95% Adjusted Gamma UCL (Use when n < 40)	602.7		
Potential UCL to Use		Use 95% H-UCL	359.6
ProUCL computes and outputs H-statistic based UCLs for historical reasons only.			
H-statistic often results in unstable (both high and low) values of UCL95 as shown in examples in the Technical Guide.			
It is therefore recommended to avoid the use of H-statistic based 95% UCLs.			
Use of nonparametric methods are preferred to compute UCL95 for skewed data sets which do not follow a gamma distribution.			
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
DU3 Post Removal			
General Statistics			
Number of Valid Observations	90	Number of Distinct Observations	51
Raw Statistics		Log-transformed Statistics	
Minimum	1.6	Minimum of Log Data	0.47
Maximum	178	Maximum of Log Data	5.182
Mean	45.41	Mean of log Data	3.545
Geometric Mean	34.63	SD of log Data	0.745
Median	21.85		
SD	36.48		
Std. Error of Mean	3.845		
Coefficient of Variation	0.803		
Skewness	1.607		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Lilliefors Test Statistic	0.253	Lilliefors Test Statistic	0.239
Lilliefors Critical Value	0.0934	Lilliefors Critical Value	0.0934
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	51.8	95% H-UCL	53.7

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 Topsham Annex Skeet Range, Topsham, Maine

95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	
95% Adjusted-CLT UCL (Chen-1995)	52.43	97.5% Chebyshev (MVUE) UCL	70.43
95% Modified-t UCL (Johnson-1978)	51.91	99% Chebyshev (MVUE) UCL	85.21
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.938	Data do not follow a Discernable Distribution (0.05)	
Theta Star	23.43		
MLE of Mean	45.41		
MLE of Standard Deviation	32.62		
nu star	348.8		
Approximate Chi Square Value (.05)	306.5	Nonparametric Statistics	
Adjusted Level of Significance	0.0473	95% CLT UCL	51.73
Adjusted Chi Square Value	305.9	95% Jackknife UCL	51.8
		95% Standard Bootstrap UCL	51.81
Anderson-Darling Test Statistic	6.595	95% Bootstrap-t UCL	53.08
Anderson-Darling 5% Critical Value	0.765	95% Hall's Bootstrap UCL	52.55
Kolmogorov-Smirnov Test Statistic	0.255	95% Percentile Bootstrap UCL	51.47
Kolmogorov-Smirnov 5% Critical Value	0.0954	95% BCA Bootstrap UCL	52.32
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	62.17
		97.5% Chebyshev(Mean, Sd) UCL	69.42
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	83.66
95% Approximate Gamma UCL (Use when n >= 40)	51.67		
95% Adjusted Gamma UCL (Use when n < 40)	51.78		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	
		62.17	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
DU4 Current Conditions			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	13
Raw Statistics		Log-transformed Statistics	
Minimum	22.9	Minimum of Log Data	3.131
Maximum	474	Maximum of Log Data	6.161
Mean	94.79	Mean of log Data	4.142
Geometric Mean	62.91	SD of log Data	0.848
Median	61.4		
SD	120		
Std. Error of Mean	33.27		
Coefficient of Variation	1.266		
Skewness	3.031		
Relevant UCL Statistics			

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Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.587	Shapiro Wilk Test Statistic	0.926
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	154.1	95% H-UCL	170
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	181.7
95% Adjusted-CLT UCL (Chen-1995)	179.4	97.5% Chebyshev (MVUE) UCL	222.7
95% Modified-t UCL (Johnson-1978)	158.8	99% Chebyshev (MVUE) UCL	303.2
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.099	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	86.26		
MLE of Mean	94.79		
MLE of Standard Deviation	90.42		
nu star	28.57		
Approximate Chi Square Value (.05)	17.37	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	149.5
Adjusted Chi Square Value	16.14	95% Jackknife UCL	154.1
		95% Standard Bootstrap UCL	147.4
Anderson-Darling Test Statistic	0.747	95% Bootstrap-t UCL	271.9
Anderson-Darling 5% Critical Value	0.752	95% Hall's Bootstrap UCL	362.8
Kolmogorov-Smirnov Test Statistic	0.182	95% Percentile Bootstrap UCL	152.6
Kolmogorov-Smirnov 5% Critical Value	0.242	95% BCA Bootstrap UCL	183.6
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	239.8
		97.5% Chebyshev(Mean, Sd) UCL	302.6
		99% Chebyshev(Mean, Sd) UCL	425.9
Assuming Gamma Distribution			
95% Approximate Gamma UCL (Use when n >= 40)	155.9		
95% Adjusted Gamma UCL (Use when n < 40)	167.8		
Potential UCL to Use		Use 95% Approximate Gamma UCL 155.9	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
DU4 Post Removal			
General Statistics			
Number of Valid Observations	13	Number of Distinct Observations	6
Raw Statistics		Log-transformed Statistics	
Minimum	21.5	Minimum of Log Data	3.068
Maximum	150	Maximum of Log Data	5.011
Mean	38.14	Mean of log Data	3.406
Geometric Mean	30.15	SD of log Data	0.612

Attachment D
 USEPA ProUCL Output - Surface Soil UCLs for Lead
 Topsham Annex Skeet Range, Topsham, Maine

Median	21.5		
SD	36.85		
Std. Error of Mean	10.22		
Coefficient of Variation	0.966		
Skewness	2.772		
Relevant UCL Statistics			
Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.537	Shapiro Wilk Test Statistic	0.642
Shapiro Wilk Critical Value	0.866	Shapiro Wilk Critical Value	0.866
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	
Assuming Normal Distribution		Assuming Lognormal Distribution	
95% Student's-t UCL	56.35	95% H-UCL	54.11
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	63.21
95% Adjusted-CLT UCL (Chen-1995)	63.34	97.5% Chebyshev (MVUE) UCL	75.09
95% Modified-t UCL (Johnson-1978)	57.66	99% Chebyshev (MVUE) UCL	98.41
Gamma Distribution Test		Data Distribution	
k star (bias corrected)	1.806	Data do not follow a Discernable Distribution (0.05)	
Theta Star	21.12		
MLE of Mean	38.14		
MLE of Standard Deviation	28.38		
nu star	46.95		
Approximate Chi Square Value (.05)	32.23	Nonparametric Statistics	
Adjusted Level of Significance	0.0301	95% CLT UCL	54.95
Adjusted Chi Square Value	30.5	95% Jackknife UCL	56.35
		95% Standard Bootstrap UCL	54.25
Anderson-Darling Test Statistic	2.31	95% Bootstrap-t UCL	119.5
Anderson-Darling 5% Critical Value	0.742	95% Hall's Bootstrap UCL	124.4
Kolmogorov-Smirnov Test Statistic	0.375	95% Percentile Bootstrap UCL	56.66
Kolmogorov-Smirnov 5% Critical Value	0.239	95% BCA Bootstrap UCL	69.22
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	82.69
Assuming Gamma Distribution		97.5% Chebyshev(Mean, Sd) UCL	102
95% Approximate Gamma UCL (Use when n >= 40)	55.56	99% Chebyshev(Mean, Sd) UCL	139.8
95% Adjusted Gamma UCL (Use when n < 40)	58.72		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL 82.69	
Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.			
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)			
and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.			
Site-Wide Post Removal (Final)			

Attachment D
 USEPA ProUCL Output - Surface Soil UCLs for Lead
 Topsham Annex Skeet Range, Topsham, Maine

General Statistics						
Number of Valid Observations		293	Number of Distinct Observations		126	
Raw Statistics			Log-transformed Statistics			
Minimum		1.6	Minimum of Log Data		0.47	
Maximum		257.5	Maximum of Log Data		5.551	
Mean		42.24	Mean of log Data		3.47	
Geometric Mean		32.14	SD of log Data		0.701	
Median		21.5				
SD		37.5				
Std. Error of Mean		2.191				
Coefficient of Variation		0.888				
Skewness		2.186				
Relevant UCL Statistics						
Normal Distribution Test			Lognormal Distribution Test			
Lilliefors Test Statistic		0.304	Lilliefors Test Statistic		0.311	
Lilliefors Critical Value		0.0518	Lilliefors Critical Value		0.0518	
Data not Normal at 5% Significance Level			Data not Lognormal at 5% Significance Level			
Assuming Normal Distribution			Assuming Lognormal Distribution			
95% Student's-t UCL		45.85	95% H-UCL		44.45	
95% UCLs (Adjusted for Skewness)			95% Chebyshev (MVUE) UCL			49.2
95% Adjusted-CLT UCL (Chen-1995)		46.14	97.5% Chebyshev (MVUE) UCL		52.72	
95% Modified-t UCL (Johnson-1978)		45.9	99% Chebyshev (MVUE) UCL		59.65	
Gamma Distribution Test			Data Distribution			
k star (bias corrected)		1.963	Data do not follow a Discernable Distribution (0.05)			
Theta Star		21.51				
MLE of Mean		42.24				
MLE of Standard Deviation		30.14				
nu star		1150				
Approximate Chi Square Value (.05)		1073	Nonparametric Statistics			
Adjusted Level of Significance		0.0492	95% CLT UCL		45.84	
Adjusted Chi Square Value		1072	95% Jackknife UCL		45.85	
Anderson-Darling Test Statistic		32.96	95% Standard Bootstrap UCL		45.76	
Anderson-Darling 5% Critical Value		0.766	95% Bootstrap-t UCL		46.41	
Kolmogorov-Smirnov Test Statistic		0.321	95% Hall's Bootstrap UCL		46.29	
Kolmogorov-Smirnov 5% Critical Value		0.0536	95% Percentile Bootstrap UCL		45.92	
Data not Gamma Distributed at 5% Significance Level			95% BCA Bootstrap UCL		46.08	
			95% Chebyshev(Mean, Sd) UCL		51.79	
			97.5% Chebyshev(Mean, Sd) UCL		55.92	
			99% Chebyshev(Mean, Sd) UCL		64.04	
Assuming Gamma Distribution						
95% Approximate Gamma UCL (Use when n >= 40)		45.3				
95% Adjusted Gamma UCL (Use when n < 40)		45.31				
Potential UCL to Use			Use 95% Chebyshev (Mean, Sd) UCL			51.79

Attachment D
USEPA ProUCL Output - Surface Soil UCLs for Lead
Topsham Annex Skeet Range, Topsham, Maine

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)

and Singh and Singh (2003). For additional insight, the user may want to consult a statistician.
