APPENDIX A

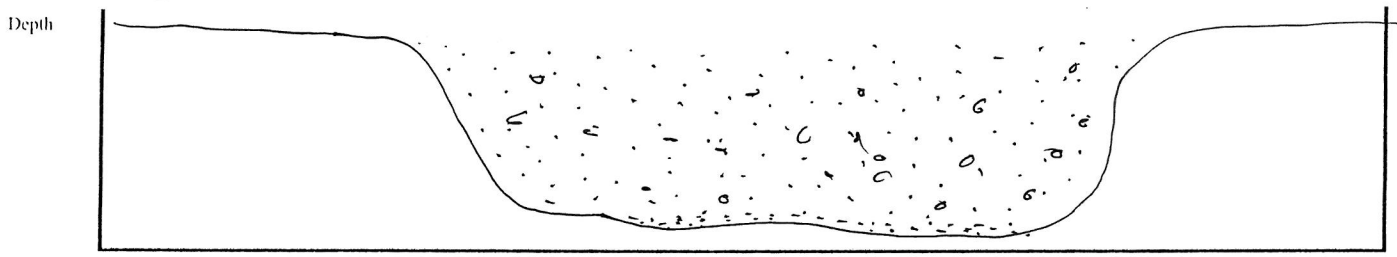
FIELD LOGS

TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	178EP001	Depth:	9'	Northing		
Geol./Eng.	R. McDonald	Width:	4'	Easting		
Date:	14 Dec 2010	Length:	16'	Elevation		

Test Pit Description and Sample Locations

Note: Not to scale.

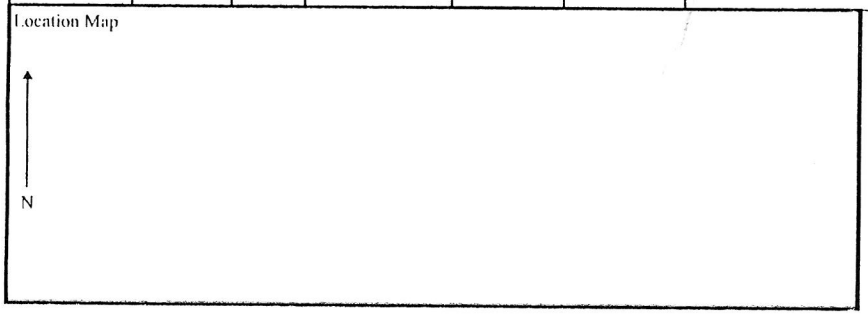


* Waste expected but not encountered.

Depth	Lithology	Depth	Lithology
0-9	Silty sand (SM) w/ some gravel (~25%), dry, loose, lt. reddish brn, gravel to 4" diameter, fine-coarse sand, no visible staining.		
@ 9'	Sand (SW), fine, dry, lt. tan, no visible staining - too loose @ 9', could not excavate further.		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BN/As)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	TMPA, EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	178EP001-01-121410	0.2-0.7	-	Silty sand (SM) as above														

Location Map

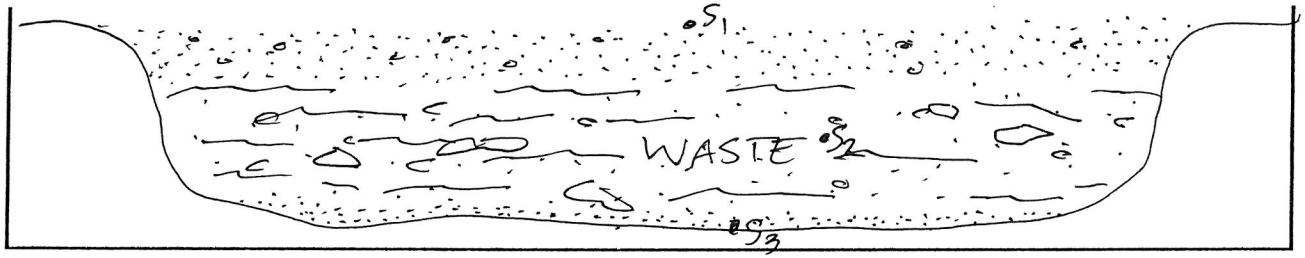


TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	178EP002	Depth:	6'	Northing		
Geol./Eng.	R. McDonald	Width:	3'	Easting		
Date:	15 Dec. 2010	Length:	30'	Elevation		

Test Pit Description and Sample Locations

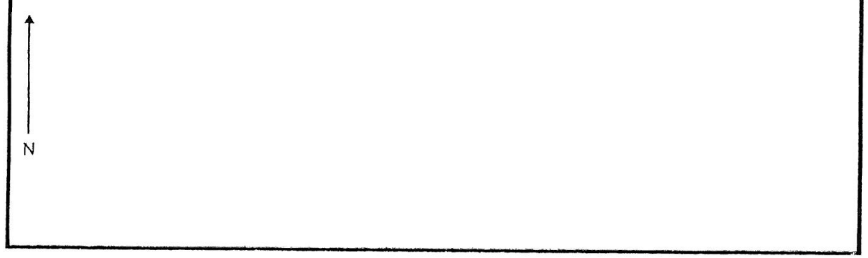
Note: Not to scale.

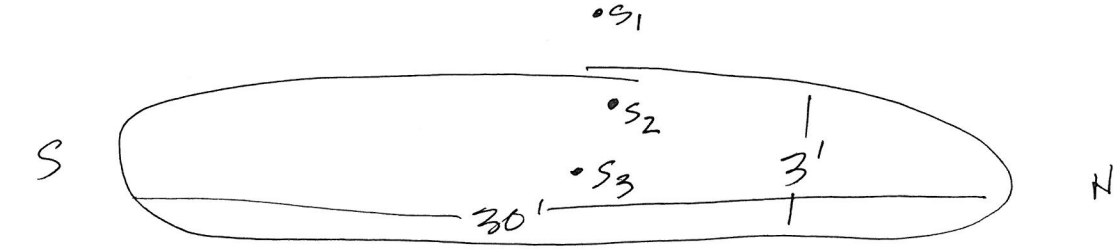


Depth	Lithology	Depth	Lithology
0'-2'	Silty Sand (SM) w/ some (20-25%) gravel, pea-cobble sized, Dry, loose, Lt. brown - Lt. reddish brown		
2'-6'	Waste in Silty Sand (SM) as above. Waste includes: glass bottles & jars, rusted metal, burned wood, ash, carbon rods from batteries.		
@ 6'	Sand (SW), lt. tan, loose, med-coarse, sl. moist.		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC MS (BN-As)	GC MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	178EP002-01-121510	0.2-0.7	—	Silty sand (SM) as above		X	X	X										
	178EP002-02-121510	2-2.5	—	SM in waste zone		X	X	X										
	178EP002-03-121510	6-6.5	—	Sand (SW) as above		X	X	X										

Location Map



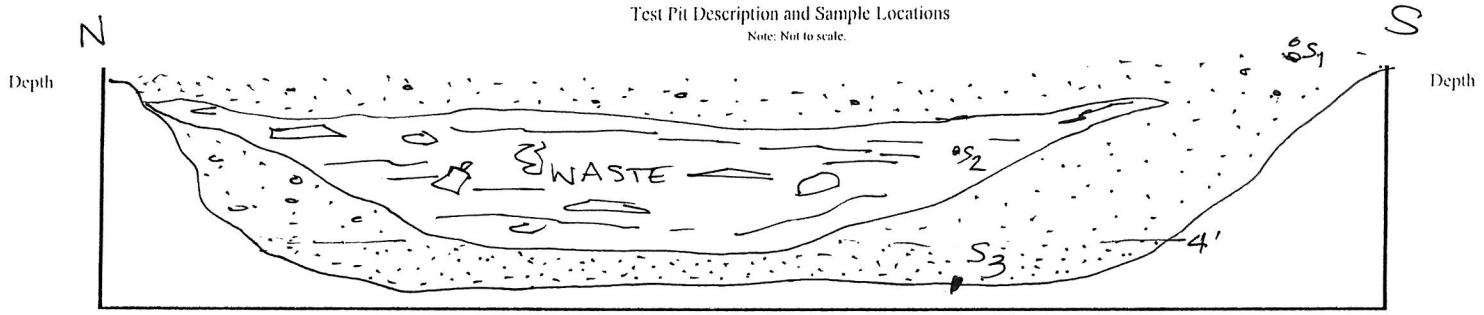


TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	178EP003	Depth:	6'	Northing		
Geol./Eng.	R. McDonald	Width:	3'	Easting		
Date:	15 Dec. 2010	Length:	65'	Elevation		

Test Pit Description and Sample Locations

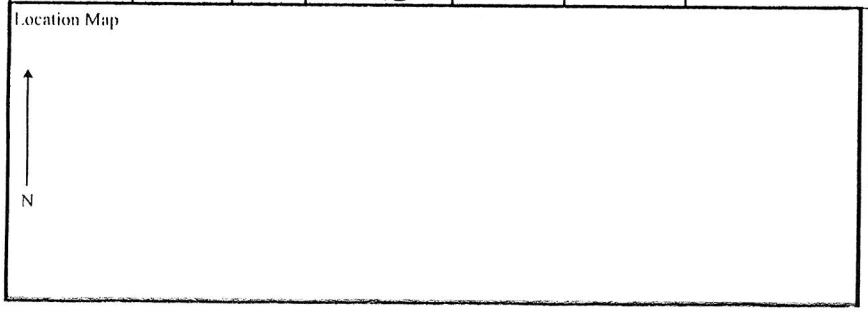
Note: Not to scale.



Depth	Lithology	Depth	Lithology
0-1'	Silty Sand w/ little gravel, dry, loose, some surface debris. Possibly fill material	4-6'	Sand (SW), lt. tan, sl. moist, little (<10%) gravel (pea size)
1'-4'	Waste in sand. Waste includes: broken glass, glass bottles & jars, rusted metal, burned wood, ash, carbon tubes from batteries. Ends approx. 1'e N of S. edge of pit. Waste tapers to edges.		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BN-As)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	178EP003-01-121510	0.2-0.7	—	Silty sand as above		X	X	X										
	178EP003-02-121510	2-2.5'	—	Waste in silty sand, as above		X	X	X										
	178EP003-03-121510	6-6.5'	—	Sand (SW) as above		X	X	X										

Location Map



TEST PIT INFORMATION

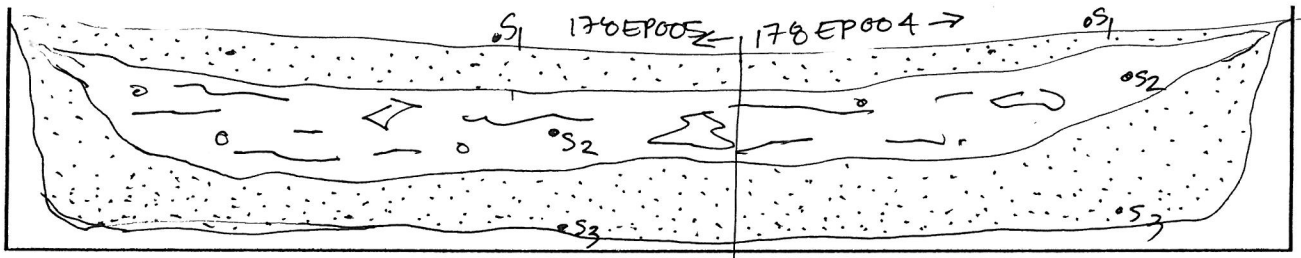
Page: 1 of 1

					North Stake	South Stake
Site ID:	176EP004 & 176EP005	Depth:	6.5'	Northing		
Geol./Eng.	R. McDonald	Width:	3.5'	Easting		
Date:	15 Dec. 2010	Length:	145'	Elevation		

Test Pit Description and Sample Locations

Note: Not to scale.

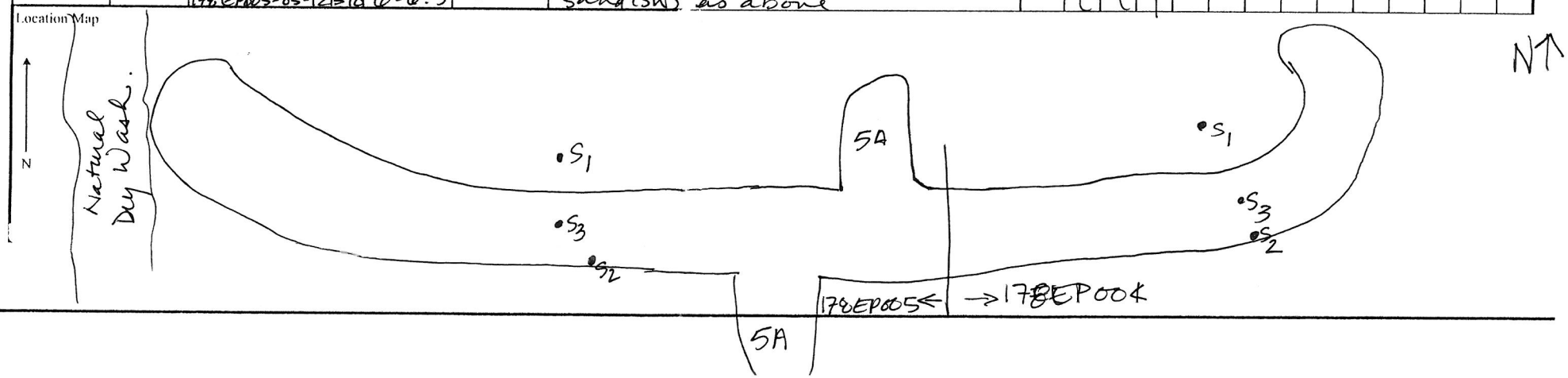
176EP004 & 176EP005 are 2 halves of the same excavation. '5A' was excavated to determine physical extent of waste. Its dimensions are: 3'W x 42'L x 6'D



Depth	Lithology	Depth	Lithology
0-1	Silty sand (SM), dry, loose, lt. brn-lt. reddish brn, med-coarse, some surface debris	4-6.5	Sand (SW), lt. tan, sl. moist, med-coarse, little (<10%) gravel (pea-size)
1-4	SM as above, w/ waste. Waste includes: metal wire, broken glass, 1.5" iron pipe, burned wood, ash, glass bottles & jars, pieces & flakes of rusted metal, copper wire, newspaper, metal spoon, blue & green X-mas light bulbs		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA/ EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	176EP004-01-121510	0.2-0.7	—	Silty sand (SM) as above														
	176EP004-02-121510	2-2.5	—	Silty sand in waste zone														
	176EP004-03-121510	5-5.5	—	Sand (SW) as above														
	176EP005-01-121510	0.2-0.7	—	Silty sand (SM) as above														
	176EP005-02-121510	3-3.5	—	Silty sand in waste zone														
	176EP005-03-121510	6-6.5	—	Sand (SW) as above														

Location Map

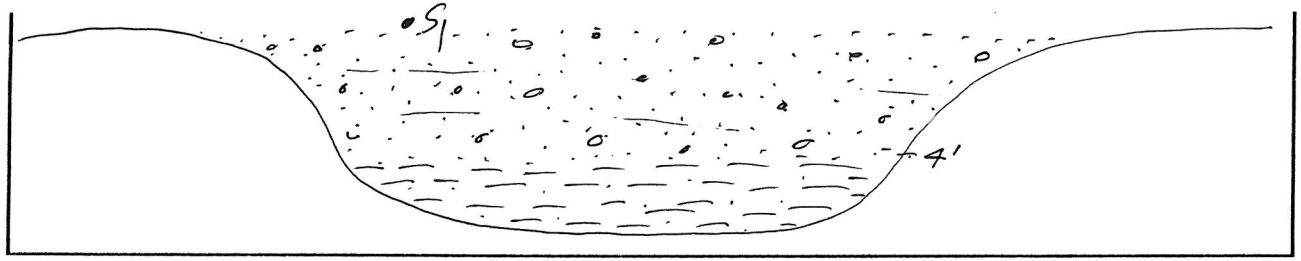


TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	178EP0006	Depth:	6'	Northing		
Geol./Eng.	R. McDonald	Width:	30"	Easting		
Date:	16 Dec. 2010	Length:	16'	Elevation		

Test Pit Description and Sample Locations

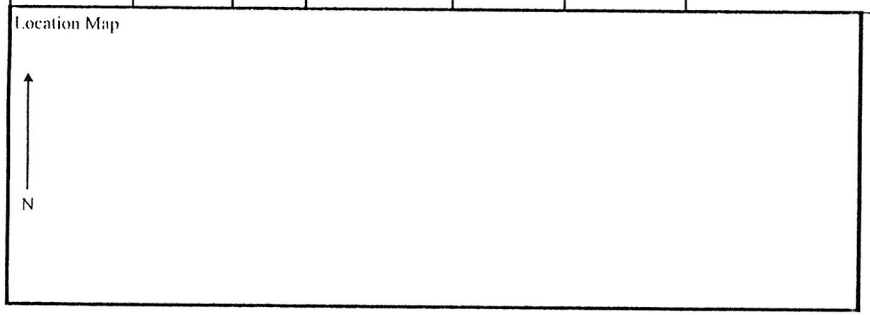
Note: Not to scale.

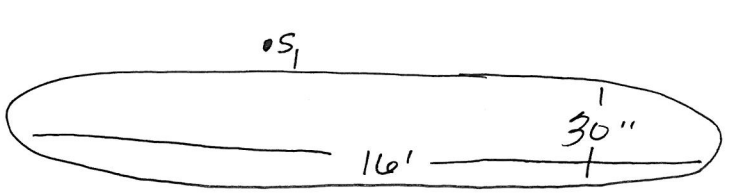


Depth	Lithology	Depth	Lithology
0-4'	Silty sand w/ gravel (SM-GM) dry, loose; gravel is pea-cobble size, subround-subangular; lt. reddish brn, sl. bedding. Sides cave easily		
4-6'	Clay (CL) w/ silt, reddish brown, hard, inelastic, v. sl. moist, interbedded silt		

Site ID		Field Sample #	Depth	Headspace	Sample Description	GC/MS (BN-As)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA/ EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
		178EP0006-01-12116/0	0.2-0.7	—	Silty sand w/ gravel (SM-GM) as above		X	X	X										

Location Map



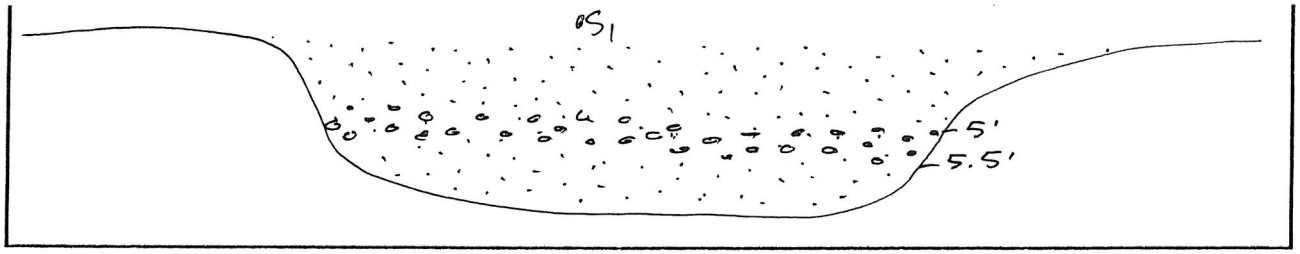


TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	176EP007	Depth:	7.5'	Northing		
Geol./Eng.	K. McDonald	Width:	30"	Easting		
Date:	16 Dec. 2010	Length:	16'	Elevation		

Test Pit Description and Sample Locations

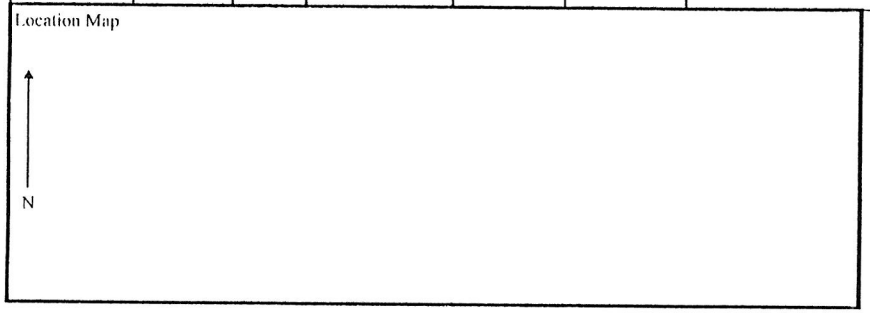
Note: Not to scale.

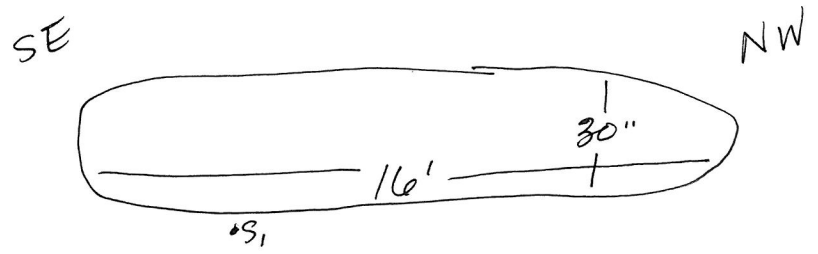


Depth	Lithology	Depth	Lithology
0-7.5'	Sand (SM), lt. tan, dry-sl. moist w/ depth, fine-coarse, some pea-sized gravel, loose, weakly bedded. 6" gravel layer from 5-5.5' bgs		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	DMPA, EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	176EP007-01-121610	0.2-0.7	~	Sand (SM) as above		X	X	X										

Location Map



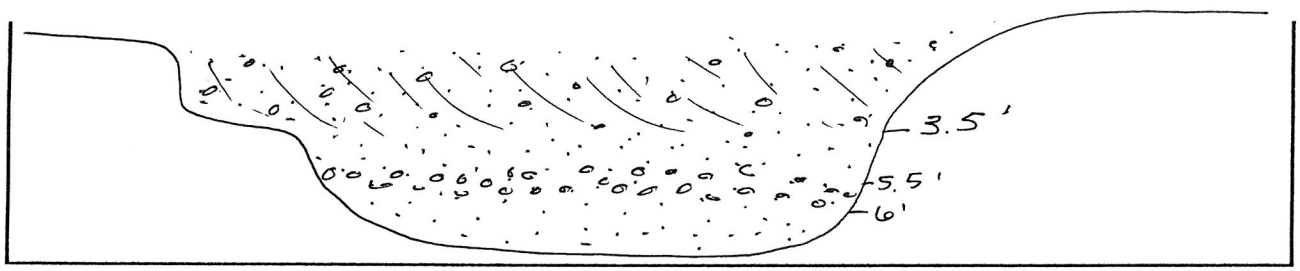


TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	174EP008	Depth:	7'	Northing		
Geol./Eng.	R. McDonald	Width:	3'	Easting		
Date:	11e DEC. 2010	Length:	16'	Elevation		

Test Pit Description and Sample Locations

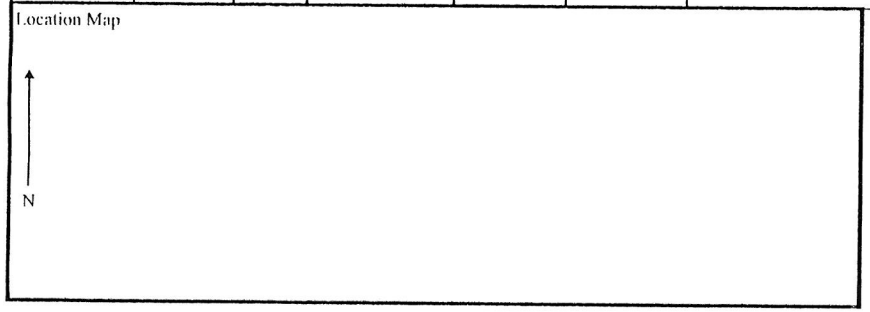
Note: Not to scale.

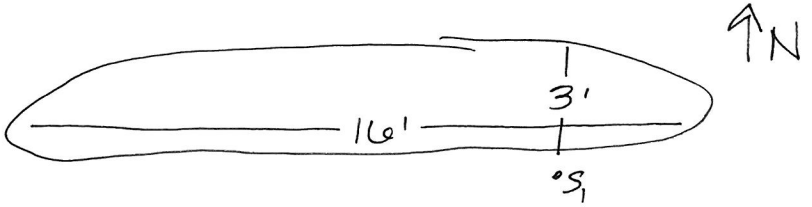


Depth	Lithology	Depth	Lithology
0-3.5'	Cross-bedded silty sand & gravel (SM-GM), dry, loose, gravel is pea-size, lt. reddish brn.		
3.5-7'	Silty sand w/ some gravel (SM), massive, dry, loose, lt. reddish brn. Gravel zone from 5.5-6'		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BN/As)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA/EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	174EP008-01-121610	0.2-0.7	—	Silty sand & gravel (SM-GM) as above		X	X	X										

Location Map



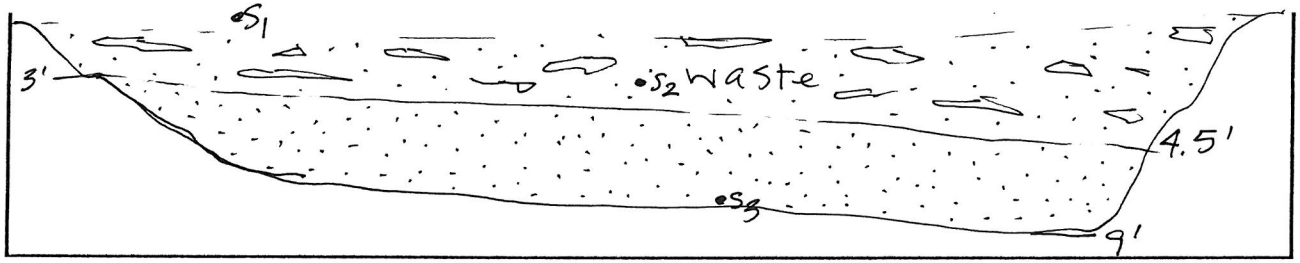


TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	178EP009	Depth:	9'	Northing		
Geol./Eng.	R. McDonald	Width:	30"	Easting		
Date:	20 Dec. 2010	Length:	38'	Elevation		

Test Pit Description and Sample Locations

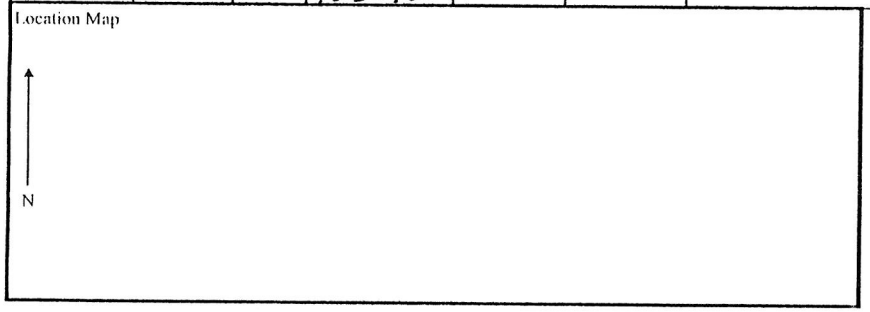
Note: Not to scale.

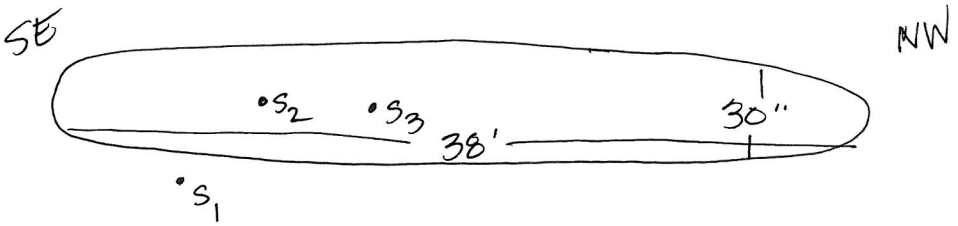


Depth	Lithology	Depth	Lithology
Surface	Sand & gravel (GM), dry, loose, silty; gravel is pea-bobble size, subround-subangular; some debris @ surface	4.5-9'	Sand (SW), little silt, sl. damp, lt. tan, fine-med.
S - 4.5'	Waste in sand, sl. damp. Waste incl: copper wire, lots of broken glass bottles/jars/etc., ash, burned paper, rusted metal. Waste in a distinct zone from 3-4 ft bgs to surface.		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC MS (BNAs)	GC MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	IMPAs/EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	178EP009-01-122010	0.2-0.7	/	Sand & gravel (GM) as for 'surface'		X	X	X										
	178EP009-02-122010	3-3.5	/	sand in waste zone as for S-4.5'		X	X	X										
	178EP009-03-122010	7.5-8	/	Sand (SW) as for 4.5-9'		X	X	X										

Location Map





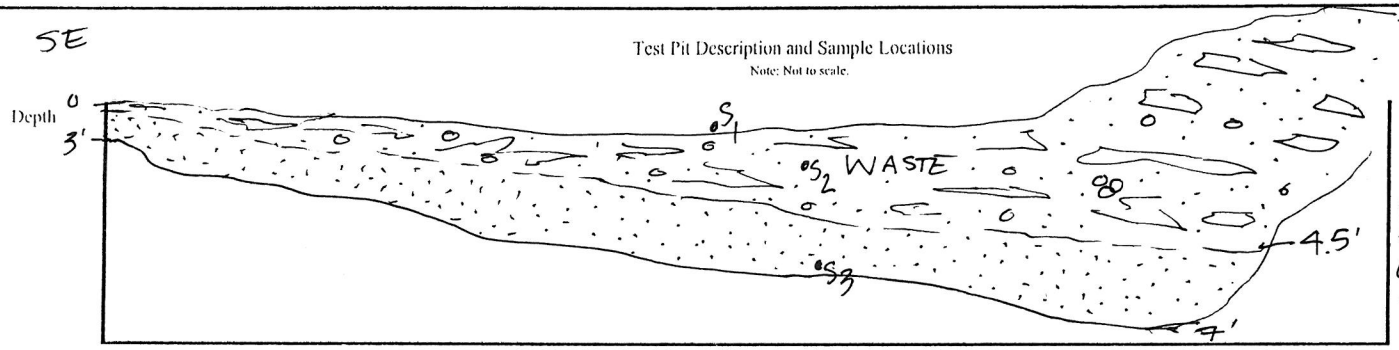
TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	178EP010	Depth:	7'	Northing		
Geol./Eng.	R. McDonald	Width:	3'	Easting		
Date:	20 Dec. 2010	Length:	64'	Elevation		

SE

Test Pit Description and Sample Locations

Note: Not to scale.



+4.5' NW

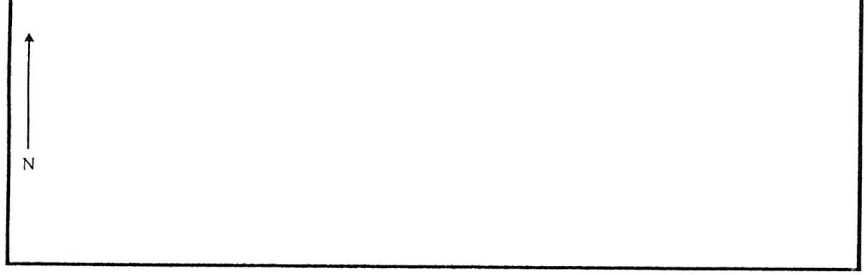
Depth

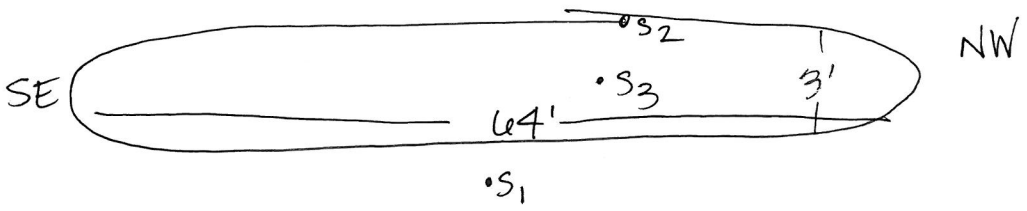
*NW. end of trench is approx. 4-5' higher in elev. than SE end. Waste cont. to NW into hillside. Excavation could not go further b/c sides continually caved in.

Depth	Lithology	Depth	Lithology
0-1'	Silty sand & gravel (GM), dry, loose, gravel is pea-cobble size, subround-subangular; some debris @ surface	5-7'	Sand (SW), little silt, sl. damp, lt. tan, fine-med.
1-5'	Waste in sand, thinning to <1' in SE. Waste includes: glass bottles, broken glass, metal pipe, ash, plaster, rusted metal, wire, battery casing		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	178EP010-01-122010	0.2-0.7	—	GM as for 0-1'		X	X	X										
	178EP010-02-122010	3-3.5'	—	Sand in waste zone as for 1'-5'		X	X	X										
	178EP010-03-122010	5-5.5'	—	Sand (SW) as for 5-7'. Includes FD, MS, MSD.		X	X	X										

Location Map





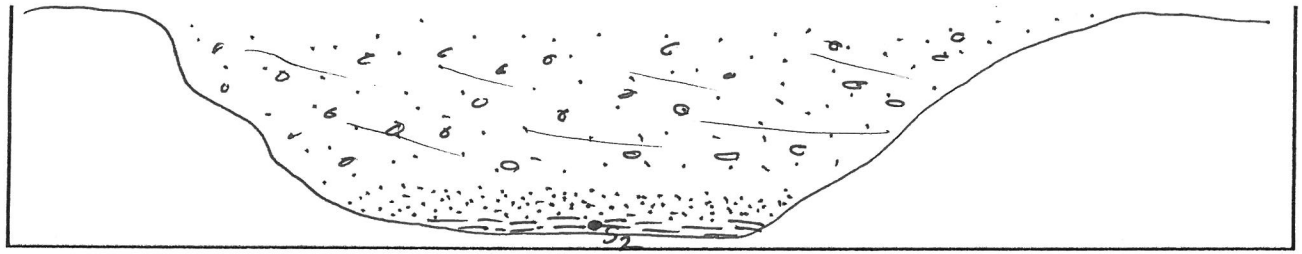
178A

TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	YPG178BG0001	Depth:	8'	Northing		
Geol./Eng.	R. McDonald	Width:	3'	Easting		
Date:	20 Dec. 2010	Length:	18'	Elevation		

Test Pit Description and Sample Locations

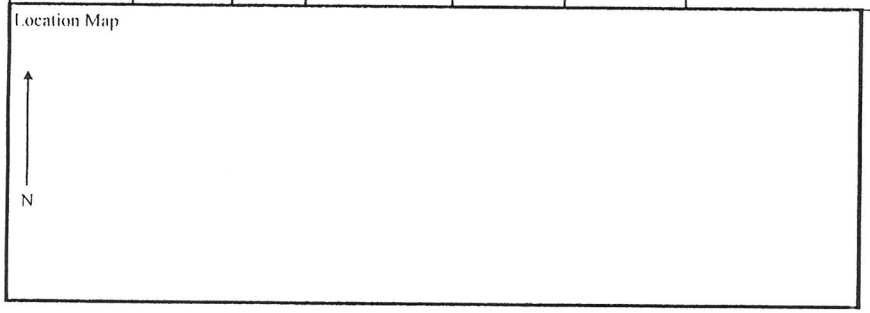
Note: Not to scale.

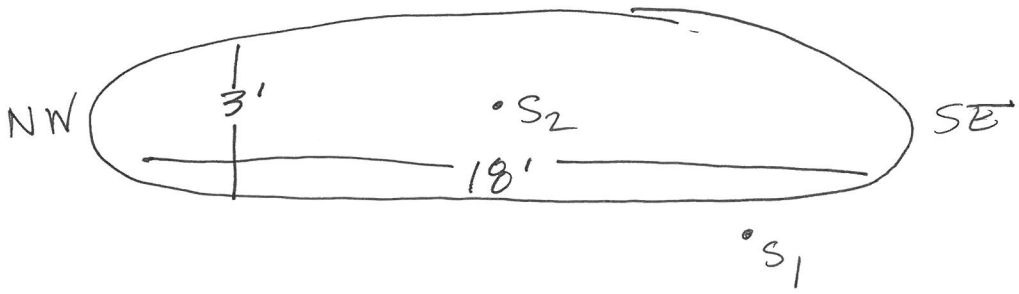


Depth	Lithology	Depth	Lithology
0-6.5	Silty sand & gravel (GM), dry, loose, lt. reddish brn, gravel is subround-subangular, pea-cobble size, weak bedding throughout. No visible staining.		
6.5-7.5 (3 pan)	sand (SW), lt tan, dry - sl. damp, no visible staining		
7.5-8	hard clay (caliche), reddish brn, inelastic, v. sl. damp, no visible staining.		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	DMPA, EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT Lab
	178BG0001-01-122010	0.2-0.7	~	GM as above														
	178BG0001-02-122010	7.5-8	~	in clay as above														

Location Map





178B

TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	YPG 178B 4002	Depth:	8.5'	Northing		
Geol./Eng.	R. McDonald	Width:	30"	Easting		
Date:	16 Dec. 2010	Length:	16'	Elevation		

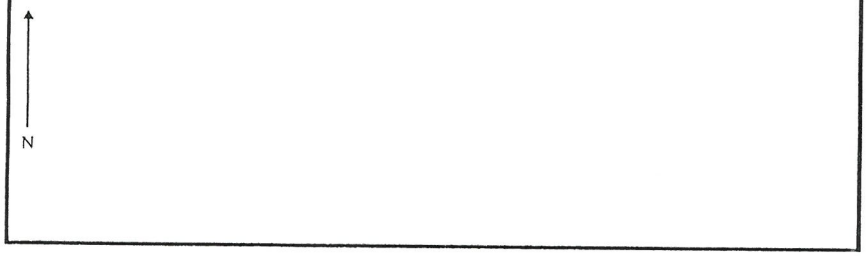
Test Pit Description and Sample Locations

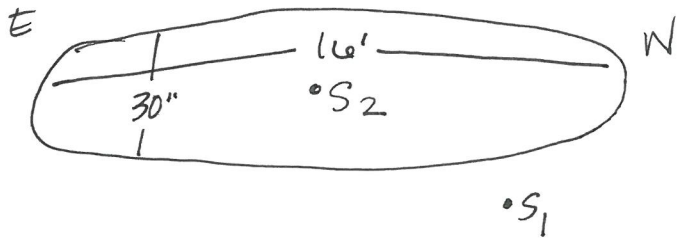
Note: Not to scale.

Depth	Lithology	Depth	Lithology
0'-3'	silty sand & Gravel (SM-GM), cross-bedded, dry, loose, gravel is pea-size, no visible staining		
3-8.5'	silty sand w/ some gravel (SM), massive, dry, loose, gravel layer from approx. 5'-5.5', no visible staining		
@8.5'	silty sand (SW), lt. tan, sl. moist, fine-med, little (<10%) gravel, no visible staining		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA/EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	178B4002-01-121610	0.2-0.7	—	SM-GM as above														
	178B4002-02-121610	8-8.5	—	SW as above														

Location Map





APPENDIX B

SITE PHOTOGRAPHS

APPENDIX B – TEST PITS

Photograph B-1

Test Pit- 178EP001 – No debris, waste, or contamination observed.
Length – 16 ft; Width – 4 ft; Depth – 9 ft

APPENDIX B – TEST PITS

Photograph B-2
Test Pit- 178EP002 – Debris in bottom and sidewalls
Orientated: South - North
Length – 30 ft; Width – 3 ft; Depth – 6 ft

APPENDIX B – TEST PITS

Photograph B-3

Test Pit-178EP002 – Encountered debris included (Glass bottles, glass jars, rusted metal, burned wood, ash, and carbon rods from batteries).

APPENDIX B – TEST PITS

Photograph B-4
Test Pit- 178EP003 – Debris in bottom and sidewalls
Orientation: North - South
Length – 65 ft; Width – 3 ft; Depth – 6 ft

APPENDIX B – TEST PITS

Photograph B-5

Test Pit- 178EP003 – Encountered debris included (Broken glass, glass bottles, glass jars, rusted metal, burned wood, ash, carbon tubes from batteries. Slight petroleum hydrocarbon odor).

APPENDIX B – TEST PITS

Photograph B-6

Test Pit- 178EP004/178EP005 – Debris in bottom and sidewalls. Test pit included both 178EP004 and 178EP005.

Orientation: East - West

Length – 145 ft; Width – 3.5 ft; Depth – 6.5 ft

Photograph B-7
Test Pit-178EP005a – Debris in bottom and sidewalls. Test pit was at a perpendicular angle to 178EP004/178EP005 at its midpoint.
Orientation: South - North
Length – 12 ft; Width – 3 ft

APPENDIX B – TEST PITS

Photograph B-8

Test Pit-178EP004/178EP005/178EP005a – Encountered debris included (Metal wire, broken glass, iron pipe, burned wood, ash, glass bottles, glass jars, rusted metal, copper wire, newspaper, light bulbs, Christmas lights, and a metal spoon).

Photograph B-9
Test Pit-178EP006 – No debris, waste, or contamination observed.
Orientation: West - East
Length – 16 ft; Width – 2.5 ft; Depth – 6 ft

APPENDIX B – TEST PITS

Photograph – B-10
Test Pit-178EP007 – No debris, waste, or contamination observed.
Length – 16 ft; Width – 2.5 ft; Depth – 7.5 ft

Photograph B-11
Test Pit-178EP008 – No debris, waste, or contamination observed.
Orientation: West - East
Length – 16 ft; Width – 3 ft; Depth – 7 ft

Photograph B-12
Test Pit- 178EP009 – Debris in bottom and sidewalls
Length – 38 ft; Width – 2.5 ft; Depth – 9 ft

Photograph B-13
Test Pit-178EP009 – Encountered debris included (Broken glass, glass bottles, glass jars, ash, burned wood, rusted metal, and copper wire).

Photograph B-14
Test Pit- 178EP010 – Debris in sidewalls
Orientation: Northwest - Southeast
Length – 64 ft; Width – 3 ft; Depth – 7 ft

Photograph B-15

Test Pit- 178EP010 – Encountered debris included (Glass bottles, broken glass, metal pipe, ash, plastic, rusted metal, wire, and a battery case).

APPENDIX C

ANALYTICAL DATA AND QUALITY CONTROL TABLES

APPENDIX C
DATA QUALITY ASSESSMENT

The purpose of this section is to assess the analytical data quality for the soil samples collected in support of the YPG-178 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI). Site-specific quality control (QC) issues are discussed here in terms of precision, accuracy, representation, comparability, and completeness. Data, including data validation flags, are presented in Table C.1. Table C.2 contains explanatory information for Table C.1. QC data are presented beginning with Table C.3.

C.1 PRECISION

Precision is controlled through the use of field duplicates and matrix spike duplicates.

C.1.1 Field Duplicates

In accordance with Section A.3.5 of the QAPP (Appendix A of Parsons, 2010), field duplicates are required at a rate of one per 20 samples of the same matrix. Field duplicate frequency was measured program-wide and not per individual site. Thirty-one soil samples were collected at this site during the RFI. Two field duplicates were collected associated with this site. A total of 14 field duplicates were collected in association with 240 normal field samples collected program-wide at the inactive landfills and Muggins Mountain OB/OD sites. Therefore, overall field duplicate frequency was met for the RFI. Table C.3 presents the results of the field duplicate samples (178EP010-03 and 178SS007) collected at this site.

The field duplicate acceptance limit is defined as 35 Relative Percent Difference (RPD) for soil samples. If excessive exceedances of the RPD limit are identified, required action is to evaluate the sampling program to determine if field sampling protocols are being followed and implement corrective action if required.

One hundred and sixty distinct analytes were tested for in the two field duplicates, generating 272 duplicate pair results (the greater number of results comes from the same analytes being tested for in two methods). Soil test panels included: volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), explosives, and metals. The RPD is evaluated when

the concentration in the sample (parent or field duplicate) is greater than or equal to 5 times the Reporting Limit (RL). When concentrations in the parent or field duplicate sample are between the RL and 5 times the RL, these are evaluated by calculating the difference between the parent and field duplicate concentrations (parent - field duplicate). This difference then must be less than 2 times the RL to be in control. Parent and field duplicate concentrations less than the RL are not evaluated. Precision limits were not exceeded for any of the evaluated results (Table C.3), resulting in 100-percent compliance.

Precision was well controlled with respect to field duplicates, since 100-percent of duplicate results met established criteria.

C.1.2 Matrix Spike Duplicates

In accordance with the QAPP (Parsons, 2010), the frequency requirement for matrix spike duplicates is set at one per 20 samples of the same matrix. Because this frequency is not site-specific, and because matrix effects are not generally expected on a site-specific basis, matrix spike duplicates were evaluated on a program basis. Anomalies resulting in data flagged "J" or "UJ" are considered minor, and by definition these anomalies result in 'flagged' usable data. Matrix spike and matrix spike duplicate results associated with YPG-178 are presented on Table C.4.

A program-wide evaluation of matrix spike duplicate precision was conducted for the inactive landfill and Muggins Mountain OB/OD sites. In all, 24 matrix spike and matrix spike duplicate pairs were collected, generating 2,406 result pairs. Of the 2,406 spike duplicate pair results 29 (1.2-percent) were outside control limits (precision was only required to be evaluated when there was a detection in the parent sample). Based on the program-wide evaluation of the spike duplicate precision, it was determined that spike precision was well controlled during the RFIs, since only 1.2-percent of matrix spike duplicate pair results were qualified for RPD exceedances. As shown on Table C.4, 3 of 310 (1.0-percent) results were qualified for matrix spike duplicate precision at YPG-178, which is well within tolerable limits for the purpose of evaluating data usability.

C.2 ACCURACY

Field control of accuracy is monitored by matrix spikes. In accordance with the QAPP (Appendix A of Parsons, 2010), matrix spikes are required at a frequency of one per 20 samples of the same matrix. Matrix spikes were evaluated on a program-wide basis and not per individual site. Of the 240 normal field samples, 24 matrix spike and matrix spike duplicate pairs were collected, meeting the overall frequency requirement for matrix spikes. There were four spike pairs collected in association with the YPG-178 samples. Data flagged as a result of matrix spike recovery issues for YPG-178 during the data evaluation and validation process are summarized in Section C.5 below. Anomalies resulting in data flagged "J" or "UJ" are considered minor, and by definition these anomalies result in usable data. No results flagged for matrix spike recoveries were determined to be unusable data at YPG-178.

A program-wide matrix spike recovery issue with antimony was identified when reviewing the data. Antimony results displayed a matrix effect in soils that biased the concentrations low. Low antimony recoveries have been well documented as an issue with the preparation and analytical method in some soils. The laboratory control samples (or laboratory fortified blanks) were in control, indicating the analysis and sample preparation were in control with respect to antimony. Although a low bias was identified, the data required only 'J' or 'UJ' flagging and are still considered usable results.

Accuracy was determined to be in control with respect to matrix spike and matrix spike duplicate results since no results were 'rejected' ('R'-flagged) and no wide-spread matrix effects were identified, except the antimony issue discussed above.

C.3 REPRESENTATION

Representation is controlled through the Data Quality Objective (DQO) process, and is detailed in the RFI Work Plan (Appendix A of Parsons, 2010). QC guidelines as established in the work plan and associated Standard Operating Procedures (SOPs), and QAPP (Parsons, 2010), describe management of sampling procedures, use of appropriate sample containers, adherence to holding times, use of proper preservation, and sampling of equipment blanks. Table A.3.2 of the QAPP (Parsons, 2010) describes requirements for containers, preservation, and holding

times. Containers and preservation were used in accordance with Table A.3.2. Holding times and were assessed for each analytical result and are discussed here.

C.3.1 Holding Time

Holding times were not exceeded for any of the YPG-178 sampling results.

C.3.2 Field Blanks

Equipment blanks were required at a frequency of one per sampling technique per 20 samples. For purposes of meeting the frequency requirement, "technique" was interpreted in terms of reusable equipment that came in contact with the sample during sampling. No sampling techniques required reusable equipment during the RFI at YPG-178; therefore, no equipment blanks were required.

C.4 ANALYTICAL COMPLETENESS

A total of 1.2-percent (49 of 4,244) of analytical results for normal and field duplicate samples were flagged for QC issues and no results were rejected. All other results met QC criteria. Completeness is defined in the QAPP (Appendix A of Parsons, 2010) as the percent of usable data. The completeness goal is 95-percent. A total of 4,244 out of 4,244 analytical results were usable, resulting in 100-percent analytical completeness and meeting the goal for this site.

C.5 SUMMARY OF QUALIFIED RESULTS

Results were considered qualified in terms of data usability if they were flagged "U", "UJ", "J", "NJ" or "R" during data validation as outline on Tables A.5.15 and A.5.16 of the QAPP (Appendix A of Parsons, 2010). Flags are defined in Table C.2. Results may be qualified "U" simply because no analyte was detected. Results may be qualified "J" simply because the detected value is between the MDL (method detection limit) and RL (practical quantitation limit [PQL]), (i.e., is a trace value). Flags are also applied due to QC exceedances. This summary does not consider routine flagging of non-detects and trace results. Qualified results were classified as minor if flagged "U", "UJ", or "J", and major if flagged "R" or "NJ". No data were qualified for major issues at this site. All results are presented in Table C.1.

C.5.1 Minor Data Quality Issues

A total of 49 results were flagged due to minor QC issues. These issues are presented below:

- 5 2,2-dichloropropane results were flagged "UJ" due to calibration issues.
- 8 results (2 antimony, 1 arsenic, 1 barium, 2 magnesium, 1 manganese, and 1potassium) were flagged "UJ" or "J" due to matrix spike recoveries.
- 36 results (16 copper, 10 potassium, and 10 sodium) were flagged "J" due to inductively coupled plasma (ICP) serial dilution issues.

C.6 DATA QUALITY CONCLUSIONS

A few minor QC anomalies occurred at YPG-178 that did not significantly impact data usability. Precision, accuracy, representation, and completeness were all substantially under control. Overall, the data are suitable for decision-making purposes related to this project such as site characterization, human and ecological risk assessment, and in the determination of corrective action measures.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	1,1,1,2-Tetrachloroethane	1,1,1-Trichloroethane	1,1,2,2-Tetrachloroethane	1,1,2-Trichloroethane	1,1-Dichloroethane	1,1-Dichloroethene	1,1-Dichloropropene	1,2,3-Trichlorobenzene	1,2,3-Trichloropropane	1,2,4-Trichlorobenzene	1,2,4-Trimethylbenzene	1,2-Dibromo-3-Chloropropane	1,2-Dibromoethane (Ethylene Dibromide)
178EP001	0.2-0.7	N	12/14/2010										<0.0221 U			
178EP002	0.2-0.7	N	12/15/2010										<0.0224 U			
178EP002	2-2.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.023 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP002	6-6.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0222 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP003	0.2-0.7	N	12/15/2010										<0.0222 U			
178EP003	2-2.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0227 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP003	6-6.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0224 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP004	0.2-0.7	N	12/15/2010										<0.0221 U			
178EP004	2-2.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0221 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP004	5-5.5	N	12/15/2010	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0224 U	<0.0025 U	<0.0025 U	<0.0025 U
178EP005	0.2-0.7	N	12/15/2010										<0.0223 U			
178EP005	3-3.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0227 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP005	6-6.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0228 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP006	0.2-0.7	N	12/16/2010										<0.0223 U			
178EP007	0.2-0.7	N	12/16/2010										<0.0218 U			
178EP008	0.2-0.7	N	12/16/2010										<0.022 U			
178EP009	0.2-0.7	N	12/20/2010										<0.0223 U			
178EP009	3-3.5	N	12/20/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0237 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP009	7.5-8	N	12/20/2010	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0224 U	<0.0024 U	<0.0024 U	<0.0024 U
178EP010	0.2-0.7	N	12/20/2010										<0.0218 U			
178EP010	3-3.5	N	12/20/2010	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0223 U	<0.0021 U	<0.0021 U	<0.0021 U
178EP010	5-5.5	N	12/20/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0225 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP010	5-5.5	FD	12/20/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0223 U	<0.0022 U	<0.0022 U	<0.0022 U
178SS007	0.2-0.7	N	12/13/2010										<0.0224 U			
178SS007	0.2-0.7	FD	12/13/2010										<0.0222 U			
178SS008	0.2-0.7	N	12/13/2010										<0.0224 U			
178SS009	0.2-0.7	N	12/13/2010										<0.0229 U			
178SS010	0.2-0.7	N	12/13/2010										<0.0227 U			
178SS011	0.2-0.7	N	12/13/2010										<0.0225 U			
178SS012	0.2-0.7	N	12/13/2010										<0.0223 U			
178SS013	0.2-0.7	N	12/14/2010										<0.0226 U			
178SS014	0.2-0.7	N	12/14/2010										<0.0227 U			
178SS019	0.2-0.7	N	12/14/2010										<0.0221 U			
178SS019	0.2-0.7	N	1/13/2011													

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Dichloropropane	1,3,5-Trimethylbenzene (Mesitylene)	1,3,5-Trinitrobenzene	1,3-Dichlorobenzene	1,3-Dichloropropane	1,3-Dinitrobenzene	1,4-Dichlorobenzene	2,2-Dichloropropane	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trinitrotoluene	2,4-Dichlorophenol
178EP001	0.2-0.7	N	12/14/2010	<0.0178 U				<0.0097 U	<0.0186 U		<0.0041 U	<0.0104 U		<0.0396 U	<0.052 U	<0.019 U	<0.0533 U
178EP002	0.2-0.7	N	12/15/2010	<0.018 U				<0.0098 U	<0.0189 U		<0.0041 U	<0.0106 U		<0.0402 U	<0.0528 U	<0.019 U	<0.0541 U
178EP002	2-2.5	N	12/15/2010	<0.0185 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0098 U	<0.0193 U	<0.0023 U	<0.0041 U	<0.0109 U	<0.0023 U	<0.0411 U	<0.0541 U	<0.019 U	<0.0554 U
178EP002	6-6.5	N	12/15/2010	<0.0178 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.0186 U	<0.0022 U	<0.0042 U	<0.0105 U	<0.0022 U	<0.0397 U	<0.0522 U	<0.019 U	<0.0535 U
178EP003	0.2-0.7	N	12/15/2010	<0.0179 U				<0.0099 U	<0.0187 U		<0.0042 U	<0.0105 U		<0.0397 U	<0.0523 U	<0.019 U	<0.0536 U
178EP003	2-2.5	N	12/15/2010	<0.0183 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.0191 U	<0.0022 U	<0.0042 U	<0.0107 U	<0.0022 U	<0.0407 U	<0.0535 U	<0.019 U	<0.0548 U
178EP003	6-6.5	N	12/15/2010	<0.018 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0098 U	<0.0188 U	<0.0023 U	<0.0041 U	<0.0106 U	<0.0023 U	<0.0401 U	<0.0527 U	<0.019 U	<0.054 U
178EP004	0.2-0.7	N	12/15/2010	<0.0178 U				<0.0099 U	<0.0186 U		<0.0042 U	<0.0105 U		<0.0396 U	<0.0521 U	<0.019 U	<0.0534 U
178EP004	2-2.5	N	12/15/2010	<0.0178 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.0186 U	<0.0022 U	<0.0042 U	<0.0104 U	<0.0022 U	<0.0396 U	<0.052 U	<0.019 U	<0.0533 U
178EP004	5-5.5	N	12/15/2010	<0.018 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0099 U	<0.0188 U	<0.0025 U	<0.0042 U	<0.0106 U	<0.0025 U	<0.0401 U	<0.0527 U	<0.019 U	<0.0541 U
178EP005	0.2-0.7	N	12/15/2010	<0.0179 U				<0.0098 U	<0.0187 U		<0.0041 U	<0.0105 U		<0.0399 U	<0.0525 U	<0.019 U	<0.0538 U
178EP005	3-3.5	N	12/15/2010	<0.0182 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.0191 U	<0.0022 U	<0.0042 U	<0.0107 U	<0.0022 U	<0.0406 U	<0.0534 U	<0.019 U	<0.0547 U
178EP005	6-6.5	N	12/15/2010	<0.0183 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0099 U	<0.0191 U	<0.0023 U	<0.0042 U	<0.0108 U	<0.0023 U	<0.0408 U	<0.0536 U	<0.019 U	<0.055 U
178EP006	0.2-0.7	N	12/16/2010	<0.018 U				<0.0098 U	<0.0188 U		<0.0041 U	<0.0106 U		<0.04 U	<0.0526 U	<0.019 U	<0.0539 U
178EP007	0.2-0.7	N	12/16/2010	<0.0175 U				<0.0098 U	<0.0183 U		<0.0041 U	<0.0103 U		<0.0391 U	<0.0513 U	<0.019 U	<0.0526 U
178EP008	0.2-0.7	N	12/16/2010	<0.0177 U				<0.0098 U	<0.0185 U		<0.0041 U	<0.0104 U		<0.0393 U	<0.0517 U	<0.019 U	<0.053 U
178EP009	0.2-0.7	N	12/20/2010	<0.0179 U				<0.0099 U	<0.0187 U		<0.0042 U	<0.0105 U		<0.0399 U	<0.0525 U	<0.019 U	<0.0538 U
178EP009	3-3.5	N	12/20/2010	<0.019 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0098 U	<0.0199 U	<0.0022 U	<0.0041 U	<0.0112 U	<0.0022 UJ	<0.0424 U	<0.0557 U	<0.019 U	<0.0571 U
178EP009	7.5-8	N	12/20/2010	<0.0181 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0098 U	<0.0189 U	<0.0024 U	<0.0041 U	<0.0106 U	<0.0024 UJ	<0.0402 U	<0.0528 U	<0.019 U	<0.0542 U
178EP010	0.2-0.7	N	12/20/2010	<0.0176 U				<0.0099 U	<0.0184 U		<0.0042 U	<0.0103 U		<0.0391 U	<0.0514 U	<0.019 U	<0.0527 U
178EP010	3-3.5	N	12/20/2010	<0.018 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0098 U	<0.0188 U	<0.0021 U	<0.0041 U	<0.0106 U	<0.0021 UJ	<0.04 U	<0.0526 U	<0.019 U	<0.0539 U
178EP010	5-5.5	N	12/20/2010	<0.0181 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0098 U	<0.0189 U	<0.0023 U	<0.0041 U	<0.0106 U	<0.0023 UJ	<0.0403 U	<0.053 U	<0.019 U	<0.0543 U
178EP010	5-5.5	FD	12/20/2010	<0.018 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0098 U	<0.0188 U	<0.0022 U	<0.0041 U	<0.0106 U	<0.0022 UJ	<0.04 U	<0.0526 U	<0.019 U	<0.0539 U
178SS007	0.2-0.7	N	12/13/2010	<0.018 U				<0.0099 U	<0.0188 U		<0.0042 U	<0.0106 U		<0.04 U	<0.0526 U	<0.019 U	<0.054 U
178SS007	0.2-0.7	FD	12/13/2010	<0.0179 U				<0.0099 U	<0.0187 U		<0.0042 U	<0.0105 U		<0.0398 U	<0.0523 U	<0.019 U	<0.0536 U
178SS008	0.2-0.7	N	12/13/2010	<0.018 U				<0.0098 U	<0.0189 U		<0.0041 U	<0.0106 U		<0.0402 U	<0.0528 U	<0.019 U	<0.0541 U
178SS009	0.2-0.7	N	12/13/2010	<0.0185 U				<0.0099 U	<0.0193 U		<0.0042 U	<0.0108 U		<0.0411 U	<0.054 U	<0.019 U	<0.0554 U
178SS010	0.2-0.7	N	12/13/2010	<0.0182 U				<0.0099 U	<0.0191 U		<0.0042 U	<0.0107 U		<0.0406 U	<0.0534 U	<0.019 U	<0.0547 U
178SS011	0.2-0.7	N	12/13/2010	<0.0181 U				<0.0098 U	<0.0189 U		<0.0041 U	<0.0106 U		<0.0403 U	<0.0529 U	<0.019 U	<0.0543 U
178SS012	0.2-0.7	N	12/13/2010	<0.018 U				<0.0098 U	<0.0188 U		<0.0041 U	<0.0106 U		<0.04 U	<0.0526 U	<0.019 U	<0.0539 U
178SS013	0.2-0.7	N	12/14/2010	<0.0182 U				<0.0099 U	<0.019 U		<0.0042 U	<0.0107 U		<0.0406 U	<0.0533 U	<0.019 U	<0.0547 U
178SS014	0.2-0.7	N	12/14/2010	<0.0183 U				<0.0098 U	<0.0191 U		<0.0041 U	<0.0107 U		<0.0407 U	<0.0535 U	<0.019 U	<0.0548 U
178SS019	0.2-0.7	N	12/14/2010	<0.0178 U					<0.0186 U			<0.0104 U		<0.0396 U	<0.052 U		<0.0533 U
178SS019	0.2-0.7	N	1/13/2011					<0.0096 U			<0.004 U					<0.019 U	

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	2,4-Dimethylphenol	2,4-Dinitrophenol	2,4-Dinitrotoluene	2,6-Dinitrotoluene	2-Amino-4,6-Dinitrotoluene	2-Chloronaphthalene	2-Chlorophenol	2-Chlorotoluene	2-Hexanone	2-Methylnaphthalene	2-Methylphenol (o-Cresol)	2-Nitroaniline	2-Nitrophenol	2-Nitrotoluene
178EP001	0.2-0.7	N	12/14/2010	<0.0422 U	<0.178 U	<0.0467 U	<0.0196 U	<0.012 U	<0.018 U	<0.0255 U			<0.0178 U	<0.0101 U	<0.0373 U	<0.0152 U	<0.013 U
178EP002	0.2-0.7	N	12/15/2010	<0.0428 U	<0.18 U	<0.0474 U	<0.0199 U	<0.012 U	<0.0183 U	<0.0259 U			<0.018 U	<0.0103 U	<0.0378 U	<0.0154 U	<0.013 U
178EP002	2-2.5	N	12/15/2010	<0.0438 U	<0.185 U	<0.0485 U	<0.0203 U	<0.012 U	<0.0187 U	<0.0265 U	<0.0023 U	<0.0056 U	<0.0185 U	<0.0105 U	<0.0387 U	<0.0158 U	<0.013 U
178EP002	6-6.5	N	12/15/2010	<0.0423 U	<0.178 U	<0.0469 U	<0.0197 U	<0.012 U	<0.018 U	<0.0256 U	<0.0022 U	<0.0056 U	<0.0178 U	<0.0102 U	<0.0374 U	<0.0152 U	<0.013 U
178EP003	0.2-0.7	N	12/15/2010	<0.0424 U	<0.179 U	<0.0469 U	<0.0197 U	<0.012 U	<0.0181 U	<0.0256 U			<0.0179 U	<0.0102 U	<0.0374 U	<0.0152 U	<0.013 U
178EP003	2-2.5	N	12/15/2010	<0.0434 U	<0.183 U	<0.048 U	<0.0201 U	<0.012 U	<0.0185 U	<0.0262 U	<0.0022 U	<0.0055 U	<0.0183 U	<0.0104 U	<0.0383 U	<0.0156 U	<0.013 U
178EP003	6-6.5	N	12/15/2010	<0.0427 U	<0.18 U	<0.0473 U	<0.0198 U	<0.012 U	<0.0182 U	<0.0259 U	<0.0023 U	<0.0057 U	<0.018 U	<0.0103 U	<0.0378 U	<0.0154 U	<0.013 U
178EP004	0.2-0.7	N	12/15/2010	<0.0422 U	<0.178 U	<0.0468 U	<0.0196 U	<0.012 U	<0.018 U	<0.0255 U			<0.0178 U	<0.0102 U	<0.0373 U	<0.0152 U	<0.013 U
178EP004	2-2.5	N	12/15/2010	<0.0422 U	<0.178 U	<0.0467 U	<0.0196 U	<0.012 U	<0.018 U	<0.0255 U	<0.0022 U	<0.0056 U	<0.0178 U	<0.0101 U	<0.0373 U	<0.0152 U	<0.013 U
178EP004	5-5.5	N	12/15/2010	<0.0428 U	<0.18 U	<0.0473 U	<0.0198 U	<0.012 U	<0.0182 U	<0.0259 U	<0.0025 U	<0.0064 U	<0.018 U	<0.0103 U	<0.0378 U	<0.0154 U	<0.013 U
178EP005	0.2-0.7	N	12/15/2010	<0.0426 U	<0.179 U	<0.0471 U	<0.0198 U	<0.012 U	<0.0181 U	<0.0257 U			<0.0179 U	<0.0102 U	<0.0376 U	<0.0153 U	<0.013 U
178EP005	3-3.5	N	12/15/2010	<0.0433 U	<0.182 U	<0.0479 U	<0.0201 U	<0.012 U	<0.0184 U	<0.0262 U	<0.0022 U	<0.0054 U	<0.0182 U	<0.0104 U	<0.0382 U	<0.0156 U	<0.013 U
178EP005	6-6.5	N	12/15/2010	<0.0435 U	<0.183 U	<0.0481 U	<0.0202 U	<0.012 U	<0.0185 U	<0.0263 U	<0.0023 U	<0.0058 U	<0.0183 U	<0.0105 U	<0.0384 U	<0.0156 U	<0.013 U
178EP006	0.2-0.7	N	12/16/2010	<0.0427 U	<0.18 U	<0.0472 U	<0.0198 U	<0.012 U	<0.0182 U	<0.0258 U			<0.018 U	<0.0103 U	<0.0377 U	<0.0153 U	<0.013 U
178EP007	0.2-0.7	N	12/16/2010	<0.0416 U	<0.175 U	<0.0461 U	<0.0193 U	<0.012 U	<0.0177 U	<0.0252 U			<0.0175 U	<0.01 U	<0.0368 U	<0.015 U	<0.013 U
178EP008	0.2-0.7	N	12/16/2010	<0.0419 U	<0.177 U	<0.0464 U	<0.0195 U	<0.012 U	<0.0179 U	<0.0253 U			<0.0177 U	<0.0101 U	<0.037 U	<0.0151 U	<0.013 U
178EP009	0.2-0.7	N	12/20/2010	<0.0425 U	<0.179 U	<0.0471 U	<0.0197 U	<0.012 U	<0.0181 U	<0.0257 U			<0.0179 U	<0.0102 U	<0.0376 U	<0.0153 U	<0.013 U
178EP009	3-3.5	N	12/20/2010	<0.0452 U	<0.19 U	<0.05 U	<0.021 U	<0.012 U	<0.0193 U	<0.0273 U	<0.0022 U	<0.0055 U	<0.019 U	<0.0109 U	<0.0399 U	<0.0162 U	<0.013 U
178EP009	7.5-8	N	12/20/2010	<0.0428 U	<0.181 U	<0.0474 U	<0.0199 U	<0.012 U	<0.0183 U	<0.0259 U	<0.0024 U	<0.006 U	<0.0181 U	<0.0103 U	<0.0378 U	<0.0154 U	<0.013 U
178EP010	0.2-0.7	N	12/20/2010	<0.0417 U	<0.176 U	<0.0462 U	<0.0194 U	<0.012 U	<0.0178 U	<0.0252 U			<0.0176 U	<0.01 U	<0.0368 U	<0.015 U	<0.013 U
178EP010	3-3.5	N	12/20/2010	<0.0427 U	<0.18 U	<0.0472 U	<0.0198 U	<0.012 U	<0.0182 U	<0.0258 U	<0.0021 U	<0.0052 U	<0.018 U	<0.0103 U	<0.0377 U	<0.0153 U	<0.013 U
178EP010	5-5.5	N	12/20/2010	<0.043 U	<0.181 U	<0.0476 U	<0.0199 U	<0.012 U	<0.0183 U	<0.026 U	<0.0023 U	<0.0056 U	<0.0181 U	<0.0103 U	<0.038 U	<0.0154 U	<0.013 U
178EP010	5-5.5	FD	12/20/2010	<0.0427 U	<0.18 U	<0.0472 U	<0.0198 U	<0.012 U	<0.0182 U	<0.0258 U	<0.0022 U	<0.0054 U	<0.018 U	<0.0103 U	<0.0377 U	<0.0153 U	<0.013 U
178SS007	0.2-0.7	N	12/13/2010	<0.0427 U	<0.18 U	<0.0473 U	<0.0198 U	<0.012 U	<0.0182 U	<0.0258 U			<0.018 U	<0.0103 U	<0.0377 U	<0.0153 U	<0.013 U
178SS007	0.2-0.7	FD	12/13/2010	<0.0424 U	<0.179 U	<0.047 U	<0.0197 U	<0.012 U	<0.0181 U	<0.0257 U			<0.0179 U	<0.0102 U	<0.0375 U	<0.0153 U	<0.013 U
178SS008	0.2-0.7	N	12/13/2010	<0.0428 U	<0.18 U	<0.0474 U	<0.0199 U	<0.012 U	<0.0183 U	<0.0259 U			<0.018 U	<0.0103 U	<0.0378 U	<0.0154 U	<0.013 U
178SS009	0.2-0.7	N	12/13/2010	<0.0438 U	<0.185 U	<0.0485 U	<0.0203 U	<0.012 U	<0.0187 U	<0.0265 U			<0.0185 U	<0.0105 U	<0.0387 U	<0.0158 U	<0.013 U
178SS010	0.2-0.7	N	12/13/2010	<0.0433 U	<0.182 U	<0.0479 U	<0.0201 U	<0.012 U	<0.0184 U	<0.0262 U			<0.0182 U	<0.0104 U	<0.0382 U	<0.0156 U	<0.013 U
178SS011	0.2-0.7	N	12/13/2010	<0.0429 U	<0.181 U	<0.0475 U	<0.0199 U	<0.012 U	<0.0183 U	<0.026 U			<0.0181 U	<0.0103 U	<0.0379 U	<0.0154 U	<0.013 U
178SS012	0.2-0.7	N	12/13/2010	<0.0426 U	<0.18 U	<0.0472 U	<0.0198 U	<0.012 U	<0.0182 U	<0.0258 U			<0.018 U	<0.0103 U	<0.0377 U	<0.0153 U	<0.013 U
178SS013	0.2-0.7	N	12/14/2010	<0.0432 U	<0.182 U	<0.0479 U	<0.0201 U	<0.012 U	<0.0184 U	<0.0261 U			<0.0182 U	<0.0104 U	<0.0382 U	<0.0155 U	<0.013 U
178SS014	0.2-0.7	N	12/14/2010	<0.0434 U	<0.183 U	<0.048 U	<0.0201 U	<0.012 U	<0.0185 U	<0.0262 U			<0.0183 U	<0.0104 U	<0.0383 U	<0.0156 U	<0.013 U
178SS019	0.2-0.7	N	12/14/2010	<0.0422 U	<0.178 U	<0.0467 U	<0.0196 U		<0.018 U	<0.0255 U			<0.0178 U	<0.0101 U	<0.0373 U	<0.0152 U	
178SS019	0.2-0.7	N	1/13/2011			<0.0051 U	<0.007 U	<0.012 U									<0.012 U

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	3-Nitroaniline	3-Nitrotoluene	4,6-Dinitro-2-Methylphenol	4-Amino-2,6-Dinitrotoluene	4-Bromophenyl Phenyl Ether	4-Chloro-3-Methylphenol	4-Chlorophenyl Phenyl Ether	4-Chlorotoluene	4-Nitroaniline	4-Nitrophenol	4-Nitrotoluene	Acenaphthene	Acenaphthylene	Acetone
178EP001	0.2-0.7	N	12/14/2010	<0.0405 U	<0.015 U	<0.0325 U	<0.0097 U	<0.0292 U	<0.0261 U	<0.0369 U		<0.0619 U	<0.114 U	<0.018 U	<0.0188 U	<0.0111 U	
178EP002	0.2-0.7	N	12/15/2010	<0.0411 U	<0.015 U	<0.033 U	<0.0098 U	<0.0297 U	<0.0265 U	<0.0374 U		<0.0628 U	<0.116 U	<0.018 U	<0.0191 U	<0.0113 U	
178EP002	2-2.5	N	12/15/2010	<0.0421 U	<0.015 U	<0.0338 U	<0.0098 U	<0.0304 U	<0.0271 U	<0.0383 U	<0.0023 U	<0.0643 U	<0.119 U	<0.018 U	<0.0195 U	<0.0116 U	<0.0056 U
178EP002	6-6.5	N	12/15/2010	<0.0406 U	<0.015 U	<0.0327 U	<0.0099 U	<0.0293 U	<0.0262 U	<0.037 U	<0.0022 U	<0.0621 U	<0.115 U	<0.018 U	<0.0188 U	<0.0112 U	<0.0056 U
178EP003	0.2-0.7	N	12/15/2010	<0.0407 U	<0.015 U	<0.0327 U	<0.0099 U	<0.0294 U	<0.0262 U	<0.037 U		<0.0621 U	<0.115 U	<0.018 U	<0.0189 U	<0.0112 U	
178EP003	2-2.5	N	12/15/2010	<0.0416 U	<0.015 U	<0.0335 U	<0.0099 U	<0.03 U	<0.0268 U	<0.0379 U	<0.0022 U	<0.0636 U	<0.118 U	<0.018 U	<0.0193 U	<0.0115 U	<0.0055 U
178EP003	6-6.5	N	12/15/2010	<0.041 U	<0.015 U	<0.033 U	<0.0098 U	<0.0296 U	<0.0265 U	<0.0374 U	<0.0023 U	<0.0627 U	<0.116 U	<0.018 U	<0.019 U	<0.0113 U	<0.0057 U
178EP004	0.2-0.7	N	12/15/2010	<0.0405 U	<0.015 U	<0.0326 U	<0.0099 U	<0.0293 U	<0.0262 U	<0.0369 U		<0.062 U	<0.115 U	<0.018 U	<0.0188 U	<0.0112 U	
178EP004	2-2.5	N	12/15/2010	<0.0405 U	<0.015 U	<0.0325 U	<0.0099 U	<0.0292 U	<0.0261 U	<0.0369 U	<0.0022 U	<0.0619 U	<0.114 U	<0.018 U	<0.0188 U	<0.0111 U	<0.0056 U
178EP004	5-5.5	N	12/15/2010	<0.041 U	<0.015 U	<0.033 U	<0.0099 U	<0.0296 U	<0.0265 U	<0.0374 U	<0.0025 U	<0.0627 U	<0.116 U	<0.018 U	<0.019 U	<0.0113 U	<0.0064 U
178EP005	0.2-0.7	N	12/15/2010	<0.0408 U	<0.015 U	<0.0328 U	<0.0098 U	<0.0295 U	<0.0263 U	<0.0372 U		<0.0624 U	<0.116 U	<0.018 U	<0.0189 U	<0.0112 U	
178EP005	3-3.5	N	12/15/2010	<0.0415 U	<0.015 U	<0.0334 U	<0.0099 U	<0.03 U	<0.0268 U	<0.0378 U	<0.0022 U	<0.0635 U	<0.117 U	<0.018 U	<0.0193 U	<0.0114 U	<0.0054 U
178EP005	6-6.5	N	12/15/2010	<0.0417 U	<0.015 U	<0.0335 U	<0.0099 U	<0.0301 U	<0.0269 U	<0.038 U	<0.0023 U	<0.0638 U	<0.118 U	<0.018 U	<0.0194 U	<0.0115 U	<0.0058 U
178EP006	0.2-0.7	N	12/16/2010	<0.0409 U	<0.015 U	<0.0329 U	<0.0098 U	<0.0296 U	<0.0264 U	<0.0373 U		<0.0626 U	<0.116 U	<0.018 U	<0.019 U	<0.0113 U	
178EP007	0.2-0.7	N	12/16/2010	<0.0399 U	<0.015 U	<0.0321 U	<0.0098 U	<0.0288 U	<0.0258 U	<0.0364 U		<0.0611 U	<0.113 U	<0.018 U	<0.0185 U	<0.011 U	
178EP008	0.2-0.7	N	12/16/2010	<0.0402 U	<0.015 U	<0.0323 U	<0.0098 U	<0.029 U	<0.0259 U	<0.0366 U		<0.0615 U	<0.114 U	<0.018 U	<0.0187 U	<0.0111 U	
178EP009	0.2-0.7	N	12/20/2010	<0.0408 U	<0.015 U	<0.0328 U	<0.0099 U	<0.0295 U	<0.0263 U	<0.0372 U		<0.0624 U	<0.115 U	<0.018 U	<0.0189 U	<0.0112 U	
178EP009	3-3.5	N	12/20/2010	<0.0433 U	<0.015 U	<0.0349 U	<0.0098 U	<0.0313 U	<0.028 U	<0.0395 U	<0.0022 U	<0.0663 U	<0.123 U	<0.018 U	<0.0201 U	<0.0119 U	<0.0055 U
178EP009	7.5-8	N	12/20/2010	<0.0411 U	<0.015 U	<0.033 U	<0.0098 U	<0.0297 U	<0.0265 U	<0.0374 U	<0.0024 U	<0.0628 U	<0.116 U	<0.018 U	<0.0191 U	<0.0113 U	<0.006 U
178EP010	0.2-0.7	N	12/20/2010	<0.04 U	<0.015 U	<0.0322 U	<0.0099 U	<0.0289 U	<0.0258 U	<0.0364 U		<0.0612 U	<0.113 U	<0.018 U	<0.0186 U	<0.011 U	
178EP010	3-3.5	N	12/20/2010	<0.0409 U	<0.015 U	<0.0329 U	<0.0098 U	<0.0296 U	<0.0264 U	<0.0373 U	<0.0021 U	<0.0626 U	<0.116 U	<0.018 U	<0.019 U	<0.0113 U	<0.0052 U
178EP010	5-5.5	N	12/20/2010	<0.0412 U	<0.015 U	<0.0331 U	<0.0098 U	<0.0298 U	<0.0266 U	<0.0375 U	<0.0023 U	<0.063 U	<0.117 U	<0.018 U	<0.0191 U	<0.0114 U	<0.0056 U
178EP010	5-5.5	FD	12/20/2010	<0.0409 U	<0.015 U	<0.0329 U	<0.0098 U	<0.0296 U	<0.0264 U	<0.0373 U	<0.0022 U	<0.0626 U	<0.116 U	<0.018 U	<0.019 U	<0.0113 U	<0.0054 U
178SS007	0.2-0.7	N	12/13/2010	<0.041 U	<0.015 U	<0.0329 U	<0.0099 U	<0.0296 U	<0.0264 U	<0.0373 U		<0.0626 U	<0.116 U	<0.018 U	<0.019 U	<0.0113 U	
178SS007	0.2-0.7	FD	12/13/2010	<0.0407 U	<0.015 U	<0.0327 U	<0.0099 U	<0.0294 U	<0.0263 U	<0.0371 U		<0.0622 U	<0.115 U	<0.018 U	<0.0189 U	<0.0112 U	
178SS008	0.2-0.7	N	12/13/2010	<0.0411 U	<0.015 U	<0.033 U	<0.0098 U	<0.0297 U	<0.0265 U	<0.0374 U		<0.0628 U	<0.116 U	<0.018 U	<0.0191 U	<0.0113 U	
178SS009	0.2-0.7	N	12/13/2010	<0.042 U	<0.015 U	<0.0338 U	<0.0099 U	<0.0304 U	<0.0271 U	<0.0383 U		<0.0643 U	<0.119 U	<0.018 U	<0.0195 U	<0.0116 U	
178SS010	0.2-0.7	N	12/13/2010	<0.0415 U	<0.015 U	<0.0334 U	<0.0099 U	<0.03 U	<0.0268 U	<0.0378 U		<0.0634 U	<0.117 U	<0.018 U	<0.0193 U	<0.0114 U	
178SS011	0.2-0.7	N	12/13/2010	<0.0412 U	<0.015 U	<0.0331 U	<0.0098 U	<0.0297 U	<0.0266 U	<0.0375 U		<0.0629 U	<0.116 U	<0.018 U	<0.0191 U	<0.0113 U	
178SS012	0.2-0.7	N	12/13/2010	<0.0409 U	<0.015 U	<0.0329 U	<0.0098 U	<0.0295 U	<0.0264 U	<0.0373 U		<0.0625 U	<0.116 U	<0.018 U	<0.019 U	<0.0113 U	
178SS013	0.2-0.7	N	12/14/2010	<0.0415 U	<0.015 U	<0.0333 U	<0.0099 U	<0.0299 U	<0.0268 U	<0.0378 U		<0.0634 U	<0.117 U	<0.018 U	<0.0192 U	<0.0114 U	
178SS014	0.2-0.7	N	12/14/2010	<0.0416 U	<0.015 U	<0.0335 U	<0.0098 U	<0.0301 U	<0.0269 U	<0.0379 U		<0.0636 U	<0.118 U	<0.018 U	<0.0193 U	<0.0115 U	
178SS019	0.2-0.7	N	12/14/2010	<0.0405 U		<0.0325 U		<0.0292 U	<0.0261 U	<0.0369 U		<0.0619 U	<0.114 U		<0.0188 U	<0.0111 U	
178SS019	0.2-0.7	N	1/13/2011		<0.015 U		<0.0096 U							<0.017 U			

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	Aluminum	Anthracene	Antimony	Arsenic	Barium	Benzene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzyl Alcohol	Benzyl Butyl Phthalate	Beryllium	bis(2-Chloroethoxy) Methane
178EP001	0.2-0.7	N	12/14/2010	4690	<0.0117 U	0.16 J	8.42 J	114		<0.0142 U	<0.0191 U	<0.0103 U	<0.00916 U	<0.0152 U	<0.0385 U	<0.00699 U	<0.0028 U	<0.0183 U
178EP002	0.2-0.7	N	12/15/2010	5470	<0.0118 U	<0.12 U	4.44	218		<0.0144 U	<0.0194 U	<0.0105 U	<0.0093 U	<0.0154 U	<0.0391 U	<0.0071 U	0.13 J	<0.0186 U
178EP002	2-2.5	N	12/15/2010	4040	<0.0121 U	<0.12 U	2.97	147	<0.0023 U	<0.0147 U	<0.0198 U	<0.0107 U	<0.00952 U	<0.0158 U	<0.04 U	<0.00726 U	<0.0029 U	<0.019 U
178EP002	6-6.5	N	12/15/2010	2840	<0.0117 U	<0.12 U	0.73 J	186	<0.0022 U	<0.0142 U	<0.0191 U	<0.0104 U	<0.00919 U	<0.0152 U	<0.0386 U	<0.00701 U	<0.0028 U	<0.0183 U
178EP003	0.2-0.7	N	12/15/2010	2760	<0.0117 U	<0.12 U	2.53	66.7		<0.0142 U	<0.0192 U	<0.0104 U	<0.0092 U	<0.0152 U	<0.0386 U	<0.00702 U	<0.0028 U	<0.0184 U
178EP003	2-2.5	N	12/15/2010	4110	<0.012 U	4.34	5.85	130	<0.0022 U	<0.0146 U	<0.0196 U	<0.0106 U	<0.00942 U	<0.0156 U	<0.0395 U	<0.00719 U	<0.0029 U	<0.0188 U
178EP003	6-6.5	N	12/15/2010	1310	<0.0118 U	<0.12 U	1.18 J	89.5	<0.0023 U	<0.0143 U	<0.0193 U	<0.0105 U	<0.00928 U	<0.0154 U	<0.039 U	<0.00708 U	<0.0028 U	<0.0185 U
178EP004	0.2-0.7	N	12/15/2010	3310	<0.0117 U	<0.12 U	3.82	56.6		<0.0142 U	<0.0191 U	<0.0104 U	<0.00917 U	<0.0152 U	<0.0385 U	<0.007 U	<0.0028 U	<0.0183 U
178EP004	2-2.5	N	12/15/2010	2820	<0.0116 U	<0.12 U	3.55	74	<0.0022 U	<0.0142 U	<0.0191 U	<0.0103 U	0.222 J	<0.0152 U	<0.0385 U	<0.00699 U	<0.0028 U	<0.0183 U
178EP004	5-5.5	N	12/15/2010	1400	<0.0118 U	<0.12 U	1.57 J	37.2	<0.0025 U	<0.0144 U	<0.0193 U	<0.0105 U	<0.00928 U	<0.0154 U	<0.039 U	<0.00708 U	<0.0028 U	<0.0185 U
178EP005	0.2-0.7	N	12/15/2010	4070	<0.0118 U	<0.12 U	4.69	101		<0.0143 U	<0.0193 U	<0.0104 U	<0.00924 U	<0.0153 U	<0.0388 U	<0.00705 U	<0.0028 U	<0.0184 U
178EP005	3-3.5	N	12/15/2010	4180	<0.012 U	1.69 J	5.13	149	<0.0022 U	<0.0145 U	<0.0196 U	<0.0106 U	<0.0094 U	<0.0156 U	<0.0395 U	<0.00717 U	<0.0029 U	<0.0188 U
178EP005	6-6.5	N	12/15/2010	2070	<0.012 U	<0.12 U	1.62 J	154	<0.0023 U	<0.0146 U	<0.0197 U	<0.0107 U	<0.00944 U	<0.0156 U	<0.0396 U	<0.0072 U	<0.0028 U	<0.0188 U
178EP006	0.2-0.7	N	12/16/2010	4970	<0.0118 U	<0.12 U	3.3	82.8		<0.0143 U	<0.0193 U	<0.0105 U	<0.00926 U	<0.0153 U	<0.0389 U	<0.00707 U	0.043 J	<0.0185 U
178EP007	0.2-0.7	N	12/16/2010	1440	<0.0115 U	<0.12 U	4.18	55.1		<0.014 U	<0.0188 U	<0.0102 U	<0.00904 U	<0.015 U	<0.038 U	<0.0069 U	<0.0028 U	<0.018 U
178EP008	0.2-0.7	N	12/16/2010	1240	<0.0116 U	<0.12 U	2.37	39		<0.0141 U	<0.019 U	<0.0103 U	<0.0091 U	<0.0151 U	<0.0382 U	<0.00694 U	<0.0028 U	<0.0182 U
178EP009	0.2-0.7	N	12/20/2010	3580	<0.0117 U	<0.12 U	2.46	52.9		<0.0143 U	<0.0192 U	<0.0104 U	<0.00924 U	<0.0153 U	<0.0388 U	<0.00705 U	<0.0028 U	<0.0184 U
178EP009	3-3.5	N	12/20/2010	4080	<0.0125 U	1.87 J	4.67	285	<0.0022 U	<0.0152 U	<0.0204 U	<0.0111 U	<0.00981 U	<0.0162 U	<0.0412 U	<0.00749 U	<0.003 U	<0.0196 U
178EP009	7.5-8	N	12/20/2010	2100	<0.0118 U	<0.12 U	1.92	236	<0.0024 U	<0.0144 U	<0.0194 U	<0.0105 U	<0.0093 U	<0.0154 U	<0.0391 U	<0.0071 U	<0.0029 U	<0.0186 U
178EP010	0.2-0.7	N	12/20/2010	1880	<0.0115 U	0.2 J	2.24	48.9		<0.014 U	<0.0189 U	<0.0102 U	<0.00905 U	<0.015 U	<0.038 U	<0.00691 U	<0.0028 U	<0.0181 U
178EP010	3-3.5	N	12/20/2010	3400	<0.0118 U	<0.12 U	5.75	126	<0.0021 U	<0.0143 U	<0.0193 U	<0.0105 U	<0.00926 U	<0.0153 U	<0.0389 U	<0.00707 U	<0.0028 U	<0.0185 U
178EP010	5-5.5	N	12/20/2010	1660	<0.0119 U	<0.12 UJ	1.09 J	70.4	<0.0023 U	<0.0144 U	<0.0194 U	<0.0105 U	<0.00933 U	<0.0154 U	<0.0392 U	<0.00712 U	<0.0028 U	<0.0186 U
178EP010	5-5.5	FD	12/20/2010	1710	<0.0118 U	<0.12 U	1.2 J	78.3	<0.0022 U	<0.0143 U	<0.0193 U	<0.0105 U	<0.00926 U	<0.0153 U	<0.0389 U	<0.00707 U	<0.0028 U	<0.0185 U
178SS007	0.2-0.7	N	12/13/2010	1360	<0.0118 U	<0.12 UJ	1.29 J	56.7 J		<0.0143 U	<0.0193 U	<0.0105 U	<0.00927 U	<0.0153 U	<0.0389 U	<0.00707 U	<0.0028 U	<0.0185 U
178SS007	0.2-0.7	FD	12/13/2010	1510	<0.0117 U	<0.12 U	1.43 J	64.1		<0.0142 U	<0.0192 U	<0.0104 U	<0.00921 U	<0.0153 U	<0.0387 U	<0.00703 U	<0.0028 U	<0.0184 U
178SS008	0.2-0.7	N	12/13/2010	1530	<0.0118 U	<0.12 U	1.42 J	211		<0.0144 U	<0.0194 U	<0.0105 U	<0.0093 U	<0.0154 U	<0.0391 U	<0.0071 U	<0.0028 U	<0.0186 U
178SS009	0.2-0.7	N	12/13/2010	2170	<0.0121 U	<0.12 U	1.27 J	33		<0.0147 U	<0.0198 U	<0.0107 U	<0.00951 U	<0.0158 U	<0.04 U	<0.00726 U	<0.0029 U	<0.019 U
178SS010	0.2-0.7	N	12/13/2010	2040	<0.0119 U	<0.12 U	1.33 J	219		<0.0145 U	<0.0196 U	<0.0106 U	<0.00939 U	<0.0156 U	<0.0394 U	<0.00717 U	<0.0029 U	<0.0187 U
178SS011	0.2-0.7	N	12/13/2010	1100	<0.0119 U	<0.12 U	0.92 J	176		<0.0144 U	<0.0194 U	<0.0105 U	<0.00932 U	<0.0154 U	<0.0391 U	<0.00711 U	<0.0028 U	<0.0186 U
178SS012	0.2-0.7	N	12/13/2010	1560	<0.0118 U	<0.12 U	1.81	69.7		<0.0143 U	<0.0193 U	<0.0105 U	<0.00926 U	<0.0153 U	<0.0389 U	<0.00707 U	<0.0028 U	<0.0185 U
178SS013	0.2-0.7	N	12/14/2010	2520	<0.0119 U	<0.12 U	1.53 J	82.2		<0.0145 U	<0.0196 U	<0.0106 U	<0.00939 U	<0.0155 U	<0.0394 U	<0.00716 U	0.11 J	<0.0187 U
178SS014	0.2-0.7	N	12/14/2010	3330	<0.012 U	<0.12 U	5.2	102		<0.0146 U	<0.0196 U	<0.0106 U	<0.00942 U	<0.0156 U	<0.0396 U	<0.00719 U	<0.0029 U	<0.0188 U
178SS019	0.2-0.7	N	12/14/2010	2510	<0.0116 U	<0.12 U	3.29	132		<0.0142 U	<0.0191 U	<0.0103 U	<0.00916 U	<0.0152 U	<0.0385 U	<0.00699 U	<0.0028 U	<0.0183 U
178SS019	0.2-0.7	N	1/13/2011															

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	bis(2-Chloroisopropyl) Ether	bis(2-Ethylhexyl) Phthalate	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	Cadmium	Calcium	Carbazole	Carbon Disulfide	Carbon Tetrachloride	Chlorobenzene
178EP001	0.2-0.7	N	12/14/2010	<0.025 U	<0.0171 U	<0.0128 U						0.055 J	15400	<0.0238 U			
178EP002	0.2-0.7	N	12/15/2010	<0.0254 U	<0.0173 U	<0.013 U						0.17 J	23600	<0.0242 U			
178EP002	2-2.5	N	12/15/2010	<0.026 U	<0.0177 U	<0.0133 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	0.34	13300	<0.0247 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP002	6-6.5	N	12/15/2010	<0.0251 U	<0.0171 U	<0.0128 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	0.029 J	3820	<0.0239 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP003	0.2-0.7	N	12/15/2010	<0.0251 U	<0.0171 U	<0.0128 U						0.057 J	9830	<0.0239 U			
178EP003	2-2.5	N	12/15/2010	<0.0257 U	<0.0176 U	<0.0131 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	0.63	9050	<0.0245 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP003	6-6.5	N	12/15/2010	<0.0253 U	<0.0173 U	<0.0129 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	0.15 J	21500	<0.0241 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP004	0.2-0.7	N	12/15/2010	<0.025 U	<0.0171 U	<0.0128 U						0.039 J	7960	<0.0238 U			
178EP004	2-2.5	N	12/15/2010	<0.025 U	<0.0171 U	<0.0128 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	0.49	7530	<0.0238 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP004	5-5.5	N	12/15/2010	<0.0253 U	<0.0173 U	<0.0129 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0098 U	1490	<0.0241 U	<0.0025 U	<0.0025 U	<0.0025 U
178EP005	0.2-0.7	N	12/15/2010	<0.0252 U	<0.0172 U	<0.0129 U						0.014 J	11500	<0.024 U			
178EP005	3-3.5	N	12/15/2010	<0.0257 U	<0.0175 U	<0.0131 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	0.37	14000	<0.0244 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP005	6-6.5	N	12/15/2010	<0.0258 U	<0.0176 U	<0.0131 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	0.05 J	11700	<0.0245 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP006	0.2-0.7	N	12/16/2010	<0.0253 U	<0.0173 U	<0.0129 U						0.041 J	10100	<0.0241 U			
178EP007	0.2-0.7	N	12/16/2010	<0.0247 U	<0.0169 U	<0.0126 U						<0.0098 U	10100	<0.0235 U			
178EP008	0.2-0.7	N	12/16/2010	<0.0248 U	<0.017 U	<0.0127 U						<0.0097 U	3570	<0.0236 U			
178EP009	0.2-0.7	N	12/20/2010	<0.0252 U	<0.0172 U	<0.0129 U						<0.0099 U	4870	<0.024 U			
178EP009	3-3.5	N	12/20/2010	<0.0268 U	<0.0183 U	<0.0137 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	0.95	10300	<0.0255 U	<0.0022 U	<0.0022 U	<0.0022 U
178EP009	7.5-8	N	12/20/2010	<0.0254 U	<0.0173 U	<0.013 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	0.033 J	8110	<0.0242 U	<0.0024 U	<0.0024 U	<0.0024 U
178EP010	0.2-0.7	N	12/20/2010	<0.0247 U	<0.0169 U	<0.0126 U						<0.0098 U	5560	<0.0235 U			
178EP010	3-3.5	N	12/20/2010	<0.0253 U	<0.0173 U	<0.0129 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	0.34	13200	<0.0241 U	<0.0021 U	<0.0021 U	<0.0021 U
178EP010	5-5.5	N	12/20/2010	<0.0255 U	<0.0174 U	<0.013 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.01 U	1300	<0.0242 U	<0.0023 U	<0.0023 U	<0.0023 U
178EP010	5-5.5	FD	12/20/2010	<0.0253 U	<0.0173 U	<0.0129 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	1350	<0.0241 U	<0.0022 U	<0.0022 U	<0.0022 U
178SS007	0.2-0.7	N	12/13/2010	<0.0253 U	<0.0173 U	<0.0129 U						0.065 J	15300	<0.0241 U			
178SS007	0.2-0.7	FD	12/13/2010	<0.0252 U	<0.0172 U	<0.0128 U						0.1 J	20100	<0.0239 U			
178SS008	0.2-0.7	N	12/13/2010	<0.0254 U	<0.0173 U	<0.0129 U						0.022 J	9550	<0.0242 U			
178SS009	0.2-0.7	N	12/13/2010	<0.026 U	<0.0177 U	<0.0132 U						0.028 J	10900	<0.0247 U			
178SS010	0.2-0.7	N	12/13/2010	<0.0256 U	<0.0175 U	<0.0131 U						0.019 J	7280	<0.0244 U			
178SS011	0.2-0.7	N	12/13/2010	<0.0254 U	<0.0174 U	<0.013 U						0.046 J	11100	<0.0242 U			
178SS012	0.2-0.7	N	12/13/2010	<0.0253 U	<0.0173 U	<0.0129 U						<0.01 U	3620	<0.0241 U			
178SS013	0.2-0.7	N	12/14/2010	<0.0256 U	<0.0175 U	<0.0131 U						0.046 J	6760	<0.0244 U			
178SS014	0.2-0.7	N	12/14/2010	<0.0257 U	<0.0176 U	<0.0131 U						0.046 J	17800	<0.0245 U			
178SS019	0.2-0.7	N	12/14/2010	<0.025 U	<0.0171 U	<0.0128 U						0.017 J	2800	<0.0238 U			
178SS019	0.2-0.7	N	1/13/2011														

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	Chloroethane	Chloroform	Chloromethane	Chromium, Total	Chrysene	cis-1,2-Dichloroethylene	cis-1,3-Dichloropropene	Cobalt	Copper	Dibenz(a,h)anthracene	Dibenzofuran	Dibromochloromethane	Dibromomethane	Dichlorodifluoromethane	Diethyl Phthalate
178EP001	0.2-0.7	N	12/14/2010				6.18	<0.0111 U			1.82	3.06 J	<0.0091 U	<0.0114 U				<0.0306 U
178EP002	0.2-0.7	N	12/15/2010				6.92	<0.0113 U			2.41	4.95 J	<0.00924 U	<0.0116 U				<0.0311 U
178EP002	2-2.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	8.89	<0.0116 U	<0.0023 U	<0.0023 U	2.31	23.8 J	<0.00945 U	<0.0119 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0318 U
178EP002	6-6.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	3.85	<0.0112 U	<0.0022 U	<0.0022 U	1.75	2.63 J	<0.00913 U	<0.0115 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0307 U
178EP003	0.2-0.7	N	12/15/2010				5.75	<0.0112 U			1.79	3.36 J	<0.00914 U	<0.0115 U				<0.0308 U
178EP003	2-2.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	10.2	<0.0115 U	<0.0022 U	<0.0022 U	2.71	38.1 J	<0.00935 U	<0.0118 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0315 U
178EP003	6-6.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	2.76	<0.0113 U	<0.0023 U	<0.0023 U	1.18	2.33 J	<0.00922 U	<0.0116 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.031 U
178EP004	0.2-0.7	N	12/15/2010				4.84	<0.0112 U			1.71	2.86 J	<0.00911 U	<0.0115 U				<0.0307 U
178EP004	2-2.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	5.51	<0.0111 U	<0.0022 U	<0.0022 U	2.1	8.02 J	0.0146 J	<0.0114 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0306 U
178EP004	5-5.5	N	12/15/2010	<0.0025 U	<0.0025 U	<0.0025 U	3.06	<0.0113 U	<0.0025 U	<0.0025 U	1.53	1.86 J	<0.00922 U	<0.0116 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.031 U
178EP005	0.2-0.7	N	12/15/2010				6.88	<0.0112 U			2.19	3.39 J	<0.00918 U	<0.0116 U				<0.0309 U
178EP005	3-3.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	9.86	<0.0114 U	<0.0022 U	<0.0022 U	2.51	42.7 J	<0.00933 U	<0.0117 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0314 U
178EP005	6-6.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	3.44	<0.0115 U	<0.0023 U	<0.0023 U	1.2	2 J	<0.00938 U	<0.0118 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0316 U
178EP006	0.2-0.7	N	12/16/2010				6.47	<0.0113 U			2.64	5.59 J	<0.0092 U	<0.0116 U				<0.031 U
178EP007	0.2-0.7	N	12/16/2010				6.32	<0.011 U			1.39	1.71 J	<0.00898 U	<0.0113 U				<0.0302 U
178EP008	0.2-0.7	N	12/16/2010				5.83	<0.0111 U			1.4	1.49 J	<0.00904 U	<0.0114 U				<0.0304 U
178EP009	0.2-0.7	N	12/20/2010				6.13	<0.0112 U			3.12	4.34	<0.00918 U	<0.0115 U				<0.0309 U
178EP009	3-3.5	N	12/20/2010	<0.0022 U	<0.0022 U	<0.0022 U	14.4	<0.0119 U	<0.0022 U	<0.0022 U	3.61	51.7	<0.00975 U	<0.0123 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0328 U
178EP009	7.5-8	N	12/20/2010	<0.0024 U	<0.0024 U	<0.0024 U	4.49	<0.0113 U	<0.0024 U	<0.0024 U	1.36	2.18	<0.00924 U	<0.0116 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0311 U
178EP010	0.2-0.7	N	12/20/2010				3.18	<0.011 U			1.34	2.3	<0.00899 U	<0.0113 U				<0.0303 U
178EP010	3-3.5	N	12/20/2010	<0.0021 U	<0.0021 U	<0.0021 U	10.2	<0.0113 U	<0.0021 U	<0.0021 U	2.78	52.9	<0.0092 U	<0.0116 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.031 U
178EP010	5-5.5	N	12/20/2010	<0.0023 U	<0.0023 U	<0.0023 U	3.95	<0.0114 U	<0.0023 U	<0.0023 U	1.77	1.81	<0.00927 U	<0.0117 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0312 U
178EP010	5-5.5	FD	12/20/2010	<0.0022 U	<0.0022 U	<0.0022 U	3.91	<0.0113 U	<0.0022 U	<0.0022 U	1.68	1.73	<0.0092 U	<0.0116 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.031 U
178SS007	0.2-0.7	N	12/13/2010				2.93	<0.0113 U			1.05	1.39	<0.00921 U	<0.0116 U				<0.031 U
178SS007	0.2-0.7	FD	12/13/2010				3.16	<0.0112 U			1.18	1.48	<0.00915 U	<0.0115 U				<0.0308 U
178SS008	0.2-0.7	N	12/13/2010				3.21	<0.0113 U			1.12	1.47	<0.00924 U	<0.0116 U				<0.0311 U
178SS009	0.2-0.7	N	12/13/2010				4.22	<0.0116 U			1.76	2.45	<0.00945 U	<0.0119 U				<0.0318 U
178SS010	0.2-0.7	N	12/13/2010				2.75	<0.0114 U			1.59	2.2	<0.00933 U	<0.0117 U				<0.0314 U
178SS011	0.2-0.7	N	12/13/2010				2.37	<0.0113 U			0.99	1.51	<0.00926 U	<0.0116 U				<0.0312 U
178SS012	0.2-0.7	N	12/13/2010				2.58	<0.0113 U			1.43	1.82	<0.0092 U	<0.0116 U				<0.031 U
178SS013	0.2-0.7	N	12/14/2010				3.92	<0.0114 U			1.76	3.6	<0.00932 U	<0.0117 U				<0.0314 U
178SS014	0.2-0.7	N	12/14/2010				5.05	<0.0115 U			1.76	3.02	<0.00936 U	<0.0118 U				<0.0315 U
178SS019	0.2-0.7	N	12/14/2010				5.38	<0.0111 U			1.39	1.73	<0.0091 U	<0.0114 U				<0.0306 U
178SS019	0.2-0.7	N	1/13/2011															

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	Dimethyl Phthalate	Di-n-Butyl Phthalate	Di-n-Octyl Phthalate	Ethylbenzene	Fluoranthene	Fluorene	Hexachlorobenzene	Hexachlorobutadiene	Hexachloroethane	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine	Indeno(1,2,3-c,d)pyrene	Iron	Isophorone	Isopropylbenzene (Cumene)
178EP001	0.2-0.7	N	12/14/2010	<0.00734 U	<0.008 U	<0.0108 U		<0.00733 U	<0.0101 U	<0.0397 U	<0.0218 U	<0.0492 U	<0.012 U	<0.0133 U	5870	<0.0108 U	
178EP002	0.2-0.7	N	12/15/2010	<0.00745 U	<0.00813 U	<0.011 U		<0.00744 U	<0.0103 U	<0.0403 U	<0.0221 U	<0.05 U	<0.012 U	<0.0135 U	6910	<0.011 U	
178EP002	2-2.5	N	12/15/2010	<0.00763 U	<0.00832 U	<0.0113 U	<0.0023 U	<0.00762 U	<0.0105 U	<0.0412 U	<0.0226 U	<0.0511 U	<0.012 U	<0.0138 U	20000	<0.0113 U	<0.0023 U
178EP002	6-6.5	N	12/15/2010	<0.00737 U	<0.00803 U	<0.0109 U	<0.0022 U	<0.00736 U	<0.0102 U	<0.0398 U	<0.0219 U	<0.0494 U	<0.012 U	<0.0133 U	4360	<0.0109 U	<0.0022 U
178EP003	0.2-0.7	N	12/15/2010	<0.00737 U	<0.00804 U	<0.0109 U		<0.00736 U	<0.0102 U	<0.0398 U	<0.0219 U	<0.0494 U	<0.012 U	<0.0133 U	5500	<0.0109 U	
178EP003	2-2.5	N	12/15/2010	<0.00755 U	<0.00823 U	<0.0112 U	<0.0022 U	<0.00754 U	<0.0104 U	<0.0408 U	<0.0224 U	<0.0506 U	<0.012 U	<0.0136 U	10200	<0.0112 U	<0.0022 U
178EP003	6-6.5	N	12/15/2010	<0.00744 U	<0.00811 U	<0.011 U	<0.0023 U	<0.00743 U	<0.0103 U	<0.0402 U	<0.0221 U	<0.0499 U	<0.012 U	<0.0134 U	3390	<0.011 U	<0.0023 U
178EP004	0.2-0.7	N	12/15/2010	<0.00735 U	<0.00802 U	<0.0109 U		<0.00734 U	<0.0102 U	<0.0397 U	<0.0218 U	<0.0493 U	<0.012 U	<0.0133 U	5450	<0.0109 U	
178EP004	2-2.5	N	12/15/2010	<0.00734 U	<0.008 U	<0.0108 U	<0.0022 U	<0.00733 U	<0.0101 U	<0.0397 U	<0.0218 U	<0.0492 U	<0.012 U	0.201 J	8990	<0.0108 U	<0.0022 U
178EP004	5-5.5	N	12/15/2010	<0.00744 U	<0.00811 U	<0.011 U	<0.0025 U	<0.00743 U	<0.0103 U	<0.0402 U	<0.0221 U	<0.0499 U	<0.012 U	<0.0134 U	4530	<0.011 U	<0.0025 U
178EP005	0.2-0.7	N	12/15/2010	<0.00741 U	<0.00808 U	<0.0109 U		<0.0074 U	<0.0102 U	<0.04 U	<0.022 U	<0.0496 U	<0.012 U	<0.0134 U	5980	<0.0109 U	
178EP005	3-3.5	N	12/15/2010	<0.00753 U	<0.00821 U	<0.0111 U	<0.0022 U	<0.00752 U	<0.0104 U	<0.0407 U	<0.0224 U	<0.0505 U	<0.012 U	<0.0136 U	10100	<0.0111 U	<0.0022 U
178EP005	6-6.5	N	12/15/2010	<0.00757 U	<0.00825 U	<0.0112 U	<0.0023 U	<0.00756 U	<0.0105 U	<0.0409 U	<0.0225 U	<0.0507 U	<0.012 U	<0.0137 U	4560	<0.0112 U	<0.0023 U
178EP006	0.2-0.7	N	12/16/2010	<0.00742 U	<0.00809 U	<0.011 U		<0.00741 U	<0.0103 U	<0.0401 U	<0.022 U	<0.0498 U	<0.012 U	<0.0134 U	7550	<0.011 U	
178EP007	0.2-0.7	N	12/16/2010	<0.00725 U	<0.0079 U	<0.0107 U		<0.00724 U	<0.01 U	<0.0392 U	<0.0215 U	<0.0486 U	<0.012 U	<0.0131 U	5560	<0.0107 U	
178EP008	0.2-0.7	N	12/16/2010	<0.00729 U	<0.00795 U	<0.0108 U		<0.00728 U	<0.0101 U	<0.0394 U	<0.0217 U	<0.0489 U	<0.012 U	<0.0132 U	5690	<0.0108 U	
178EP009	0.2-0.7	N	12/20/2010	<0.0074 U	<0.00807 U	<0.0109 U		<0.00739 U	<0.0102 U	<0.04 U	<0.022 U	<0.0496 U	<0.012 U	<0.0134 U	7220	<0.0109 U	
178EP009	3-3.5	N	12/20/2010	<0.00786 U	<0.00857 U	<0.0116 U	<0.0022 U	<0.00785 U	<0.0109 U	<0.0425 U	<0.0233 U	<0.0527 U	<0.012 U	<0.0142 U	21400	<0.0116 U	<0.0022 U
178EP009	7.5-8	N	12/20/2010	<0.00746 U	<0.00813 U	<0.011 U	<0.0024 U	<0.00745 U	<0.0103 U	<0.0403 U	<0.0221 U	<0.05 U	<0.012 U	<0.0135 U	6520	<0.011 U	<0.0024 U
178EP010	0.2-0.7	N	12/20/2010	<0.00726 U	<0.00791 U	<0.0107 U		<0.00725 U	<0.01 U	<0.0392 U	<0.0215 U	<0.0486 U	<0.012 U	<0.0131 U	4450	<0.0107 U	
178EP010	3-3.5	N	12/20/2010	<0.00743 U	<0.0081 U	<0.011 U	<0.0021 U	<0.00742 U	<0.0103 U	<0.0401 U	<0.022 U	<0.0498 U	<0.012 U	<0.0134 U	16800	<0.011 U	<0.0021 U
178EP010	5-5.5	N	12/20/2010	<0.00748 U	<0.00815 U	<0.011 U	<0.0023 U	<0.00747 U	<0.0103 U	<0.0404 U	<0.0222 U	<0.0501 U	<0.012 U	<0.0135 U	5620	<0.011 U	<0.0023 U
178EP010	5-5.5	FD	12/20/2010	<0.00742 U	<0.00809 U	<0.011 U	<0.0022 U	<0.00741 U	<0.0103 U	<0.0401 U	<0.022 U	<0.0498 U	<0.012 U	<0.0134 U	5540	<0.011 U	<0.0022 U
178SS007	0.2-0.7	N	12/13/2010	<0.00743 U	<0.0081 U	<0.011 U		<0.00742 U	<0.0103 U	<0.0401 U	<0.0221 U	<0.0498 U	<0.012 U	<0.0134 U	3520	<0.011 U	
178SS007	0.2-0.7	FD	12/13/2010	<0.00739 U	<0.00805 U	<0.0109 U		<0.00738 U	<0.0102 U	<0.0399 U	<0.0219 U	<0.0495 U	<0.012 U	<0.0133 U	3560	<0.0109 U	
178SS008	0.2-0.7	N	12/13/2010	<0.00745 U	<0.00813 U	<0.011 U		<0.00744 U	<0.0103 U	<0.0403 U	<0.0221 U	<0.05 U	<0.012 U	<0.0135 U	3900	<0.011 U	
178SS009	0.2-0.7	N	12/13/2010	<0.00763 U	<0.00831 U	<0.0113 U		<0.00761 U	<0.0105 U	<0.0412 U	<0.0226 U	<0.0511 U	<0.012 U	<0.0138 U	5120	<0.0113 U	
178SS010	0.2-0.7	N	12/13/2010	<0.00753 U	<0.00821 U	<0.0111 U		<0.00752 U	<0.0104 U	<0.0407 U	<0.0224 U	<0.0505 U	<0.012 U	<0.0136 U	3970	<0.0111 U	
178SS011	0.2-0.7	N	12/13/2010	<0.00747 U	<0.00814 U	<0.011 U		<0.00746 U	<0.0103 U	<0.0404 U	<0.0222 U	<0.0501 U	<0.012 U	<0.0135 U	3560	<0.011 U	
178SS012	0.2-0.7	N	12/13/2010	<0.00742 U	<0.00809 U	<0.011 U		<0.00741 U	<0.0103 U	<0.0401 U	<0.022 U	<0.0497 U	<0.012 U	<0.0134 U	3660	<0.011 U	
178SS013	0.2-0.7	N	12/14/2010	<0.00752 U	<0.0082 U	<0.0111 U		<0.00751 U	<0.0104 U	<0.0407 U	<0.0223 U	<0.0504 U	<0.012 U	<0.0136 U	4210	<0.0111 U	
178SS014	0.2-0.7	N	12/14/2010	<0.00755 U	<0.00823 U	<0.0112 U		<0.00754 U	<0.0104 U	<0.0408 U	<0.0224 U	<0.0506 U	<0.012 U	<0.0136 U	4840	<0.0112 U	
178SS019	0.2-0.7	N	12/14/2010	<0.00734 U	<0.008 U	<0.0108 U		<0.00733 U	<0.0101 U	<0.0397 U	<0.0218 U	<0.0492 U		<0.0133 U	5050	<0.0108 U	
178SS019	0.2-0.7	N	1/13/2011										<0.012 U				

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	Lead	m,p-Xylene (Sum Of Isomers)	Magnesium	Manganese	Mercury	Methyl Ethyl Ketone (2-Butanone)	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	Methylene Chloride	Molybdenum	Naphthalene	n-Butylbenzene	Nickel	Nitrobenzene	Nitroglycerin	N-Nitrosodimethylamine	N-Nitrosodi-n-Propylamine
178EP001	0.2-0.7	N	12/14/2010	3.33		1620	138	<0.0029 U				0.22 J	<0.011 U		3.33	<0.017 U	<0.015 U	<0.0171 U	<0.0168 U
178EP002	0.2-0.7	N	12/15/2010	5.43		2220	182	<0.0034 U				0.14 J	<0.0112 U		4.76	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178EP002	2-2.5	N	12/15/2010	107	<0.0023 U	1690	253	0.019	<0.0056 U	<0.0056 U	<0.0023 U	0.54 J	<0.0115 U	<0.0023 U	5.87	<0.017 U	<0.015 U	<0.0177 U	<0.0174 U
178EP002	6-6.5	N	12/15/2010	3.07	<0.0022 U	880	94.9	<0.0035 U	<0.0056 U	<0.0056 U	<0.0022 U	0.091 J	<0.0111 U	<0.0022 U	3.25	<0.017 U	<0.015 U	<0.0171 U	<0.0168 U
178EP003	0.2-0.7	N	12/15/2010	5.61		1630	114	<0.0034 U				0.11 J	<0.0111 U		3.38	<0.017 U	<0.015 U	<0.0171 U	<0.0168 U
178EP003	2-2.5	N	12/15/2010	203	<0.0022 U	1950	394	0.093	<0.0055 U	<0.0055 U	<0.0022 U	0.56 J	<0.0114 U	<0.0022 U	5.25	<0.017 U	<0.015 U	<0.0176 U	<0.0172 U
178EP003	6-6.5	N	12/15/2010	4.5	<0.0023 U	635	64.6	<0.0035 U	<0.0057 U	<0.0057 U	<0.0023 U	0.14 J	<0.0112 U	<0.0023 U	1.94	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178EP004	0.2-0.7	N	12/15/2010	3.59		1360	119	<0.0035 U				0.15 J	<0.0111 U		3.05	<0.017 U	<0.015 U	<0.0171 U	<0.0168 U
178EP004	2-2.5	N	12/15/2010	177	<0.0022 U	1180	182	<0.0035 U	<0.0056 U	<0.0056 U	<0.0022 U	0.27 J	<0.011 U	<0.0022 U	4.86	<0.017 U	<0.015 U	<0.0171 U	<0.0168 U
178EP004	5-5.5	N	12/15/2010	3.42	<0.0025 U	695	88.7	<0.0035 U	<0.0064 U	<0.0064 U	<0.0025 U	0.099 J	<0.0112 U	<0.0025 U	2.54	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178EP005	0.2-0.7	N	12/15/2010	3.75		1790	104	<0.0034 U				0.12 J	<0.0111 U		3.92	<0.017 U	<0.015 U	<0.0172 U	<0.0169 U
178EP005	3-3.5	N	12/15/2010	144	<0.0022 U	1700	767	0.01 J	<0.0054 U	<0.0054 U	<0.0022 U	0.6 J	<0.0113 U	<0.0022 U	5.58	<0.017 U	<0.015 U	<0.0175 U	<0.0172 U
178EP005	6-6.5	N	12/15/2010	3.02	<0.0023 U	835	95.4	<0.0035 U	<0.0058 U	<0.0058 U	<0.0023 U	0.13 J	<0.0114 U	<0.0023 U	2.48	<0.017 U	<0.015 U	<0.0176 U	<0.0173 U
178EP006	0.2-0.7	N	12/16/2010	5.73		2390	175	0.016				0.18 J	<0.0112 U		4.93	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178EP007	0.2-0.7	N	12/16/2010	2.73		841	81.4	<0.0034 U				0.081 J	<0.0109 U		2.25	<0.017 U	<0.015 U	<0.0169 U	<0.0166 U
178EP008	0.2-0.7	N	12/16/2010	3.21		727	87.7	<0.0034 U				0.082 J	<0.011 U		2.11	<0.017 U	<0.015 U	<0.017 U	<0.0167 U
178EP009	0.2-0.7	N	12/20/2010	5.13		2060	156	0.0087 J				0.16 J	<0.0111 U		5.72	<0.017 U	<0.015 U	<0.0172 U	<0.0169 U
178EP009	3-3.5	N	12/20/2010	163	<0.0022 U	1490	246	0.068	<0.0055 U	<0.0055 U	<0.0022 U	1.6	<0.0118 U	<0.0022 U	11.9	<0.017 U	<0.015 U	<0.0183 U	<0.018 U
178EP009	7.5-8	N	12/20/2010	3.42	<0.0024 U	894	104	0.0056 J	<0.006 U	<0.006 U	<0.0024 U	0.056 J	<0.0112 U	<0.0024 U	2.7	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178EP010	0.2-0.7	N	12/20/2010	3.51		935	90.4	0.0063 J				0.13 J	<0.0109 U		2.4	<0.017 U	<0.015 U	<0.0169 U	<0.0166 U
178EP010	3-3.5	N	12/20/2010	271	<0.0021 U	1730	695	0.0068 J	<0.0052 U	<0.0052 U	<0.0021 U	1.25	<0.0112 U	<0.0021 U	8.01	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178EP010	5-5.5	N	12/20/2010	3.26	<0.0023 U	717 J	78.3	0.0044 J	<0.0056 U	<0.0056 U	<0.0023 U	<0.039 U	<0.0113 U	<0.0023 U	2.58	<0.017 U	<0.015 U	<0.0174 U	<0.0171 U
178EP010	5-5.5	FD	12/20/2010	3.23	<0.0022 U	677	71.6	0.0083 J	<0.0054 U	<0.0054 U	<0.0022 U	0.048 J	<0.0112 U	<0.0022 U	2.54	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178SS007	0.2-0.7	N	12/13/2010	2.9		652 J	60.4 J	<0.0029 U				0.075 J	<0.0112 U		1.67	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178SS007	0.2-0.7	FD	12/13/2010	3.11		663	66.5	<0.0035 U				0.089 J	<0.0111 U		1.87	<0.017 U	<0.015 U	<0.0172 U	<0.0169 U
178SS008	0.2-0.7	N	12/13/2010	2.72		535	61.9	<0.0035 U				0.058 J	<0.0112 U		1.99	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178SS009	0.2-0.7	N	12/13/2010	3.46		998	121	<0.0036 U				0.11 J	<0.0115 U		3.1	<0.017 U	<0.015 U	<0.0177 U	<0.0174 U
178SS010	0.2-0.7	N	12/13/2010	3.18		1070	98	<0.0035 U				0.067 J	<0.0113 U		2.78	<0.017 U	<0.015 U	<0.0175 U	<0.0172 U
178SS011	0.2-0.7	N	12/13/2010	2.36		525	64.2	<0.0035 U				0.068 J	<0.0112 U		1.92	<0.017 U	<0.015 U	<0.0174 U	<0.0171 U
178SS012	0.2-0.7	N	12/13/2010	2.76		693	68.4	<0.0035 U				0.084 J	<0.0112 U		2.46	<0.017 U	<0.015 U	<0.0173 U	<0.017 U
178SS013	0.2-0.7	N	12/14/2010	4.1		1220	137	<0.0035 U				0.12 J	<0.0113 U		3.35	<0.017 U	<0.015 U	<0.0175 U	<0.0172 U
178SS014	0.2-0.7	N	12/14/2010	2.97		1460	126	<0.0035 U				0.34 J	<0.0114 U		3.3	<0.017 U	<0.015 U	<0.0176 U	<0.0172 U
178SS019	0.2-0.7	N	12/14/2010	3.82		907	58	<0.0034 U				0.13 J	<0.011 U		2.3	<0.0154 U		<0.0171 U	<0.0168 U
178SS019	0.2-0.7	N	1/13/2011													<0.017 U	<0.014 U		

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	N-Nitrosodiphenylamine	n-Propylbenzene	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	o-Xylene (1,2-Dimethylbenzene)	p-Cymene (p-Isopropyltoluene)	Pentachlorophenol	Pentaerythritol Tetranitrate	Phenanthrene	Phenol	Potassium	Pyrene	sec-Butylbenzene	Selenium	Silver	Sodium
178EP001	0.2-0.7	N	12/14/2010	<0.0105 U		<0.012 U			<0.0271 U	<0.024 U	<0.0135 U	<0.0161 U	1110 J	<0.0465 U		<0.19 U	<0.035 U	218
178EP002	0.2-0.7	N	12/15/2010	<0.0107 U		<0.012 U			<0.0275 U	<0.024 U	<0.0137 U	<0.0163 U	1150	<0.0472 U		<0.2 U	0.055 J	6240
178EP002	2-2.5	N	12/15/2010	<0.011 U	<0.0023 U	<0.012 U	<0.0023 U	<0.0023 U	<0.0282 U	<0.024 U	<0.014 U	<0.0167 U	948	<0.0483 U	<0.0023 U	<0.2 U	4.1	2080
178EP002	6-6.5	N	12/15/2010	<0.0106 U	<0.0022 U	<0.012 U	<0.0022 U	<0.0022 U	<0.0272 U	<0.025 U	<0.0135 U	<0.0161 U	570	<0.0467 U	<0.0022 U	<0.2 U	0.052 J	1840
178EP003	0.2-0.7	N	12/15/2010	<0.0106 U		<0.012 U			<0.0272 U	<0.025 U	<0.0135 U	<0.0161 U	775	<0.0467 U		<0.19 U	0.035 J	70.7
178EP003	2-2.5	N	12/15/2010	<0.0108 U	<0.0022 U	0.013 J	<0.0022 U	<0.0022 U	<0.0279 U	<0.025 U	<0.0138 U	<0.0165 U	927	<0.0478 U	<0.0022 U	<0.2 U	1.04	3650
178EP003	6-6.5	N	12/15/2010	<0.0107 U	<0.0023 U	<0.012 U	<0.0023 U	<0.0023 U	<0.0275 U	<0.024 U	<0.0136 U	<0.0163 U	298	<0.0471 U	<0.0023 U	<0.2 U	<0.036 U	1000
178EP004	0.2-0.7	N	12/15/2010	<0.0106 U		<0.012 U			<0.0272 U	<0.025 U	<0.0135 U	<0.0161 U	737	<0.0466 U		<0.19 U	0.058 J	415
178EP004	2-2.5	N	12/15/2010	<0.0105 U	<0.0022 U	<0.012 U	<0.0022 U	<0.0022 U	<0.0271 U	<0.025 U	<0.0135 U	<0.0161 U	548	<0.0465 U	<0.0022 U	<0.2 U	0.2 J	183
178EP004	5-5.5	N	12/15/2010	<0.0107 U	<0.0025 U	<0.012 U	<0.0025 U	<0.0025 U	<0.0275 U	<0.025 U	<0.0136 U	<0.0163 U	309	<0.0471 U	<0.0025 U	<0.19 U	0.068 J	453
178EP005	0.2-0.7	N	12/15/2010	<0.0106 U		<0.012 U			<0.0274 U	<0.024 U	<0.0136 U	<0.0162 U	726	<0.0469 U		<0.2 U	<0.035 U	658
178EP005	3-3.5	N	12/15/2010	<0.0108 U	<0.0022 U	<0.012 U	<0.0022 U	<0.0022 U	<0.0278 U	<0.025 U	<0.0138 U	<0.0165 U	1040	<0.0477 U	<0.0022 U	<0.2 U	0.64	3250
178EP005	6-6.5	N	12/15/2010	<0.0109 U	<0.0023 U	<0.012 U	<0.0023 U	<0.0023 U	<0.0279 U	<0.025 U	<0.0139 U	<0.0166 U	421	<0.0479 U	<0.0023 U	<0.2 U	<0.036 U	1640
178EP006	0.2-0.7	N	12/16/2010	<0.0107 U		<0.012 U			<0.0274 U	<0.024 U	<0.0136 U	<0.0162 U	1070	<0.047 U		<0.2 U	0.051 J	68.7
178EP007	0.2-0.7	N	12/16/2010	<0.0104 U		<0.012 U			<0.0268 U	<0.024 U	<0.0133 U	<0.0159 U	414	<0.0459 U		<0.19 U	<0.035 U	30.5 J
178EP008	0.2-0.7	N	12/16/2010	<0.0105 U		<0.012 U			<0.0269 U	<0.024 U	<0.0134 U	<0.016 U	358	<0.0462 U		<0.19 U	<0.035 U	22.5 J
178EP009	0.2-0.7	N	12/20/2010	<0.0106 U		<0.012 U			<0.0273 U	<0.025 U	<0.0136 U	<0.0162 U	1070	<0.0469 U		<0.2 U	<0.035 U	175
178EP009	3-3.5	N	12/20/2010	<0.0113 U	<0.0022 U	<0.012 U	<0.0022 U	<0.0022 U	<0.029 U	<0.024 U	<0.0144 U	<0.0172 U	1010	<0.0498 U	<0.0022 U	<0.21 U	0.28 J	1670
178EP009	7.5-8	N	12/20/2010	<0.0107 U	<0.0024 U	<0.012 U	<0.0024 U	<0.0024 U	<0.0275 U	<0.024 U	<0.0137 U	<0.0163 U	476	<0.0472 U	<0.0024 U	<0.2 U	<0.036 U	1120
178EP010	0.2-0.7	N	12/20/2010	<0.0104 U		<0.012 U			<0.0268 U	<0.025 U	<0.0133 U	<0.0159 U	485	<0.046 U		<0.19 U	<0.035 U	70.2
178EP010	3-3.5	N	12/20/2010	<0.0107 U	<0.0021 U	<0.012 U	<0.0021 U	<0.0021 U	<0.0274 U	<0.024 U	<0.0136 U	<0.0163 U	1070	<0.047 U	<0.0021 U	<0.2 U	0.71	1180
178EP010	5-5.5	N	12/20/2010	<0.0107 U	<0.0023 U	<0.012 U	<0.0023 U	<0.0023 U	<0.0276 U	<0.024 U	<0.0137 U	<0.0164 U	345	<0.0474 U	<0.0023 U	<0.2 U	<0.036 U	909
178EP010	5-5.5	FD	12/20/2010	<0.0107 U	<0.0022 U	<0.012 U	<0.0022 U	<0.0022 U	<0.0274 U	<0.024 U	<0.0136 U	<0.0162 U	353	<0.047 U	<0.0022 U	<0.19 U	<0.035 U	783
178SS007	0.2-0.7	N	12/13/2010	<0.0107 U		<0.012 U			<0.0274 U	<0.025 U	<0.0136 U	<0.0163 U	300 J	<0.0471 U		<0.2 U	<0.035 U	371 J
178SS007	0.2-0.7	FD	12/13/2010	<0.0106 U		<0.012 U			<0.0273 U	<0.025 U	<0.0135 U	<0.0162 U	327 J	<0.0468 U		0.2 J	<0.035 U	481 J
178SS008	0.2-0.7	N	12/13/2010	<0.0107 U		<0.012 U			<0.0275 U	<0.024 U	<0.0137 U	<0.0163 U	291 J	<0.0472 U		0.21 J	<0.036 U	226 J
178SS009	0.2-0.7	N	12/13/2010	<0.011 U		<0.012 U			<0.0282 U	<0.025 U	<0.014 U	<0.0167 U	421 J	<0.0483 U		<0.2 U	<0.037 U	572 J
178SS010	0.2-0.7	N	12/13/2010	<0.0108 U		<0.012 U			<0.0278 U	<0.025 U	<0.0138 U	<0.0165 U	462 J	<0.0477 U		<0.2 U	<0.036 U	371 J
178SS011	0.2-0.7	N	12/13/2010	<0.0107 U		<0.012 U			<0.0276 U	<0.024 U	<0.0137 U	<0.0163 U	247 J	<0.0473 U		<0.2 U	<0.036 U	226 J
178SS012	0.2-0.7	N	12/13/2010	<0.0107 U		<0.012 U			<0.0274 U	<0.024 U	<0.0136 U	<0.0162 U	316 J	<0.047 U		<0.2 U	<0.036 U	686 J
178SS013	0.2-0.7	N	12/14/2010	<0.0108 U		<0.012 U			<0.0278 U	<0.025 U	<0.0138 U	<0.0165 U	545 J	<0.0477 U		<0.2 U	<0.036 U	689 J
178SS014	0.2-0.7	N	12/14/2010	<0.0108 U		<0.012 U			<0.0279 U	<0.024 U	<0.0138 U	<0.0165 U	740 J	<0.0478 U		<0.2 U	<0.036 U	1370 J
178SS019	0.2-0.7	N	12/14/2010	<0.0105 U					<0.0271 U		<0.0135 U	<0.0161 U	417 J	<0.0465 U		<0.19 U	0.069 J	1510 J
178SS019	0.2-0.7	N	1/13/2011			<0.012 U				<0.024 U								

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.1
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	Styrene	t-Butylbenzene	tert-Butyl Methyl Ether	Tetrachloroethylene (PCE)	Tetryl	Thallium	Toluene	trans-1,2-Dichloroethene	trans-1,3-Dichloropropene	Trichloroethylene (TCE)	Trichlorofluoromethane	Vanadium	Vinyl Chloride	Zinc
178EP001	0.2-0.7	N	12/14/2010					<0.0097 U	<0.1 U						18.4		14.3
178EP002	0.2-0.7	N	12/15/2010					<0.0098 U	<0.1 U						18.9		21
178EP002	2-2.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0098 U	<0.1 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	15.4	<0.0023 U	148
178EP002	6-6.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.1 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	11.2	<0.0022 U	11.3
178EP003	0.2-0.7	N	12/15/2010					<0.0099 U	<0.1 U						15.3		17.9
178EP003	2-2.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.1 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	16.6	<0.0022 U	566
178EP003	6-6.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0098 U	<0.1 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	7.43	<0.0023 U	12.4
178EP004	0.2-0.7	N	12/15/2010					<0.0099 U	<0.1 U						15.2		13.8
178EP004	2-2.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.1 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	14.7	<0.0022 U	298
178EP004	5-5.5	N	12/15/2010	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0099 U	<0.1 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	<0.0025 U	12.4	<0.0025 U	10.6
178EP005	0.2-0.7	N	12/15/2010					<0.0098 U	<0.1 U						19.6		15.3
178EP005	3-3.5	N	12/15/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0099 U	<0.1 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	18.1	<0.0022 U	1060
178EP005	6-6.5	N	12/15/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0099 U	<0.1 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	11.5	<0.0023 U	12.1
178EP006	0.2-0.7	N	12/16/2010					<0.0098 U	<0.1 U						18.3		22.8
178EP007	0.2-0.7	N	12/16/2010					<0.0098 U	<0.1 U						20.6		12.4
178EP008	0.2-0.7	N	12/16/2010					<0.0098 U	<0.099 U						19.7		12.9
178EP009	0.2-0.7	N	12/20/2010					<0.0099 U	<0.1 U						18.2		19.5
178EP009	3-3.5	N	12/20/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0098 U	<0.11 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	19.5	<0.0022 U	164
178EP009	7.5-8	N	12/20/2010	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0098 U	<0.1 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	<0.0024 U	20.2	<0.0024 U	13.7
178EP010	0.2-0.7	N	12/20/2010					<0.0099 U	<0.1 U						13.4		10.6
178EP010	3-3.5	N	12/20/2010	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0098 U	<0.1 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	<0.0021 U	15.6	<0.0021 U	279
178EP010	5-5.5	N	12/20/2010	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0098 U	<0.1 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	<0.0023 U	16	<0.0023 U	12
178EP010	5-5.5	FD	12/20/2010	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0098 U	<0.1 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	<0.0022 U	15.8	<0.0022 U	12
178SS007	0.2-0.7	N	12/13/2010					<0.0099 U	<0.1 U						11.1		7.93
178SS007	0.2-0.7	FD	12/13/2010					<0.0099 U	<0.1 U						11.9		7.83
178SS008	0.2-0.7	N	12/13/2010					<0.0098 U	<0.1 U						10.4		8.76
178SS009	0.2-0.7	N	12/13/2010					<0.0099 U	<0.1 U						16.4		12.9
178SS010	0.2-0.7	N	12/13/2010					<0.0099 U	<0.1 U						8.88		23.5
178SS011	0.2-0.7	N	12/13/2010					<0.0098 U	<0.1 U						8.44		8.39
178SS012	0.2-0.7	N	12/13/2010					<0.0098 U	<0.1 U						8.94		8.85
178SS013	0.2-0.7	N	12/14/2010					<0.0099 U	<0.1 U						12		11.5
178SS014	0.2-0.7	N	12/14/2010					<0.0098 U	<0.1 U						16.1		12.5
178SS019	0.2-0.7	N	12/14/2010						<0.1 U						15.3		13.1
178SS019	0.2-0.7	N	1/13/2011					<0.0096 U									

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal; FD = Field Duplicate.

TABLE C.2
USEPA FLAGS FOR ANALYTICAL DATA
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Flag	Description
U	The analyte was not detected above the associated value. [a/]
J	The analyte was detected. The associated value is considered approximate, but usable for decision making purposes.
UJ	The analyte was not detected above the associated value; however, the associated value is considered approximate.
NJ	The analyte was detected at the associated value; however, based on professional judgment the value is considered to be a false positive.
R	The data is unusable for all purposes.

[a/] Associated value is the method detection limit (MDL) unless qualified 'U' based on laboratory/field blank contamination during the data validation. In this case, the value is the result reported by the laboratory.

TABLE C.3

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	2,4-Dinitrophenol	12/20/2010	0	0	1.69	MG/KG	NA
178EP010-03-122010	Cresols, m & p	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Isophorone	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Indeno(1,2,3-c,d)pyrene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Hexachloroethane	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Hexachlorobenzene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Hexachlorobutadiene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Fluoranthene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Fluorene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	2-Chlorotoluene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	2,4-Dinitrotoluene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Naphthalene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Di-n-Octyl Phthalate	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Di-n-Butyl Phthalate	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	4,6-Dinitro-2-Methylphenol	12/20/2010	0	0	1.69	MG/KG	NA
178EP010-03-122010	Dimethyl Phthalate	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	2,4-Dimethylphenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Diethyl Phthalate	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	2,4-Dichlorophenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	1,3-Dichlorobenzene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Dibenzofuran	12/20/2010	0	0	0.338	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	2,6-Dinitrotoluene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Acetone	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Chlorobenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Carbon Disulfide	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Toluene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Benzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	t-Butylbenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	sec-Butylbenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	n-Butylbenzene	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Bromomethane	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Bromochloromethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	2-Methylphenol (o-Cresol)	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Bromodichloromethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	2-Methylnaphthalene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	2-Nitrophenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Nitrobenzene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	4-Nitroaniline	12/20/2010	0	0	1.69	MG/KG	NA
178EP010-03-122010	3-Nitroaniline	12/20/2010	0	0	1.69	MG/KG	NA
178EP010-03-122010	2-Nitroaniline	12/20/2010	0	0	1.69	MG/KG	NA
178EP010-03-122010	N-Nitrosodi-n-Propylamine	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	N-Nitrosodiphenylamine	12/20/2010	0	0	0.338	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	N-Nitrosodimethylamine	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	2-Chloronaphthalene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Bromobenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Chromium, Total	12/20/2010	3.95	3.91	0.41	MG/KG	1.02
178EP010-03-122010	Dibenz(a,h)anthracene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Antimony	12/20/2010	0	0	2.46	MG/KG	NA
178EP010-03-122010	Lead	12/20/2010	3.26	3.23	0.61	MG/KG	0.92
178EP010-03-122010	Nickel	12/20/2010	2.58	2.54	1.64	MG/KG	<5xRL (0.04)
178EP010-03-122010	Sodium	12/20/2010	909	783	40.9	MG/KG	14.89
178EP010-03-122010	Molybdenum	12/20/2010	0	0.048	1.23	MG/KG	<5xRL (0.048)
178EP010-03-122010	Manganese	12/20/2010	78.3	71.6	0.61	MG/KG	8.94
178EP010-03-122010	Magnesium	12/20/2010	717	677	4.09	MG/KG	5.74
178EP010-03-122010	Potassium	12/20/2010	345	353	8.18	MG/KG	2.29
178EP010-03-122010	Thallium	12/20/2010	0	0	0.82	MG/KG	NA
178EP010-03-122010	Copper	12/20/2010	1.81	1.73	0.41	MG/KG	<5xRL (0.08)
178EP010-03-122010	Vanadium	12/20/2010	16	15.8	0.82	MG/KG	1.26
178EP010-03-122010	Cobalt	12/20/2010	1.77	1.68	0.41	MG/KG	<5xRL (0.09)
178EP010-03-122010	Cadmium	12/20/2010	0	0	0.2	MG/KG	NA
178EP010-03-122010	Calcium	12/20/2010	1300	1350	30.7	MG/KG	3.77
178EP010-03-122010	Beryllium	12/20/2010	0	0	0.2	MG/KG	NA
178EP010-03-122010	Barium	12/20/2010	70.4	78.3	0.41	MG/KG	10.63

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	Arsenic	12/20/2010	1.09	1.2	1.64	MG/KG	<5xRL (0.11)
178EP010-03-122010	Aluminum	12/20/2010	1660	1710	8.18	MG/KG	2.97
178EP010-03-122010	Silver	12/20/2010	0	0	0.41	MG/KG	NA
178EP010-03-122010	Mercury	12/20/2010	0.0044	0.0083	0.01	MG/KG	<5xRL (0.0039)
178EP010-03-122010	Iron	12/20/2010	5620	5540	4.09	MG/KG	1.43
178EP010-03-122010	4-Bromophenyl Phenyl Ether	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	1,4-Dichlorobenzene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	2-Chlorophenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Chrysene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Carbazole	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	4-Chloro-3-Methylphenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Benzyl Alcohol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Benzo(k)fluoranthene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Benzo(g,h,i)perylene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Benzo(b)fluoranthene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Selenium	12/20/2010	0	0	1.64	MG/KG	NA
178EP010-03-122010	Benzo(a)anthracene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	4-Chlorophenyl Phenyl Ether	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	bis(2-Ethylhexyl) Phthalate	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	bis(2-Chloroisopropyl) Ether	12/20/2010	0	0	0.338	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	bis(2-Chloroethoxy) Methane	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Benzyl Butyl Phthalate	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Anthracene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Acenaphthylene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Acenaphthene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Zinc	12/20/2010	12	12	0.82	MG/KG	0
178EP010-03-122010	Benzo(a)pyrene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	1,2,4-Trimethylbenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,1,1,2-Tetrachloroethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Phenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Phenanthrene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Pentachlorophenol	12/20/2010	0	0	1.69	MG/KG	NA
178EP010-03-122010	4-Nitrophenol	12/20/2010	0	0	1.69	MG/KG	NA
178EP010-03-122010	o-Xylene (1,2-Dimethylbenzene)	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	m,p-Xylene (Sum Of Isomers)	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	1,2,4-Trichlorobenzene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	1,3,5-Trimethylbenzene (Mesitylene)	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	2,4,5-Trichlorophenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	1,2,3-Trichloropropane	12/20/2010	0	0	0.0056	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	Chloroform	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Trichloroethylene (TCE)	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,2,4-Trichlorobenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,2,3-Trichlorobenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,1,2-Trichloroethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,1,1-Trichloroethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Vinyl Chloride	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	4-Nitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	1,2-Dichlorobenzene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	4-Chlorotoluene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	2,4,6-Trinitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	1,3,5-Trinitrobenzene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	Tetryl	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	Pentaerythritol Tetranitrate	12/20/2010	0	0	0.49	MG/KG	NA
178EP010-03-122010	Pyrene	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Nitrobenzene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	4-Amino-2,6-Dinitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	3-Nitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	2-Nitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	2,6-Dinitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	1,3-Dinitrobenzene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	2-Amino-4,6-Dinitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	2,4,6-Trichlorophenol	12/20/2010	0	0	0.338	MG/KG	NA
178EP010-03-122010	Nitroglycerin	12/20/2010	0	0	0.49	MG/KG	NA
178EP010-03-122010	Dibromomethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	trans-1,3-Dichloropropene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	cis-1,3-Dichloropropene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,1-Dichloropropene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	trans-1,2-Dichloroethene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	cis-1,2-Dichloroethylene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,1-Dichloroethene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,4-Dichlorobenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,2-Dichloropropane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,1-Dichloroethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,3-Dichlorobenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,2-Dibromo-3-Chloropropane	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Dibromochloromethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	p-Cymene (p-Isopropyltoluene)	12/20/2010	0	0	0.0056	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	Carbon Tetrachloride	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	tert-Butyl Methyl Ether	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	2,4-Dinitrotoluene	12/20/2010	0	0	0.24	MG/KG	NA
178EP010-03-122010	Chloromethane	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Chloroethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,2-Dichlorobenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Bromoform	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Tetrachloroethylene (PCE)	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,1,2,2-Tetrachloroethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,2-Dichloroethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	1,3-Dichloropropane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	n-Propylbenzene	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Styrene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Methylene Chloride	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Methyl Ethyl Ketone (2-Butanone)	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	2-Hexanone	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	2,2-Dichloropropane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Ethylbenzene	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Hexachlorobutadiene	12/20/2010	0	0	0.0056	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178EP010-03-122010	1,2-Dibromoethane (Ethylene Dibromide)	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Dichlorodifluoromethane	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Isopropylbenzene (Cumene)	12/20/2010	0	0	0.0056	MG/KG	NA
178EP010-03-122010	Trichlorofluoromethane	12/20/2010	0	0	0.011	MG/KG	NA
178EP010-03-122010	Naphthalene	12/20/2010	0	0	0.0056	MG/KG	NA
178SS007-01-121310	4-Bromophenyl Phenyl Ether	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Benzo(g,h,i)perylene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Benzo(b)fluoranthene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Benzo(a)pyrene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Benzo(a)anthracene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	bis(2-Ethylhexyl) Phthalate	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	bis(2-Chloroethoxy) Methane	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	4-Chlorophenyl Phenyl Ether	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	bis(2-Chloroisopropyl) Ether	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Benzyl Butyl Phthalate	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Benzo(k)fluoranthene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Benzyl Alcohol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	4-Chloro-3-Methylphenol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Carbazole	12/13/2010	0	0	0.335	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178SS007-01-121310	Chrysene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2-Chloronaphthalene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Dibenz(a,h)anthracene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	1,4-Dichlorobenzene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	1,3-Dichlorobenzene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Anthracene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Cadmium	12/13/2010	0.065	0.1	0.2	MG/KG	<5xRL (0.035)
178SS007-01-121310	Dibenzofuran	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	1,2-Dichlorobenzene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2-Chlorophenol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Magnesium	12/13/2010	652	663	4.07	MG/KG	1.67
178SS007-01-121310	Silver	12/13/2010	0	0	0.41	MG/KG	NA
178SS007-01-121310	Aluminum	12/13/2010	1360	1510	8.13	MG/KG	10.45
178SS007-01-121310	Pentaerythritol Tetranitrate	12/13/2010	0	0	0.5	MG/KG	NA
178SS007-01-121310	2,4-Dichlorophenol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Arsenic	12/13/2010	1.29	1.43	1.63	MG/KG	<5xRL (0.14)
178SS007-01-121310	Barium	12/13/2010	56.7	64.1	0.41	MG/KG	12.25
178SS007-01-121310	Beryllium	12/13/2010	0	0	0.2	MG/KG	NA
178SS007-01-121310	Calcium	12/13/2010	15300	20100	30.5	MG/KG	27.12
178SS007-01-121310	Cobalt	12/13/2010	1.05	1.18	0.41	MG/KG	<5xRL (0.13)
178SS007-01-121310	Copper	12/13/2010	1.39	1.48	0.41	MG/KG	<5xRL (0.09)

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178SS007-01-121310	Chromium, Total	12/13/2010	2.93	3.16	0.41	MG/KG	7.55
178SS007-01-121310	Potassium	12/13/2010	300	327	8.13	MG/KG	8.61
178SS007-01-121310	Acenaphthylene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Manganese	12/13/2010	60.4	66.5	0.61	MG/KG	9.61
178SS007-01-121310	Molybdenum	12/13/2010	0.075	0.089	1.22	MG/KG	<5xRL (0.014)
178SS007-01-121310	Sodium	12/13/2010	371	481	40.7	MG/KG	25.82
178SS007-01-121310	Nickel	12/13/2010	1.67	1.87	1.63	MG/KG	<5xRL (0.2)
178SS007-01-121310	Lead	12/13/2010	2.9	3.11	0.61	MG/KG	6.99
178SS007-01-121310	Antimony	12/13/2010	0	0	2.44	MG/KG	NA
178SS007-01-121310	Selenium	12/13/2010	0	0.2	1.63	MG/KG	<5xRL (0.2)
178SS007-01-121310	Thallium	12/13/2010	0	0	0.81	MG/KG	NA
178SS007-01-121310	Vanadium	12/13/2010	11.1	11.9	0.81	MG/KG	6.96
178SS007-01-121310	Zinc	12/13/2010	7.93	7.83	0.81	MG/KG	1.27
178SS007-01-121310	Acenaphthene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Iron	12/13/2010	3520	3560	4.07	MG/KG	1.13
178SS007-01-121310	Nitrobenzene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	Tetryl	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	4-Nitrophenol	12/13/2010	0	0	1.68	MG/KG	NA
178SS007-01-121310	Pentachlorophenol	12/13/2010	0	0	1.68	MG/KG	NA
178SS007-01-121310	Phenanthrene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Phenol	12/13/2010	0	0	0.335	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178SS007-01-121310	Pyrene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	1,2,4-Trichlorobenzene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2,4,5-Trichlorophenol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2,4,6-Trichlorophenol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	1,3,5-Trinitrobenzene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	Nitrobenzene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Nitroglycerin	12/13/2010	0	0	0.5	MG/KG	NA
178SS007-01-121310	4-Nitroaniline	12/13/2010	0	0	1.68	MG/KG	NA
178SS007-01-121310	4-Nitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	3-Nitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	2-Nitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	2,6-Dinitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	2,4-Dinitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	1,3-Dinitrobenzene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	4-Amino-2,6-Dinitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	2-Amino-4,6-Dinitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	Mercury	12/13/2010	0	0	0.01	MG/KG	NA
178SS007-01-121310	2,4,6-Trinitrotoluene	12/13/2010	0	0	0.25	MG/KG	NA
178SS007-01-121310	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine	12/13/2010	0	0	0.25	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178SS007-01-121310	Hexachloroethane	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2,4-Dimethylphenol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Dimethyl Phthalate	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	4,6-Dinitro-2-Methylphenol	12/13/2010	0	0	1.68	MG/KG	NA
178SS007-01-121310	Di-n-Butyl Phthalate	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Di-n-Octyl Phthalate	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2,4-Dinitrophenol	12/13/2010	0	0	1.68	MG/KG	NA
178SS007-01-121310	2,4-Dinitrotoluene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2,6-Dinitrotoluene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Fluorene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Fluoranthene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2-Nitrophenol	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Hexachlorobenzene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Diethyl Phthalate	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Indeno(1,2,3-c,d)pyrene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Isophorone	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Cresols, m & p	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2-Methylphenol (o-Cresol)	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2-Methylnaphthalene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	Naphthalene	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	N-Nitrosodimethylamine	12/13/2010	0	0	0.335	MG/KG	NA

TABLE C.3 (CONTINUED)

RFI FIELD DUPLICATE RESULTS FOR SOIL

YPG-178

US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

SAMPLE ID	ANALYTE	LOGDATE	RESULT 1[a/]	RESULT 2	RL[b/]	UNITS	RPD[c/]
178SS007-01-121310	N-Nitrosodiphenylamine	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	N-Nitrosodi-n-Propylamine	12/13/2010	0	0	0.335	MG/KG	NA
178SS007-01-121310	2-Nitroaniline	12/13/2010	0	0	1.68	MG/KG	NA
178SS007-01-121310	3-Nitroaniline	12/13/2010	0	0	1.68	MG/KG	NA
178SS007-01-121310	Hexachlorobutadiene	12/13/2010	0	0	0.335	MG/KG	NA

a/ Entries are shown when RESULT 1 is a detection.
b/ MDL is method detection limit.
c/ RPD is relative percent difference. RPD is calculated when RESULT 1 or 2 is >= 5 times the RL. The control limit is 35%. For detections >RL but < 5 times the RL, <5xRL is displayed and the difference between RESULT 1 and RESULT 2 (shown in parentheses [R1-R2]) must be within 2 times the RL. For non-detect results, no RPD is calculated and 'NA' is displayed. Bold RPDs are above the control limit.

TABLE C.4

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE RESULTS
RCRA FACILITY INVESTIGATION - INACTIVE LANDFILLS AND MUGGINS MOUNTAIN OB/OD FACILITY
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8260B	178EP010	12/20/2010	Acetone	Soil	U	109	107	20-160	4.73	30
SW8260B	178EP010	12/20/2010	Benzene	Soil	U	81	88	75-125	3.89	30
SW8260B	178EP010	12/20/2010	Bromobenzene	Soil	U	77	81	65-120	1.15	30
SW8260B	178EP010	12/20/2010	Bromochloromethane	Soil	U	98	99	70-125	2.04	30
SW8260B	178EP010	12/20/2010	Bromodichloromethane	Soil	U	90	95	70-130	2.37	30
SW8260B	178EP010	12/20/2010	Bromoform (tribromomethane)	Soil	U	85	89	55-135	0.63	30
SW8260B	178EP010	12/20/2010	Bromomethane (methyl bromide)	Soil	U	75	71	30-160	9.02	30
SW8260B	178EP010	12/20/2010	n-Butylbenzene	Soil	U	96	102	65-140	2.21	30
SW8260B	178EP010	12/20/2010	sec-Butylbenzene	Soil	U	90	93	65-130	1.20	30
SW8260B	178EP010	12/20/2010	tert-Butylbenzene	Soil	U	85	88	65-130	0.21	30
SW8260B	178EP010	12/20/2010	Carbon disulfide	Soil	U	80	82	45-160	0.67	30
SW8260B	178EP010	12/20/2010	Carbon tetrachloride	Soil	U	90	95	65-135	1.38	30
SW8260B	178EP010	12/20/2010	Chlorobenzene	Soil	U	90	93	75-125	0.60	30
SW8260B	178EP010	12/20/2010	Chloroethane	Soil	U	88	84	40-155	8.25	30
SW8260B	178EP010	12/20/2010	Chloroform	Soil	U	99	101	70-125	2.01	30
SW8260B	178EP010	12/20/2010	Chloromethane	Soil	U	77	75	50-130	5.52	30
SW8260B	178EP010	12/20/2010	2-Chlorotoluene	Soil	U	88	87	70-130	4.60	30
SW8260B	178EP010	12/20/2010	4-Chlorotoluene	Soil	U	80	87	75-125	4.40	30
SW8260B	178EP010	12/20/2010	p-Cymene (p-Isopropyltoluene)	Soil	U	93	97	75-135	0.58	30
SW8260B	178EP010	12/20/2010	Dibromochloromethane	Soil	U	93	96	65-130	0.19	30

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8260B	178EP010	12/20/2010	1,2-Dibromo-3-chloropropane	Soil	U	96	98	40-135	1.13	30
SW8260B	178EP010	12/20/2010	1,2-Dibromoethane	Soil	U	95	96	70-125	2.29	30
SW8260B	178EP010	12/20/2010	Dibromomethane (Methylene bromide)	Soil	U	90	94	75-130	1.39	30
SW8260B	178EP010	12/20/2010	1,2-Dichlorobenzene	Soil	U	85	87	75-120	0.64	30
SW8260B	178EP010	12/20/2010	1,3-Dichlorobenzene	Soil	U	87	89	70-125	1.87	30
SW8260B	178EP010	12/20/2010	1,4-Dichlorobenzene	Soil	U	88	92	70-125	0.41	30
SW8260B	178EP010	12/20/2010	Dichlorodifluoromethane	Soil	U	80	77	35-135	7.41	30
SW8260B	178EP010	12/20/2010	1,1-Dichloroethane	Soil	U	100	104	75-125	0.00	30
SW8260B	178EP010	12/20/2010	1,2-Dichloroethane	Soil	U	86	93	70-135	3.06	30
SW8260B	178EP010	12/20/2010	1,1-Dichloroethylene	Soil	U	94	95	65-135	2.71	30
SW8260B	178EP010	12/20/2010	cis-1,2-Dichloroethylene	Soil	U	100	101	65-125	2.73	30
SW8260B	178EP010	12/20/2010	trans-1,2-Dichloroethylene	Soil	U	96	97	65-135	2.09	30
SW8260B	178EP010	12/20/2010	1,2-Dichloropropane	Soil	U	87	93	70-120	2.63	30
SW8260B	178EP010	12/20/2010	1,3-Dichloropropane	Soil	U	91	95	75-125	0.00	30
SW8260B	178EP010	12/20/2010	2,2-Dichloropropane	Soil	UJ	113	115	65-135	2.24	30
SW8260B	178EP010	12/20/2010	1,1-Dichloropropene	Soil	U	87	94	70-135	4.24	30
SW8260B	178EP010	12/20/2010	cis-1,3-Dichloropropene	Soil	U	92	98	70-125	2.12	30
SW8260B	178EP010	12/20/2010	trans-1,3-Dichloropropene	Soil	U	96	102	65-125	2.04	30
SW8260B	178EP010	12/20/2010	Ethylbenzene	Soil	U	90	93	75-125	0.60	30
SW8260B	178EP010	12/20/2010	Hexachlorobutadiene	Soil	U	79	79	55-140	3.70	30
SW8260B	178EP010	12/20/2010	2-Hexanone	Soil	U	110	113	45-145	0.98	30
SW8260B	178EP010	12/20/2010	Cumene (isopropylbenzene)	Soil	U	82	85	75-130	0.44	30
SW8260B	178EP010	12/20/2010	Methylene chloride	Soil	U	91	88	55-140	7.35	30
SW8260B	178EP010	12/20/2010	Methyl ethyl ketone (2-Butanone)	Soil	U	114	113	30-160	4.49	30
SW8260B	178EP010	12/20/2010	Methyl isobutyl ketone (4-Methyl-2-pentanone)	Soil	U	102	107	45-145	1.05	30
SW8260B	178EP010	12/20/2010	Naphthalene	Soil	U	90	95	40-125	1.58	30

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8260B	178EP010	12/20/2010	tert-Butyl Methyl Ether	Soil	U	100	100	75-125	4.20	30
SW8260B	178EP010	12/20/2010	n-Propylbenzene	Soil	U	87	91	65-135	0.41	30
SW8260B	178EP010	12/20/2010	Styrene	Soil	U	99	99	75-125	3.50	30
SW8260B	178EP010	12/20/2010	1,1,1,2-Tetrachloroethane	Soil	U	92	93	75-125	2.77	30
SW8260B	178EP010	12/20/2010	1,1,2,2-Tetrachloroethane	Soil	U	87	90	55-130	0.62	30
SW8260B	178EP010	12/20/2010	Tetrachloroethylene (PCE)	Soil	U	86	90	65-140	0.62	30
SW8260B	178EP010	12/20/2010	Toluene	Soil	U	82	86	70-125	1.31	30
SW8260B	178EP010	12/20/2010	1,2,3-Trichlorobenzene	Soil	U	93	93	60-135	3.92	30
SW8260B	178EP010	12/20/2010	1,2,4-Trichlorobenzene	Soil	U	96	99	65-130	1.31	30
SW8260B	178EP010	12/20/2010	1,1,1-Trichloroethane	Soil	U	105	107	70-135	2.59	30
SW8260B	178EP010	12/20/2010	1,1,2-Trichloroethane	Soil	U	90	96	60-125	2.16	30
SW8260B	178EP010	12/20/2010	Trichloroethylene (TCE)	Soil	U	87	92	75-125	1.85	30
SW8260B	178EP010	12/20/2010	Trichlorofluoromethane	Soil	U	99	97	25-185	5.77	30
SW8260B	178EP010	12/20/2010	1,2,3-Trichloropropane	Soil	U	85	88	65-130	0.21	30
SW8260B	178EP010	12/20/2010	1,2,4-Trimethylbenzene	Soil	U	82	86	65-135	1.09	30
SW8260B	178EP010	12/20/2010	1,3,5-Trimethylbenzene	Soil	U	80	82	65-135	1.12	30
SW8260B	178EP010	12/20/2010	Vinyl chloride	Soil	U	84	84	60-125	4.34	30
SW8260B	178EP010	12/20/2010	o-Xylene	Soil	U	87	88	75-125	3.76	30
SW8260B	178EP010	12/20/2010	m,p-Xylene (Sum Of Isomers)	Soil	U	84	87	75-125	1.50	30
SW8270C	178SS007	12/13/2010	Acenaphthene	Soil	U	91	95	45-110	5.77	30
SW8270C	178EP010	12/20/2010	Acenaphthene	Soil	U	101	99	45-110	1.78	30
SW8270C	178SS007	12/13/2010	Acenaphthylene	Soil	U	93	95	45-105	3.79	30
SW8270C	178EP010	12/20/2010	Acenaphthylene	Soil	U	108	106	45-105	1.67	30
SW8270C	178SS007	12/13/2010	Anthracene	Soil	U	96	94	55-105	0.94	30
SW8270C	178EP010	12/20/2010	Anthracene	Soil	U	104	98	55-105	5.55	30
SW8270C	178EP010	12/20/2010	Benzo[a]anthracene	Soil	U	104	102	50-110	1.43	30

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8270C	178SS007	12/13/2010	Benzo[a]anthracene	Soil	U	94	92	50-110	1.60	30
SW8270C	178EP010	12/20/2010	Benzo[a]pyrene	Soil	U	103	100	50-110	3.21	30
SW8270C	178SS007	12/13/2010	Benzo[a]pyrene	Soil	U	93	97	50-110	5.34	30
SW8270C	178EP010	12/20/2010	Benzo[b]fluoranthene	Soil	U	91	88	45-115	2.97	30
SW8270C	178SS007	12/13/2010	Benzo[b]fluoranthene	Soil	U	86	95	45-115	12.15	30
SW8270C	178SS007	12/13/2010	Benzo[g,h,i]perylene	Soil	U	91	95	40-125	5.44	30
SW8270C	178EP010	12/20/2010	Benzo[g,h,i]perylene	Soil	U	139	126	40-125	9.40	30
SW8270C	178SS007	12/13/2010	Benzo[k]fluoranthene	Soil	U	102	96	45-125	5.10	30
SW8270C	178EP010	12/20/2010	Benzo[k]fluoranthene	Soil	U	97	98	45-125	0.91	30
SW8270C	178SS007	12/13/2010	Benzyl alcohol	Soil	U	87	96	20-125	10.73	30
SW8270C	178EP010	12/20/2010	Benzyl alcohol	Soil	U	81	78	20-125	2.97	30
SW8270C	178SS007	12/13/2010	Butyl benzyl phthalate	Soil	U	97	98	50-125	3.05	30
SW8270C	178EP010	12/20/2010	Butyl benzyl phthalate	Soil	U	97	91	50-125	5.35	30
SW8270C	178SS007	12/13/2010	bis(2-Chloroethoxy) methane	Soil	U	87	93	45-110	8.58	30
SW8270C	178EP010	12/20/2010	bis(2-Chloroethoxy) methane	Soil	U	103	96	45-110	6.24	30
SW8270C	178SS007	12/13/2010	bis(2-Chloroethyl)ether	Soil	U	80	89	45-105	12.30	30
SW8270C	178EP010	12/20/2010	bis(2-Chloroethyl)ether	Soil	U	97	91	45-105	5.66	30
SW8270C	178SS007	12/13/2010	bis(2-Chloroisopropyl) Ether	Soil	U	83	91	20-115	11.28	30
SW8270C	178EP010	12/20/2010	bis(2-Chloroisopropyl) Ether	Soil	U	97	92	20-115	4.39	30
SW8270C	178SS007	12/13/2010	bis(2-ethylhexyl)phthalate	Soil	U	101	100	45-125	0.59	30
SW8270C	178EP010	12/20/2010	bis(2-ethylhexyl)phthalate	Soil	U	104	97	45-125	6.49	30
SW8270C	178SS007	12/13/2010	4-Bromophenyl phenyl ether	Soil	U	97	95	45-115	0.00	30
SW8270C	178EP010	12/20/2010	4-Bromophenyl phenyl ether	Soil	U	105	98	45-115	6.72	30
SW8270C	178SS007	12/13/2010	Carbazole	Soil	U	85	86	45-115	1.74	30
SW8270C	178EP010	12/20/2010	Carbazole	Soil	U	92	92	45-115	0.32	30
SW8270C	178SS007	12/13/2010	4-Chloro-3-methylphenol	Soil	U	75	81	45-115	8.80	30

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8270C	178EP010	12/20/2010	4-Chloro-3-methylphenol	Soil	U	72	69	45-115	3.79	30
SW8270C	178SS007	12/13/2010	2-Chloronaphthalene	Soil	U	86	88	45-105	4.10	30
SW8270C	178EP010	12/20/2010	2-Chloronaphthalene	Soil	U	98	97	45-105	1.21	30
SW8270C	178SS007	12/13/2010	2-Chlorophenol	Soil	U	74	82	45-105	10.69	30
SW8270C	178EP010	12/20/2010	2-Chlorophenol	Soil	U	78	74	45-105	5.09	30
SW8270C	178SS007	12/13/2010	4-Chlorophenyl phenyl ether	Soil	U	89	93	45-110	5.58	30
SW8270C	178EP010	12/20/2010	4-Chlorophenyl phenyl ether	Soil	U	98	97	45-110	0.61	30
SW8270C	178EP010	12/20/2010	Chrysene	Soil	U	102	99	55-110	2.35	30
SW8270C	178SS007	12/13/2010	Chrysene	Soil	U	93	100	55-110	8.91	30
SW8270C	178SS007	12/13/2010	Cresols, m & p	Soil	U	77	85	40-105	10.95	30
SW8270C	178EP010	12/20/2010	Cresols, m & p	Soil	U	71	69	40-105	2.52	30
SW8270C	178SS007	12/13/2010	Dibenz[a,h]anthracene	Soil	U	93	100	40-125	8.29	30
SW8270C	178EP010	12/20/2010	Dibenz[a,h]anthracene	Soil	U	120	109	40-125	9.06	30
SW8270C	178EP010	12/20/2010	Dibenzofuran	Soil	U	93	90	50-105	2.58	30
SW8270C	178SS007	12/13/2010	Dibenzofuran	Soil	U	85	90	50-105	6.47	30
SW8270C	178SS007	12/13/2010	1,2-Dichlorobenzene	Soil	U	77	83	45-100	8.50	30
SW8270C	178EP010	12/20/2010	1,2-Dichlorobenzene	Soil	U	89	84	45-100	5.46	30
SW8270C	178SS007	12/13/2010	1,3-Dichlorobenzene	Soil	U	75	80	40-100	7.63	30
SW8270C	178EP010	12/20/2010	1,3-Dichlorobenzene	Soil	U	90	84	40-100	7.16	30
SW8270C	178EP010	12/20/2010	1,4-Dichlorobenzene	Soil	U	90	84	35-105	5.79	30
SW8270C	178SS007	12/13/2010	1,4-Dichlorobenzene	Soil	U	74	80	35-105	8.49	30
SW8270C	178SS007	12/13/2010	2,4-Dichlorophenol	Soil	U	76	81	45-110	8.33	30
SW8270C	178EP010	12/20/2010	2,4-Dichlorophenol	Soil	U	75	73	45-110	2.40	30
SW8270C	178EP010	12/20/2010	Diethyl phthalate	Soil	U	99	96	50-115	2.74	30
SW8270C	178SS007	12/13/2010	Diethyl phthalate	Soil	U	89	95	50-115	8.05	30
SW8270C	178SS007	12/13/2010	2,4-Dimethylphenol	Soil	U	70	76	30-105	10.18	30

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8270C	178EP010	12/20/2010	2,4-Dimethylphenol	Soil	U	76	74	30-105	2.75	30
SW8270C	178SS007	12/13/2010	Dimethyl phthalate	Soil	U	90	95	50-110	5.79	30
SW8270C	178EP010	12/20/2010	Dimethyl phthalate	Soil	U	104	99	50-110	4.66	30
SW8270C	178EP010	12/20/2010	Di-n-Butyl Phthalate	Soil	U	104	101	55-110	3.17	30
SW8270C	178SS007	12/13/2010	Di-n-Butyl Phthalate	Soil	U	96	93	55-110	2.21	30
SW8270C	178SS007	12/13/2010	4,6-Dinitro-2-methylphenol	Soil	U	77	73	30-135	3.58	30
SW8270C	178EP010	12/20/2010	4,6-Dinitro-2-methylphenol	Soil	U	55	64	30-135	14.93	30
SW8270C	178EP010	12/20/2010	2,4-Dinitrophenol	Soil	U	40	44	15-130	10.53	30
SW8270C	178SS007	12/13/2010	2,4-Dinitrophenol	Soil	U	62	60	15-130	0.98	30
SW8270C	178SS007	12/13/2010	2,4-Dinitrotoluene	Soil	U	86	91	50-115	7.08	30
SW8270C	178EP010	12/20/2010	2,4-Dinitrotoluene	Soil	U	93	91	50-115	1.92	30
SW8270C	178EP010	12/20/2010	2,6-Dinitrotoluene	Soil	U	98	95	50-110	3.37	30
SW8270C	178SS007	12/13/2010	2,6-Dinitrotoluene	Soil	U	87	86	50-110	0.34	30
SW8270C	178SS007	12/13/2010	di-n-Octyl phthalate	Soil	U	93	93	40-130	1.59	30
SW8270C	178EP010	12/20/2010	di-n-Octyl phthalate	Soil	U	117	112	40-130	4.12	30
SW8270C	178EP010	12/20/2010	Fluoranthene	Soil	U	100	106	55-115	5.75	30
SW8270C	178SS007	12/13/2010	Fluoranthene	Soil	U	94	97	55-115	4.06	30
SW8270C	178SS007	12/13/2010	Fluorene	Soil	U	90	95	50-110	6.43	30
SW8270C	178EP010	12/20/2010	Fluorene	Soil	U	98	98	50-110	0.90	30
SW8270C	178EP010	12/20/2010	Hexachlorobenzene	Soil	U	98	91	45-120	7.18	30
SW8270C	178SS007	12/13/2010	Hexachlorobenzene	Soil	U	94	90	45-120	3.25	30
SW8270C	178SS007	12/13/2010	Hexachlorobutadiene	Soil	U	81	84	40-115	5.41	30
SW8270C	178EP010	12/20/2010	Hexachlorobutadiene	Soil	U	94	90	40-115	4.20	30
SW8270C	178EP010	12/20/2010	Hexachloroethane	Soil	U	89	84	35-110	5.50	30
SW8270C	178SS007	12/13/2010	Hexachloroethane	Soil	U	75	82	35-110	9.85	30
SW8270C	178SS007	12/13/2010	Indeno[1,2,3-cd]pyrene	Soil	U	90	96	40-120	8.31	30

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8270C	178EP010	12/20/2010	Indeno[1,2,3-cd]pyrene	Soil	U	154	141	40-120	8.63	30
SW8270C	178EP010	12/20/2010	Isophorone	Soil	U	97	94	45-110	3.11	30
SW8270C	178SS007	12/13/2010	Isophorone	Soil	U	82	89	45-110	9.39	30
SW8270C	178SS007	12/13/2010	2-Methylnaphthalene	Soil	U	80	86	45-105	8.20	30
SW8270C	178EP010	12/20/2010	2-Methylnaphthalene	Soil	U	89	86	45-105	2.71	30
SW8270C	178EP010	12/20/2010	2-Methylphenol	Soil	U	75	71	40-105	4.46	30
SW8270C	178SS007	12/13/2010	2-Methylphenol	Soil	U	75	82	40-105	10.25	30
SW8270C	178SS007	12/13/2010	Naphthalene	Soil	U	87	92	40-105	6.97	30
SW8270C	178EP010	12/20/2010	Naphthalene	Soil	U	100	97	40-105	3.01	30
SW8270C	178EP010	12/20/2010	2-Nitroaniline	Soil	U	93	91	45-120	1.94	30
SW8270C	178SS007	12/13/2010	2-Nitroaniline	Soil	U	83	88	45-120	7.30	30
SW8270C	178SS007	12/13/2010	3-Nitroaniline	Soil	U	48	54	25-110	14.04	30
SW8270C	178EP010	12/20/2010	3-Nitroaniline	Soil	U	68	74	25-110	7.90	30
SW8270C	178SS007	12/13/2010	4-Nitroaniline	Soil	U	77	84	35-115	9.14	30
SW8270C	178EP010	12/20/2010	4-Nitroaniline	Soil	U	78	79	35-115	2.25	30
SW8270C	178SS007	12/13/2010	Nitrobenzene	Soil	U	81	86	40-115	7.12	30
SW8270C	178EP010	12/20/2010	Nitrobenzene	Soil	U	100	96	40-115	3.93	30
SW8270C	178EP010	12/20/2010	2-Nitrophenol	Soil	U	89	83	40-110	6.21	30
SW8270C	178SS007	12/13/2010	2-Nitrophenol	Soil	U	76	81	40-110	7.18	30
SW8270C	178EP010	12/20/2010	4-Nitrophenol	Soil	U	75	82	15-140	9.09	30
SW8270C	178SS007	12/13/2010	4-Nitrophenol	Soil	U	70	76	15-140	9.41	30
SW8270C	178SS007	12/13/2010	N-Nitrosodimethylamine	Soil	U	71	82	20-115	15.56	30
SW8270C	178EP010	12/20/2010	N-Nitrosodimethylamine	Soil	U	100	95	20-115	4.54	30
SW8270C	178EP010	12/20/2010	N-Nitrosodi-n-propylamine	Soil	U	96	92	40-115	4.08	30
SW8270C	178SS007	12/13/2010	N-Nitrosodi-n-propylamine	Soil	U	88	96	40-115	9.71	30
SW8270C	178SS007	12/13/2010	N-Nitrosodiphenylamine	Soil	U	102	101	50-115	0.60	30

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8270C	178EP010	12/20/2010	N-Nitrosodiphenylamine	Soil	U	115	105	50-115	8.50	30
SW8270C	178EP010	12/20/2010	Pentachlorophenol	Soil	U	111	111	25-120	0.00	30
SW8270C	178SS007	12/13/2010	Pentachlorophenol	Soil	U	70	69	25-120	0.43	30
SW8270C	178SS007	12/13/2010	Phenanthrene	Soil	U	95	96	50-110	1.86	30
SW8270C	178EP010	12/20/2010	Phenanthrene	Soil	U	103	101	50-110	2.32	30
SW8270C	178SS007	12/13/2010	Phenol	Soil	U	74	83	40-100	12.12	30
SW8270C	178EP010	12/20/2010	Phenol	Soil	U	74	71	40-100	3.67	30
SW8270C	178SS007	12/13/2010	Pyrene	Soil	U	94	96	45-125	3.12	30
SW8270C	178EP010	12/20/2010	Pyrene	Soil	U	92	84	45-125	8.40	30
SW8270C	178EP010	12/20/2010	1,2,4-Trichlorobenzene	Soil	U	93	89	45-110	4.21	30
SW8270C	178SS007	12/13/2010	1,2,4-Trichlorobenzene	Soil	U	81	87	45-110	8.48	30
SW8270C	178SS007	12/13/2010	2,4,5-Trichlorophenol	Soil	U	80	84	50-110	6.17	30
SW8270C	178EP010	12/20/2010	2,4,5-Trichlorophenol	Soil	U	77	74	50-110	3.92	30
SW8270C	178EP010	12/20/2010	2,4,6-Trichlorophenol	Soil	U	78	76	45-110	1.54	30
SW8270C	178SS007	12/13/2010	2,4,6-Trichlorophenol	Soil	U	78	82	45-110	5.97	30
SW8330	178SS007	12/13/2010	2-Amino-4,6-Dinitrotoluene	Soil	U	99	98	80-125	0.41	20
SW8330	178EP001	12/14/2010	2-Amino-4,6-Dinitrotoluene	Soil	U	109	101	80-125	5.61	20
SW8330	178EP010	12/20/2010	2-Amino-4,6-Dinitrotoluene	Soil	U	98	98	80-125	1.44	20
SW8330	178EP010	12/20/2010	4-Amino-2,6-Dinitrotoluene	Soil	U	98	97	80-125	1.65	20
SW8330	178SS007	12/13/2010	4-Amino-2,6-Dinitrotoluene	Soil	U	100	98	80-125	1.02	20
SW8330	178EP001	12/14/2010	4-Amino-2,6-Dinitrotoluene	Soil	U	110	102	80-125	5.55	20
SW8330	178SS007	12/13/2010	1,3-Dinitrobenzene	Soil	U	99	100	80-125	1.82	20
SW8330	178EP010	12/20/2010	1,3-Dinitrobenzene	Soil	U	100	99	80-125	1.42	20
SW8330	178EP001	12/14/2010	1,3-Dinitrobenzene	Soil	U	113	103	80-125	7.91	20
SW8330	178SS007	12/13/2010	2,4-Dinitrotoluene	Soil	U	99	98	80-125	0.20	20
SW8330	178EP001	12/14/2010	2,4-Dinitrotoluene	Soil	U	107	100	80-125	4.51	20

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8330	178EP010	12/20/2010	2,4-Dinitrotoluene	Soil	U	98	97	80-125	2.07	20
SW8330	178SS007	12/13/2010	2,6-Dinitrotoluene	Soil	U	97	98	80-120	1.24	20
SW8330	178EP001	12/14/2010	2,6-Dinitrotoluene	Soil	U	107	100	80-120	4.72	20
SW8330	178EP010	12/20/2010	2,6-Dinitrotoluene	Soil	U	98	97	80-120	1.85	20
SW8330	178EP010	12/20/2010	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine	Soil	U	95	95	70-135	0.21	20
SW8330	178SS007	12/13/2010	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine	Soil	U	93	94	70-135	0.65	20
SW8330	178EP001	12/14/2010	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine	Soil	U	114	100	70-135	11.76	20
SW8330	178SS007	12/13/2010	Nitrobenzene	Soil	U	95	100	75-125	5.60	20
SW8330	178EP010	12/20/2010	Nitrobenzene	Soil	U	100	100	75-125	0.80	20
SW8330	178EP001	12/14/2010	Nitrobenzene	Soil	U	100	99	75-125	0.00	20
SW8330	178EP001	12/14/2010	Nitroglycerin	Soil	U	102	98	70-135	3.15	20
SW8330	178SS007	12/13/2010	Nitroglycerin	Soil	U	95	94	70-135	1.49	20
SW8330	178EP010	12/20/2010	Nitroglycerin	Soil	U	94	95	70-135	0.32	20
SW8330	178EP010	12/20/2010	2-Nitrotoluene	Soil	U	98	98	80-125	1.03	20
SW8330	178EP001	12/14/2010	2-Nitrotoluene	Soil	U	95	97	80-125	3.61	20
SW8330	178SS007	12/13/2010	2-Nitrotoluene	Soil	U	93	98	80-125	5.92	20
SW8330	178EP001	12/14/2010	3-Nitrotoluene	Soil	U	96	96	75-120	2.33	20
SW8330	178SS007	12/13/2010	3-Nitrotoluene	Soil	U	92	98	75-120	6.57	20
SW8330	178EP010	12/20/2010	3-Nitrotoluene	Soil	U	98	97	75-120	1.44	20
SW8330	178EP010	12/20/2010	4-Nitrotoluene	Soil	U	98	97	75-125	2.28	20
SW8330	178EP001	12/14/2010	4-Nitrotoluene	Soil	U	97	96	75-125	0.84	20
SW8330	178SS007	12/13/2010	4-Nitrotoluene	Soil	U	93	97	75-125	4.87	20
SW8330	178EP001	12/14/2010	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Soil	U	111	102	75-125	7.07	20
SW8330	178SS007	12/13/2010	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Soil	U	98	97	75-125	0.21	20
SW8330	178EP010	12/20/2010	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Soil	U	97	96	75-125	1.67	20
SW8330	178EP010	12/20/2010	Pentaerythritol Tetranitrate	Soil	U	97	93	70-135	4.85	20

Method	Location	Date	Analyte	Matrix	Flag		Matrix Spike %Recovery		Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW8330	178EP001	12/14/2010	Pentaerythritol Tetranitrate	Soil	U		99		97	70-135	1.24	20
SW8330	178SS007	12/13/2010	Pentaerythritol Tetranitrate	Soil	U		96		97	70-135	0.94	20
SW8330	178EP010	12/20/2010	Tetryl	Soil	U		92		91	10-150	2.19	20
SW8330	178SS007	12/13/2010	Tetryl	Soil	U		85		85	10-150	0.24	20
SW8330	178EP001	12/14/2010	Tetryl	Soil	U		89		86	10-150	2.56	20
SW8330	178SS007	12/13/2010	1,3,5-Trinitrobenzene	Soil	U		101		100	75-125	0.20	20
SW8330	178EP001	12/14/2010	1,3,5-Trinitrobenzene	Soil	U		111		103	75-125	6.26	20
SW8330	178EP010	12/20/2010	1,3,5-Trinitrobenzene	Soil	U		100		99	75-125	1.42	20
SW8330	178EP001	12/14/2010	2,4,6-Trinitrotoluene	Soil	U		85		81	55-140	4.40	20
SW8330	178SS007	12/13/2010	2,4,6-Trinitrotoluene	Soil	U		80		79	55-140	0.25	20
SW8330	178EP010	12/20/2010	2,4,6-Trinitrotoluene	Soil	U		92		91	55-140	1.76	20
SW6010B	178SS007	12/13/2010	Aluminum	Soil			507		595	80-120	7.26	20
SW6010B	178EP001	12/14/2010	Aluminum	Soil			-398		-224	80-120	8.61	20
SW6010B	178EP010	12/20/2010	Aluminum	Soil			455		460	80-120	0.39	20
SW6010B	178EP001	12/14/2010	Antimony	Soil	J	*	36	*	35	80-120	3.32	20
SW6010B	178SS007	12/13/2010	Antimony	Soil	UJ	*	45	*	40	80-120	10.59	20
SW6010B	178EP010	12/20/2010	Antimony	Soil	UJ	*	57	*	57	80-120	0.86	20
SW6010B	178SS007	12/13/2010	Arsenic	Soil	J		89		87	80-120	2.09	20
SW6010B	178EP001	12/14/2010	Arsenic	Soil	J	*	66	*	65	80-120	0.46	20
SW6010B	178EP010	12/20/2010	Arsenic	Soil	J		92		92	80-120	0.00	20
SW6010B	178SS007	12/13/2010	Barium	Soil	J	*	36	*	17	80-120	6.12	20
SW6010B	178EP001	12/14/2010	Barium	Soil			5		-15	80-120	3.54	20
SW6010B	178EP010	12/20/2010	Barium	Soil			108		104	80-120	0.87	20
SW6010B	178EP001	12/14/2010	Beryllium	Soil	U		92		90	80-120	2.74	20
SW6010B	178SS007	12/13/2010	Beryllium	Soil	U		87		85	80-120	2.29	20
SW6010B	178EP010	12/20/2010	Beryllium	Soil	U		83		84	80-120	0.59	20

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery		Spike Duplicate %Recovery		Spike Limits	RPD	RPD Limits
SW6010B	178EP001	12/14/2010	Cadmium	Soil	J	89		86		80-120	3.39	20
SW6010B	178SS007	12/13/2010	Cadmium	Soil	J	81	*	79		80-120	2.44	20
SW6010B	178EP010	12/20/2010	Cadmium	Soil	U	86		87		80-120	0.57	20
SW6010B	178SS007	12/13/2010	Calcium	Soil		591		837		80-120	2.99	20
SW6010B	178EP001	12/14/2010	Calcium	Soil		-4182		-3843		80-120	9.26	20
SW6010B	178EP010	12/20/2010	Calcium	Soil		166		157		80-120	1.23	20
SW6010B	178EP001	12/14/2010	Chromium, Total	Soil		90		89		80-120	0.83	20
SW6010B	178EP010	12/20/2010	Chromium, Total	Soil		89		90		80-120	0.90	20
SW6010B	178SS007	12/13/2010	Chromium, Total	Soil		89		88		80-120	1.43	20
SW6010B	178EP010	12/20/2010	Cobalt	Soil		88		87		80-120	1.02	20
SW6010B	178SS007	12/13/2010	Cobalt	Soil		83		81		80-120	2.26	20
SW6010B	178EP001	12/14/2010	Cobalt	Soil		89		90		80-120	0.51	20
SW6010B	178SS007	12/13/2010	Copper	Soil		92		91		80-120	0.50	20
SW6010B	178EP001	12/14/2010	Copper	Soil	J	96		95		80-120	0.90	20
SW6010B	178EP010	12/20/2010	Copper	Soil		90		91		80-120	1.47	20
SW6010B	178EP001	12/14/2010	Iron	Soil		30		368		80-120	10.85	20
SW6010B	178SS007	12/13/2010	Iron	Soil		305		463		80-120	7.44	20
SW6010B	178EP010	12/20/2010	Iron	Soil		294		245		80-120	1.62	20
SW6010B	178EP001	12/14/2010	Lead	Soil		91		90		80-120	0.46	20
SW6010B	178EP010	12/20/2010	Lead	Soil		88		87		80-120	0.95	20
SW6010B	178SS007	12/13/2010	Lead	Soil		83		82		80-120	1.53	20
SW6010B	178EP010	12/20/2010	Magnesium	Soil	J	* 158	*	153		80-120	0.97	20
SW6010B	178SS007	12/13/2010	Magnesium	Soil	J	* 176	*	220		80-120	8.53	20
SW6010B	178EP001	12/14/2010	Magnesium	Soil		30		105		80-120	8.55	20
SW6010B	178SS007	12/13/2010	Manganese	Soil	J	107	*	139		80-120	7.49	20
SW6010B	178EP001	12/14/2010	Manganese	Soil		244		219		80-120	2.71	20

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery		Spike Duplicate %Recovery		Spike Limits	RPD	RPD Limits
SW6010B	178EP010	12/20/2010	Manganese	Soil		90		82		80-120	1.77	20
SW7471A	178EP001	12/14/2010	Mercury	Soil	U	92		100		80-120	8.33	20
SW7471A	178SS007	12/13/2010	Mercury	Soil	U	91		94		80-120	4.26	20
SW7471A	178EP010	12/20/2010	Mercury	Soil	J	96		100		80-120	3.92	20
SW6010B	178EP010	12/20/2010	Molybdenum	Soil	U	90		91		80-120	0.54	20
SW6010B	178EP001	12/14/2010	Molybdenum	Soil	J	85		84		80-120	1.75	20
SW6010B	178SS007	12/13/2010	Molybdenum	Soil	J	84		81		80-120	3.57	20
SW6010B	178EP001	12/14/2010	Nickel	Soil		87		88		80-120	0.96	20
SW6010B	178SS007	12/13/2010	Nickel	Soil		82		81		80-120	1.10	20
SW6010B	178EP010	12/20/2010	Nickel	Soil		87		86		80-120	0.99	20
SW6010B	178EP001	12/14/2010	Potassium	Soil	J	* 20		* 37		80-120	5.71	20
SW6010B	178EP010	12/20/2010	Potassium	Soil		116		116		80-120	0.24	20
SW6010B	178SS007	12/13/2010	Potassium	Soil	J	111		113		80-120	1.19	20
SW6010B	178EP001	12/14/2010	Selenium	Soil	U	89		87		80-120	1.70	20
SW6010B	178SS007	12/13/2010	Selenium	Soil	U	85		84		80-120	0.58	20
SW6010B	178EP010	12/20/2010	Selenium	Soil	U	86		86		80-120	0.57	20
SW6010B	178EP001	12/14/2010	Silver	Soil	U	94		92		75-120	2.68	20
SW6010B	178EP010	12/20/2010	Silver	Soil	U	87		88		75-120	0.56	20
SW6010B	178SS007	12/13/2010	Silver	Soil	U	89		88		75-120	1.67	20
SW6010B	178EP001	12/14/2010	Sodium	Soil		83		84		80-120	0.67	20
SW6010B	178EP010	12/20/2010	Sodium	Soil		98		100		80-120	1.16	20
SW6010B	178SS007	12/13/2010	Sodium	Soil	J	92		92		80-120	0.00	20
SW6010B	178EP010	12/20/2010	Thallium	Soil	U	88		88		80-120	0.00	20
SW6010B	178SS007	12/13/2010	Thallium	Soil	U	83		81		80-120	2.40	20
SW6010B	178EP001	12/14/2010	Thallium	Soil	U	88		87		80-120	1.14	20
SW6010B	178EP010	12/20/2010	Vanadium	Soil		94		92		80-120	0.86	20

Method	Location	Date	Analyte	Matrix	Flag	Matrix Spike %Recovery	Spike Duplicate %Recovery	Spike Limits	RPD	RPD Limits
SW6010B	178EP001	12/14/2010	Vanadium	Soil		85	93	80-120	4.69	20
SW6010B	178SS007	12/13/2010	Vanadium	Soil		100	99	80-120	0.96	20
SW6010B	178EP010	12/20/2010	Zinc	Soil		93	92	80-120	0.97	20
SW6010B	178SS007	12/13/2010	Zinc	Soil		89	91	80-120	1.53	20
SW6010B	178EP001	12/14/2010	Zinc	Soil		89	97	80-120	4.85	20

Notes:
1) Flag definitions are on Tables C.2.
2) "*" = matrix spike and/or matrix spike duplicate %Recovery is outside control limits.
3) RPD = Relative Percent Difference.
4) Bold RPD results are outside control limit.

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	1,1-Dichloroethene	1,2,4-Trichlorobenzene	1,2-Dichlorobenzene	1,2-Dichloroethane	1,2-Diphenylhydrazine	1,3,5-Trinitrobenzene	1,3-Dichlorobenzene	1,3-Dinitrobenzene	1,4-Dichlorobenzene	2,4,5-Trichlorophenol	2,4,6-Trichlorophenol	2,4,6-Trinitrotoluene	2,4-D (Dichlorophenoxyacetic Acid)	2,4-Dichlorophenol	2,4-Dimethylphenol	2,4-Dinitrophenol
178A-SS01	0-0.5	N	10/7/2009	MG/KG		<0.0155 U	<0.0113 U		<0.00974 U	<0.0427 U	<0.0166 U	<0.0248 U	<0.0102 U	<0.00579 U	<0.00812 U	<0.0734 U		<0.00961 U	<0.0804 U	<0.114 U
178A-SS02	0-0.5	N	10/7/2009	MG/KG		<0.0156 U	<0.0113 U		<0.00977 U	<0.043 U	<0.0167 U	<0.025 U	<0.0102 U	<0.0058 U	<0.00815 U	<0.0738 U		<0.00965 U	<0.0807 U	<0.114 U
178B-SS01	0-0.5	N	10/7/2009	MG/KG		<0.0155 U	<0.0112 U		<0.0097 U	<0.0426 U	<0.0166 U	<0.0247 U	<0.0101 U	<0.00576 U	<0.00809 U	<0.0731 U		<0.00958 U	<0.0801 U	<0.113 U
178B-SS02	0-0.5	N	10/7/2009	MG/KG		<0.0154 U	<0.0112 U		<0.00963 U	<0.0424 U	<0.0165 U	<0.0246 U	<0.0101 U	<0.00573 U	<0.00804 U	<0.0729 U		<0.00952 U	<0.0796 U	<0.113 U
178B-SS02	0-0.5	N	10/7/2009	UG/L																
YPG-178B-SS01	0-0	N	11/3/2009	UG/L	<4.8 U			<2.6 U									<0.05 U			
YPG-178B-SS02	0-0	N	11/3/2009	UG/L	<4.8 U			<2.6 U									<0.05 U			
YPG-178-SS01	0-0	N	11/3/2009	UG/L	<4.8 U			<2.6 U									<0.05 U			
YPG-178-SS02	0-0	N	11/3/2009	UG/L	<4.8 U			<2.6 U									<0.05 U			

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	2,4-Dinitrotoluene	2,6-Dichlorophenol	2,6-Dinitrotoluene	2-Amino-4,6-Dinitrotoluene	2-Chloronaphthalene	2-Chlorophenol	2-Methylnaphthalene	2-Methylphenol (o-Cresol)	2-Nitroaniline	2-Nitrophenol	2-Nitrotoluene	3,3'-Dichlorobenzidine	3-Nitroaniline	3-Nitrotoluene	4,6-Dinitro-2-Methylphenol
178A-SS01	0-0.5	N	10/7/2009	MG/KG	<0.0459 U	<0.0134 U	<0.0839 U	<0.0655 UJ	<0.00824 U	<0.0139 U	0.0117 J	<0.0142 U	<0.00809 U	<0.0109 U	<0.025 U	<0.106 UJ	<0.0398 U	<0.0836 U	<0.105 U
178A-SS02	0-0.5	N	10/7/2009	MG/KG	<0.0462 U	<0.0134 U	<0.0844 U	<0.0659 UJ	<0.00827 U	<0.014 U	<0.0113 U	<0.0143 U	<0.00812 U	<0.0109 U	<0.0252 U	<0.106 UJ	<0.0399 U	<0.0841 U	<0.105 U
178B-SS01	0-0.5	N	10/7/2009	MG/KG	<0.0457 U	<0.0134 U	<0.0835 U	<0.0653 UJ	<0.00821 U	<0.0139 U	<0.0112 U	<0.0142 U	<0.00806 U	<0.0108 U	<0.0249 U	<0.105 UJ	<0.0397 U	<0.0832 U	<0.104 U
178B-SS02	0-0.5	N	10/7/2009	MG/KG	<0.0455 U	<0.0133 U	<0.0833 U	<0.065 UJ	<0.00816 U	<0.0138 U	<0.0112 U	<0.0141 U	<0.00801 U	<0.0108 U	<0.0248 U	<0.105 UJ	<0.0394 U	<0.083 U	<0.104 U
178B-SS02	0-0.5	N	10/7/2009	UG/L															
YPG-178B-SS01	0-0	N	11/3/2009	UG/L															
YPG-178B-SS02	0-0	N	11/3/2009	UG/L															
YPG-178-SS01	0-0	N	11/3/2009	UG/L															
YPG-178-SS02	0-0	N	11/3/2009	UG/L															

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	4-Amino-2,6-Dinitrotoluene	4-Bromophenyl Phenyl Ether	4-Chloro-3-Methylphenol	4-Chloroaniline	4-Chlorophenyl Phenyl Ether	4-Nitroaniline	4-Nitrophenol	4-Nitrotoluene	Acenaphthene	Acenaphthylene	Aluminum	Anthracene	Antimony	Arsenic	Barium	Benzene	Benzidine
178A-SS01	0-0.5	N	10/7/2009	MG/KG	<0.0461 U	<0.0116 U	<0.00864 U	<0.00726 U	<0.00619 U	<0.0055 U	<0.0376 U	<0.0507 U	<0.0105 U	<0.00977 U	8150	0.0106 J	<1.68 U	2.6 J	173		<1.66 U
178A-SS02	0-0.5	N	10/7/2009	MG/KG	<0.0464 U	<0.0116 U	<0.00866 U	<0.00728 U	<0.00621 U	<0.00552 U	<0.0377 U	<0.051 U	<0.0105 U	<0.0098 U	10900	<0.00429 U	0.41 J	5.55	253		<1.67 U
178B-SS01	0-0.5	N	10/7/2009	MG/KG	<0.0459 U	<0.0115 U	<0.0086 U	<0.00723 U	<0.00616 U	<0.00548 U	<0.0374 U	<0.0505 U	<0.0104 U	<0.00973 U	4240	<0.00426 U	0.87 J	2.63	118		<1.66 U
178B-SS02	0-0.5	N	10/7/2009	MG/KG	<0.0457 U	<0.0115 U	<0.00855 U	<0.00718 U	<0.00612 U	<0.00545 U	<0.0372 U	<0.0503 U	<0.0104 U	<0.00966 U	2700	<0.00423 U	1.49 J	3.25	179		<1.65 U
178B-SS02	0-0.5	N	10/7/2009	UG/L														<3 U	410 J		
YPG-178B-SS01	0-0	N	11/3/2009	UG/L																<3 U	
YPG-178B-SS02	0-0	N	11/3/2009	UG/L																<3 U	
YPG-178-SS01	0-0	N	11/3/2009	UG/L																<3 U	
YPG-178-SS02	0-0	N	11/3/2009	UG/L																<3 U	

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Benzoic Acid	Benzyl Alcohol	Benzyl Butyl Phthalate	Beryllium	bis(2-Chloroethoxy) Methane	bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	bis(2-Chloroisopropyl) Ether	bis(2-Ethylhexyl) Phthalate	Cadmium	Calcium	Carbazole
178A-SS01	0-0.5	N	10/7/2009	MG/KG	0.0545 J	0.0444 J	0.0758 J	<0.0297 U	<0.0619 U	<0.0217 U	<0.00945 U	<0.0137 U	0.59 J	<0.00936 U	<0.145 U	<0.0743 U	<0.0232 U	0.23 J	10000	<0.00637 U
178A-SS02	0-0.5	N	10/7/2009	MG/KG	0.0316 J	0.0426 J	0.0514 J	<0.0298 U	<0.0621 U	<0.0217 UJ	<0.00948 U	<0.0138 U	0.61	<0.00939 U	<0.146 U	<0.0745 U	<0.0233 U	0.81	30500	<0.00639 U
178B-SS01	0-0.5	N	10/7/2009	MG/KG	<0.00491 U	<0.0236 U	<0.0225 U	<0.0296 U	<0.0616 U	<0.0216 U	<0.00942 U	<0.0137 U	0.23	<0.00933 U	<0.145 U	<0.074 U	<0.0231 U	0.49	10200	<0.00634 U
178B-SS02	0-0.5	N	10/7/2009	MG/KG	<0.00488 U	<0.0234 U	<0.0223 U	<0.0294 U	<0.0612 U	<0.0214 U	<0.00936 U	<0.0136 U	0.14 J	<0.00927 U	<0.144 U	<0.0735 U	<0.0229 U	0.6	19000	<0.0063 U
178B-SS02	0-0.5	N	10/7/2009	UG/L														4.9 J		
YPG-178B-SS01	0-0	N	11/3/2009	UG/L																
YPG-178B-SS02	0-0	N	11/3/2009	UG/L																
YPG-178-SS01	0-0	N	11/3/2009	UG/L																
YPG-178-SS02	0-0	N	11/3/2009	UG/L																

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	Carbon Tetrachloride	Chlordane	Chlorobenzene	Chloroform	Chromium, Total	Chrysene	Cobalt	Copper	Cresols, m & p	Dibenz(a,h)anthracene	Dibenzofuran	Diethyl Phthalate	Dimethyl Phthalate	Di-n-Butyl Phthalate	Di-n-Octyl Phthalate	Endrin	Fluoranthene	Fluorene
178A-SS01	0-0.5	N	10/7/2009	MG/KG					0.19 J	0.0737 J	2.02	20.4	<0.0111 U	<0.0188 U	<0.00914 U	<0.123 U	<0.00878 U	0.0274 J	<0.0239 U		0.0761 J	<0.00894 U
178A-SS02	0-0.5	N	10/7/2009	MG/KG					3.09	0.0372 J	2.27	35	<0.0111 U	<0.0189 U	<0.00917 U	<0.123 U	<0.00881 U	0.023 J	<0.024 U		0.0241 J	<0.00897 U
178B-SS01	0-0.5	N	10/7/2009	MG/KG					3.59	<0.00849 U	2.2	15.6	<0.011 U	<0.0188 U	<0.00911 U	<0.122 U	<0.00874 U	0.0228 J	<0.0238 U		<0.00575 U	<0.0089 U
178B-SS02	0-0.5	N	10/7/2009	MG/KG					1.56	<0.00844 U	2.37	103	<0.011 U	<0.0187 U	<0.00905 U	<0.122 U	<0.00869 U	0.0291 J	<0.0236 U		<0.00572 U	<0.00885 U
178B-SS02	0-0.5	N	10/7/2009	UG/L					<0.3													
YPG-178B-SS01	0-0	N	11/3/2009	UG/L	<3.3 U	<0.16 U	<2.9 U	<11 U												<0.03 U		
YPG-178B-SS02	0-0	N	11/3/2009	UG/L	<3.3 U	<0.16 U	<2.9 U	<11 U												<0.03 U		
YPG-178-SS01	0-0	N	11/3/2009	UG/L	<3.3 U	<0.16 U	<2.9 U	<11 U												<0.03 U		
YPG-178-SS02	0-0	N	11/3/2009	UG/L	<3.3 U	<0.16 U	<2.9 U	<11 U												<0.03 U		

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	gamma-BHC (Lindane)	Heptachlor	Heptachlor Epoxide	Hexachlorobenzene	Hexachlorobutadiene	Hexachloroethane	Hexahydro-1,3,5-Trinitro-1,3,5-Triazine	Indeno(1,2,3-c,d)pyrene	Iron	Isophorone	Lead	Magnesium	Manganese	Mercury	Methoxychlor	Methyl Ethyl Ketone (2-Butanone)	Molybdenum	Naphthalene	Nickel
178A-SS01	0-0.5	N	10/7/2009	MG/KG				<0.0106 U	<0.0687 U	<0.0194 U	<0.0385 U	<0.0509 U	5630	<0.00977 U	48.7	1230	5360	0.018			2.11 J	<0.0833 U	6.8 J
178A-SS02	0-0.5	N	10/7/2009	MG/KG				<0.0106 U	<0.069 U	<0.0194 U	<0.0388 U	<0.0511 U	7770	<0.0098 U	99.2	3530	409	0.11			2.71	<0.0836 U	4.89
178B-SS01	0-0.5	N	10/7/2009	MG/KG				<0.0105 U	<0.0685 U	<0.0193 U	<0.0384 U	<0.0507 U	6490	<0.00973 U	75.8	1580	665	0.056			0.44 J	<0.083 U	4.38
178B-SS02	0-0.5	N	10/7/2009	MG/KG				<0.0105 U	<0.068 U	<0.0191 U	<0.0382 U	<0.0504 U	11500	<0.00966 U	133	1530	663	0.018			0.73 J	<0.0825 U	5.8
178B-SS02	0-0.5	N	10/7/2009	UG/L											110			<0.1					
YPG-178B-SS01	0-0	N	11/3/2009	UG/L	<0.03 U	<0.02 U	<0.05 U												<0.09 U	<16 U			
YPG-178B-SS02	0-0	N	11/3/2009	UG/L	<0.03 U	<0.02 U	<0.05 U												<0.09 U	<16 U			
YPG-178-SS01	0-0	N	11/3/2009	UG/L	<0.03 U	<0.02 U	<0.05 U												<0.09 U	<16 U			
YPG-178-SS02	0-0	N	11/3/2009	UG/L	<0.03 U	<0.02 U	<0.05 U												<0.09 U	<16 U			

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	Nitrobenzene	N-Nitrosodimethylamine	N-Nitrosodi-n-Propylamine	N-Nitrosodiphenylamine	N-Nitrosopyrrolidine	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Pentachlorophenol	Phenanthrene	Phenol	Potassium	Pyrene	Reactivity	Selenium	Silver	Silvex (2,4,5-TP)	Sodium	Sulfide
178A-SS01	0-0.5	N	10/7/2009	MG/KG	<0.0729 U	<0.089 U	<0.0135 U	<0.00743 U	<0.333 U	<0.0363 U	<0.0204 U	0.0575 J	<0.00907 U	918	0.0861 J	<250 U	<1.23 U	<0.15 U		461	<80 U
178A-SS02	0-0.5	N	10/7/2009	MG/KG	<0.0731 U	<0.0893 U	<0.0135 U	<0.00745 U	<0.334 U	<0.0365 U	<0.0204 U	0.0164 J	<0.0091 U	3640	0.0242 J	<250 U	0.33 J	0.5		3220	<80 U
178B-SS01	0-0.5	N	10/7/2009	MG/KG	<0.0726 U	<0.0886 U	<0.0135 U	<0.0074 U	<0.331 U	<0.0362 U	<0.0203 U	<0.00783 U	<0.00904 U	1020	<0.00961 U	<250 U	0.61 J	0.25 J		8650	<80 U
178B-SS02	0-0.5	N	10/7/2009	MG/KG	<0.0721 U	<0.0881 U	<0.0134 U	<0.00735 U	<0.329 U	<0.036 U	<0.0201 U	<0.00778 U	<0.00898 U	803	<0.00955 U	<250 U	0.64 J	<0.031		523	<80 U
178B-SS02	0-0.5	N	10/7/2009	UG/L													28 J	9.9 J			
YPG-178B-SS01	0-0	N	11/3/2009	UG/L															<0.06 U		
YPG-178B-SS02	0-0	N	11/3/2009	UG/L															<0.06 U		
YPG-178-SS01	0-0	N	11/3/2009	UG/L															<0.06 U		
YPG-178-SS02	0-0	N	11/3/2009	UG/L															<0.06 U		

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

TABLE C.5
ANALYTICAL DATA
YPG-178
US ARMY GARRISON YUMA PROVING GROUND, AZ

Location ID	Sample Depth	Sample Type	Sample Date	Units	Tetrachloroethylene (PCE)	Tetryl	Thallium	Toxaphene	Trichloroethylene (TCE)	Vanadium	Vinyl Chloride	Zinc
178A-SS01	0-0.5	N	10/7/2009	MG/KG		<0.113 U	<0.46 U			19.2		65.1
178A-SS02	0-0.5	N	10/7/2009	MG/KG		<0.114 U	<0.094 U			16.8		384
178B-SS01	0-0.5	N	10/7/2009	MG/KG		<0.112 U	<0.093 U			16.5		364
178B-SS02	0-0.5	N	10/7/2009	MG/KG		<0.112 U	<0.092 U			19.4		466
178B-SS02	0-0.5	N	10/7/2009	UG/L								
YPG-178B-SS01	0-0	N	11/3/2009	UG/L	<4 U			<0.5 U	<3.9 U		<3.1 U	
YPG-178B-SS02	0-0	N	11/3/2009	UG/L	<4 U			<0.5 U	<3.9 U		<3.1 U	
YPG-178-SS01	0-0	N	11/3/2009	UG/L	<4 U			<0.5 U	<3.9 U		<3.1 U	
YPG-178-SS02	0-0	N	11/3/2009	UG/L	<4 U			<0.5 U	<3.9 U		<3.1 U	

Note: Results are in units of mg/kg. See Table C.2 for flag definitions. Sample Type N = Normal .

APPENDIX D

CALCULATION OF BACKGROUND THRESHOLD VALUES

APPENDIX D

CALCULATION OF BACKGROUND THRESHOLD VALUES

Metals at a site may occur naturally in soils or can be related to past waste disposal or OB/OD activities. When evaluating samples collected from a site, the samples are assumed to come from the same distribution as the background data set until significant evidence of contamination can be shown. One common method to test this is to derive a Background Threshold Value (BTV) for each metal constituent and compare the maximum detected concentrations found at the site to their respective BTVs. If the maximum detected concentration of a chemical at the site exceeds the BTV, the concentration of that chemical is assumed to be at a level which may represent contamination; i.e., it is elevated over background.

This memo presents the results of the calculations of the BTVs for metals in soils at the six inactive landfills at USAGYPG. It is anticipated that the methods for calculating BTVs presented in the RFI Work Plan (Parsons, 2010) are to be used as the remedial goal(s) if the risk-based remedial concentration(s) are below the BTV. The BTV methods presented in the RFI Work Plan (Parsons, 2010) were developed following USEPA (1989a, 1992, 2007) and US Navy (2002) guidance, and have been used to calculate a BTV for 24 metals.

Background samples have been collected as part of the RFIs being conducted at the inactive landfills and Muggins Mountain sites. These data will be used to develop BTVs for use in evaluating remediation goals. All background soil samples will be analyzed for metals using EPA Method 6010B/7471.

To calculate BTVs, the following procedures were followed. For metals that were detected only once, the one detected value was used as the BTV. For chemicals with more than one detect but including non-detects, the upper tolerance limit (UTL) on the 95th percentile with 95% confidence was used as the BTV. The UTL was calculated using the Kaplan-Meier method (USEPA 2006a, 2007b). For chemicals without non-detects, the following steps were followed:

1. The distribution of each metal was tested using the following method the Shapiro-Wilk's test for normal and lognormal distributions (USEPA 2002, 2006b, 2007b) and the Anderson-Darling test for gamma distribution (USEPA 2007b).
2. The UTL was calculated as appropriate for the distribution of each metal (USEPA 1989, 2007b).

All calculations described above were performed using the current version of ProUCL (USEPA, 2007b); i.e., v4.00.002. The outputs for these calculations from ProUCL are provided as Attachment 1 to this Appendix. The data for each background sample is provided as Table D.1 Summary statistics of the ProUCL calculation and the selection of the BTV for each metal for the Inactive Landfills are provided as Table D.1. Attachment 2 has the background test pit logs.

TABLE D.1
BACKGROUND INORGANIC ANALYTICAL RESULTS
US ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Location ID	Sample Depth	Sample Type	Sample Date	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium (Total)	Cobalt	Copper	Iron	Lead	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Background Threshold Value				12,000	--	6.6	290	0.92	0.65	37,000	14	7.9	15	15,000	14	6,100	920	0.016	0.49	14	2,500	--	0.062	8400	0.57	26	44
027BG001	0.2-0.7	N	21-Jul-10	2,000	<0.34 U	1.38 J	88.1	<0.00	<0.008	5,120	2.39	1.39	1.94	3,620	3.09	841	93.9	<0.0032	0.15 J	2.58	439	<0.25 U	0.052 J	184 J	<0.09	9.35	11.4
027BG001	9-9.5	N	21-Jul-10	2,190	<0.33 U	1.49 J	61.5	<0.00	0.096 J	9,470	4.26	1.69	2.59	5,270	3.81	1,490	131	<0.0032	0.17 J	2.98	703	<0.25 U	0.056 J	25.1 J	<0.09	13.1	15.2
028BG001	0.2-0.7	N	14-Jul-10	5,140	<0.34 U	5.24	82 J	0.27 J	0.081 J	17,700 J	8.28 J	3.03 J	7.1	9,370 J	5.95 J	3,200 J	158 J	<0.0033	0.075 J	6.32 J	1,480 J	<0.25 U	<0.031	211 J	<0.09	18.8 J	25
028BG001	9-9.5	N	14-Jul-10	5,630	<0.34 U	4.69	69.3 J	0.3 J	0.75	18,200 J	9.13 J	3.41 J	8.13	10,500 J	6.94 J	3,570 J	189 J	<0.0033	0.11 J	7.16 J	1,680 J	<0.25 U	<0.031	753 J	<0.09	17.9 J	27.6
029BG001	0.2-0.7	N	13-Dec-10	4,580	<0.12 U	3.51	71.8	<0.00	0.033 J	12,100	7.37	2.95	5.83	7,810	6.27	3,850	170	<0.0034	0.22 J	6.74	1,100 J	<0.19 U	<0.035	62.4 J	<0.1 U	17	20.7
029BG001	7-7.5	N	13-Dec-10	8,060	<0.13 U	1.6 J	223	0.56	0.079 J	27,100	11	2.34	9.7	7,440	6.06	4,240	113	<0.0038	0.11 J	10.7	1,360 J	<0.22 U	<0.039	1,450 J	<0.11	15.9	30.9
141BG001	0.2-0.7	N	28-Jul-10	3,700	<0.34 UJ	2.89	83.6	<0.00	<0.008	14,300	7.31	2.37	4.02	7,700	4.36 J	2,830	189 J	<0.011 U	0.24 J	4.58	1,280 J	<0.25 U	0.057 J	<59.2 U	0.47 J	21.7	18.7
141BG001	9.5-10	N	28-Jul-10	3,050	<0.34 U	2.35	137	<0.00	0.013 J	14,300	6.04	2.66	3.46	7,110	4.76 J	1,850	218 J	<0.016 U	0.21 J	4.2	900	<0.25 U	<0.031	<66.3 U	0.59 J	21.2	16.2
178BG001	0.2-0.7	N	20-Dec-10	3,150	<0.12 U	2.55	111	<0.00	0.015 J	11,300	5.8	2.29	3.5	6,820	4.51	1,540	157	0.0072 J	0.12 J	3.9	771	<0.19 U	<0.035	93.4	<0.1 U	19.7	15.2
178BG001	7.5-8	N	20-Dec-10	10,800	<0.14 U	4.41	190	0.98	0.15 J	29,800	8.97	7.56	12.9	13,400	12.5	4,330	918	0.012 J	0.41 J	11.4	2,110	<0.23 U	<0.042	2,320	<0.12	16.5	38.8
178BG002	0.2-0.7	N	16-Dec-10	2,790	<0.12 U	1.87	52.9	<0.00	0.029 J	9,420	4.88	1.87	3.25 J	5,460	3.17	2,010	118	<0.0034	0.14 J	3.7	855	<0.19 U	<0.035	49.1	<0.1 U	13.6	13.8
178BG002	8-8.5	N	16-Dec-10	1,370	<0.12 U	1.08 J	60.9	<0.00	<0.009	2,050	3.65	1.32	1.4 J	4,500	2.56	665	88	<0.0035	0.08 J	2.27	284	<0.2 U	0.039 J	43.9	<0.1 U	16	10.3

TABLE D.2

BACKGROUND THRESHOLD VALUES SELECTED FOR THE METALS AT SIX INACTIVE LANDFILLS

YUMA PROVING GROUND, YUMA ARIZONA

Analyte	# of Detections (12 Samples)	BTV (mg/kg)	Distribution Type	Maximum Detection	Minimum Detection	nr_SRL	GPL
Aluminum	12	12000	N	10800	1370	920000	--
Antimony	0	ND	--	--		410	35
Arsenic	12	6.6	N	5.24	1.08	10	290
Barium	12	290	G	223	52.9	170000	12000
Beryllium	4	0.92	N	0.98	0.27	1900	23
Cadmium	9	0.65	G	0.75	0.013	510	29
Calcium	12	37000	N	29800	2050	--	--
Chromium	12	14	N	11	2.39	140000	590
Cobalt	12	7.9	G	7.56	1.32	13000	--
Copper	12	15	N	12.9	1.4	41000	--
Iron	12	15000	N	13400	3620	--	--
Lead	12	14	G	12.5	2.56	800	290
Magnesium	12	6100	N	4330	665	--	--
Manganese	12	920	NP	918	88	32000	--
Mercury	4	0.016	N	0.016	0.0072	310	12
Molybdenum	12	0.49	G	0.41	0.075	5100	--
Nickel	12	14	N	11.4	2.27	20000	590
Potassium	12	2500	N	2110	284	--	--
Selenium	0	ND	--	--		5100	290
Silver	4	0.062	N	0.057	0.039	5100	--
Sodium	12	8400	LN	2320	25.1	--	--
Thallium	2	0.57	NP	0.59	0.47	67	12
Vanadium	12	26	N	21.7	9.35	1000	--
Zinc	12	44	N	38.8	10.3	310000	--

Notes:

Distribution Types:

G = Gamma

N = Normal

NP = Non-parametric

ND = Non-detect

nrSRL = non-residential Soil Remediation Level

GPL = Groundwater Protection Level

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Aluminum

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	1370
Maximum	10800
Second Largest	8060
First Quartile	2640
Median	3425
Third Quartile	5262.5
Mean	4371.6667
SD	2742.4436
Coefficient of Variation	0.6273222
Skewness	1.3704411

Log-Transformed Statistics

Minimum	7.222566
Maximum	9.2873014
Second Largest	8.9946688
First Quartile	7.8732619
Median	8.1356229
Third Quartile	8.5675724
Mean	8.2195969
SD	0.5928981

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.8765385
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9881579
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	11874.992
95% UPL (t)	9497.8866
90% Percentile (z)	7886.2496
95% Percentile (z)	8882.585
99% Percentile (z)	10751.545

Assuming Lognormal Distribution

95% UTL with 95% Coverage	18802.896
95% UPL (t)	11246.943
90% Percentile (z)	7938.0776
95% Percentile (z)	9846.0685
99% Percentile (z)	14748.316

Gamma Distribution Test

k star	2.4697053
Theta Star	1770.1168
MLE of Mean	4371.6667
MLE of Standard Deviation	2781.7909
nu star	59.272926
A-D Test Statistic	0.2196814
5% A-D Critical Value	0.7383096
K-S Test Statistic	0.142838
5% K-S Critical Value	0.2471889

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	7817
95% Percentile	9293
99% Percentile	10498.6

Assuming Gamma Distribution

90% Percentile	8097.9575
95% Percentile	9714.8976
99% Percentile	13257.555
95% WH Approx. Gamma UPL	10217.111
95% HW Approx. Gamma UPL	10406.208
95% WH Approx. Gamma UTL with 95% Coverage	14616.081
95% HW Approx. Gamma UTL with 95% Coverage	15328.384

95% UTL with 95% Coverage	10800
95% Percentile Bootstrap UTL with 95% Coverage	10800
95% BCA Bootstrap UTL with 95% Coverage	10800
95% UPL	10800
95% Chebyshev UPL	16813.82
Upper Threshold Limit Based upon IQR	9196.25

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Antimony

General Statistics

Number of Valid Data	12	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	12

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

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

The data set for variable Antimony was not processed!

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Arsenic

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	1.08
Maximum	5.24
Second Largest	4.69
First Quartile	1.5725
Median	2.45
Third Quartile	3.735
Mean	2.755
SD	1.4099162
Coefficient of Variation	0.5117663
Skewness	0.6198176

Log-Transformed Statistics

Minimum	0.076961
Maximum	1.6563215
Second Largest	1.5454326
First Quartile	0.4521968
Median	0.8952543
Third Quartile	1.3126807
Mean	0.8905644
SD	0.5228338

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9123491
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9536108
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	6.6125307
95% UPL (t)	5.3904381
90% Percentile (z)	4.5618803
95% Percentile (z)	5.0741057
99% Percentile (z)	6.0349555

Assuming Lognormal Distribution

95% UTL with 95% Coverage	10.186237
95% UPL (t)	6.4743855
90% Percentile (z)	4.7616907
95% Percentile (z)	5.757765
99% Percentile (z)	8.2223625

Gamma Distribution Test

k star	3.2276131
Theta Star	0.8535719
MLE of Mean	2.755
MLE of Standard Deviation	1.5334897
nu star	77.462715
A-D Test Statistic	0.2963862
5% A-D Critical Value	0.7349337
K-S Test Statistic	0.1372346
5% K-S Critical Value	0.2462922

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	4.662
95% Percentile	4.9375
99% Percentile	5.1795
95% UTL with 95% Coverage	5.24
95% Percentile Bootstrap UTL with 95% Coverage	5.24
95% BCA Bootstrap UTL with 95% Coverage	5.24
95% UPL	5.24
95% Chebyshev UPL	9.1516288
Upper Threshold Limit Based upon IQR	6.97875

Assuming Gamma Distribution

90% Percentile	4.8112782
95% Percentile	5.6626965
99% Percentile	7.5011387
95% WH Approx. Gamma UPL	5.9187702
95% HW Approx. Gamma UPL	6.0294445
95% WH Approx. Gamma UTL with 95% Coverage	8.1809278
95% HW Approx. Gamma UTL with 95% Coverage	8.5450894

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Barium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	52.9
Maximum	223
Second Largest	190
First Quartile	67.35
Median	82.8
Third Quartile	117.5
Mean	102.59167
SD	54.221909
Coefficient of Variation	0.5285216
Skewness	1.440906

Log-Transformed Statistics

Minimum	3.9684033
Maximum	5.4071718
Second Largest	5.2470241
First Quartile	4.208593
Median	4.4163814
Third Quartile	4.7621429
Mean	4.5253288
SD	0.4580784

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.8109006
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9086069
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	250.94281
95% UPL (t)	203.94414
90% Percentile (z)	172.07984
95% Percentile (z)	191.77877
99% Percentile (z)	228.73069

Assuming Lognormal Distribution

95% UTL with 95% Coverage	323.31635
95% UPL (t)	217.36464
90% Percentile (z)	166.0651
95% Percentile (z)	196.13451
99% Percentile (z)	267.99772

Gamma Distribution Test

k star	3.7329013
Theta Star	27.483091
MLE of Mean	102.59167
MLE of Standard Deviation	53.099304
nu star	89.589632
A-D Test Statistic	0.6492775
5% A-D Critical Value	0.7323601
K-S Test Statistic	0.2364604
5% K-S Critical Value	0.2459755

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile	184.7
95% Percentile	204.85
99% Percentile	219.37

Assuming Gamma Distribution

90% Percentile	173.78127
95% Percentile	202.57654
99% Percentile	264.29023
95% WH Approx. Gamma UPL	210.30181
95% HW Approx. Gamma UPL	211.72456
95% WH Approx. Gamma UTL with 95% Coverage	285.56558
95% HW Approx. Gamma UTL with 95% Coverage	292.9403

95% UTL with 95% Coverage	223
95% Percentile Bootstrap UTL with 95% Coverage	223
95% BCA Bootstrap UTL with 95% Coverage	223
95% UPL	223
95% Chebyshev UPL	348.59028
Upper Threshold Limit Based upon IQR	192.725

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Beryllium

General Statistics

Number of Valid Data	12	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	8
Tolerance Factor	2.736	Percent Non-Detects	66.67%

Raw Statistics

Minimum Detected	0.27
Maximum Detected	0.98
Mean of Detected	0.5275
SD of Detected	0.3285701
Minimum Non-Detect	0.0028
Maximum Non-Detect	0.0047

Log-transformed Statistics

Minimum Detected	-1.309333
Maximum Detected	-0.020203
Mean of Detected	-0.778332
SD of Detected	0.5992496
Minimum Non-Detect	-5.878136
Maximum Non-Detect	-5.360193

Data with Multiple Detection Limits

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

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

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	8
Number treated as Detected with Single DL	4
Single DL Non-Detect Percentage	66.67%

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

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

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

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.8722721
5% Shapiro Wilk Critical Value	0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.9108061
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.1770708
SD		0.3105245
95% UTL	95% Coverage	1.0266659
95% UPL (t)		0.7575083
90% Percentile (z)		0.575024
95% Percentile (z)		0.6878382
99% Percentile (z)		0.8994589

Maximum Likelihood Estimate(MLE) Method

Mean		0.5514494
SD		0.2845501
95% UTL with	95% Coverage	1.3299785
95% UPL (t)		1.0833351
90% Percentile (z)		0.916115
95% Percentile (z)		1.0194927
99% Percentile (z)		1.2134119

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-4.473028
SD (Log Scale)		2.7549289
95% UTL	95% Coverage	21.422833
95% UPL (t)		1.9670393
90% Percentile (z)		0.389674
95% Percentile (z)		1.0601672
99% Percentile (z)		6.9302429

Log ROS Method

Mean in Original Scale		0.2118161
SD in Original Scale		0.2906383
95% UTL with	95% Coverage	3.3918216
95% BCA UTL with	95% Coverage	0.98
95% Bootstrap (%) UTL with	95% Coverage	0.98
95% UPL (t)		1.1033496
90% Percentile (z)		0.5152849
95% Percentile (z)		0.8250293
99% Percentile (z)		1.994945

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Beryllium (Continued)

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	1.1073651
Theta Star	0.476356
nu star	8.8589212
A-D Test Statistic	0.3595217
5% A-D Critical Value	0.6590057
K-S Test Statistic	0.2941955
5% K-S Critical Value	0.3962549

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.175834
Median	0.000001
SD	0.311286
k star	0.1338997
Theta star	1.3131771
Nu star	3.2135924
95% Percentile of Chisquare (2k)	1.5041274
90% Percentile	0.5113994
95% Percentile	0.9875928
99% Percentile	2.4036689

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.3558333
SD		0.2042653
SE of Mean		0.0680884
95% KM UTL with	95% Coverage	0.9147031
95% KM Chebyshev UPL		1.2825616
95% KM UPL (t)		0.7376493
90% Percentile (z)		0.6176098
95% Percentile (z)		0.6918198
99% Percentile (z)		0.8310254

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.9897952
95% Hawkins Wixley (HW) Approx. Gamma UPL		1.1844015
95% WH Approx. Gamma UTL with	95% Coverage	2.3768517
95% HW Approx. Gamma UTL with	95% Coverage	3.720839

Note: DL/2 is not a recommended method.

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Cadmium

General Statistics

Number of Valid Data	12	Number of Detected Data	9
Number of Distinct Detected Data	9	Number of Non-Detect Data	3
Tolerance Factor	2.736	Percent Non-Detects	25.00%

Raw Statistics

Minimum Detected	0.013
Maximum Detected	0.75
Mean of Detected	0.1384444
SD of Detected	0.2336772
Minimum Non-Detect	0.0083
Maximum Non-Detect	0.0099

Log-transformed Statistics

Minimum Detected	-4.342806
Maximum Detected	-0.287682
Mean of Detected	-2.786005
SD of Detected	1.2622229
Minimum Non-Detect	-4.7915
Maximum Non-Detect	-4.615221

Data with Multiple Detection Limits

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

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

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	3
Number treated as Detected with Single DL	9
Single DL Non-Detect Percentage	25.00%

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.

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.5620921
5% Shapiro Wilk Critical Value	0.829

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.9372008
5% Shapiro Wilk Critical Value	0.829

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.1049417
SD		0.2082936
95% UTL	95% Coverage	0.6748329
95% UPL (t)		0.4942874
90% Percentile (z)		0.3718806
95% Percentile (z)		0.4475541
99% Percentile (z)		0.589505

Maximum Likelihood Estimate(MLE) Method

Mean		0.0626422
SD		0.2414162
95% UTL with	95% Coverage	0.7231568
95% UPL (t)		0.5139012
90% Percentile (z)		0.3720294
95% Percentile (z)		0.4597364
99% Percentile (z)		0.6242601

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-3.444977
SD (Log Scale)		1.6067436
95% UTL	95% Coverage	2.5884865
95% UPL (t)		0.64299
90% Percentile (z)		0.2501105
95% Percentile (z)		0.4483778
99% Percentile (z)		1.3402651

Log ROS Method

Mean in Original Scale		0.1045703
SD in Original Scale		0.20849
95% UTL with	95% Coverage	3.4279085
95% BCA UTL with	95% Coverage	0.75
95% Bootstrap (%) UTL with	95% Coverage	0.75
95% UPL (t)		0.7544292
90% Percentile (z)		0.2703368
95% Percentile (z)		0.5098602
99% Percentile (z)		1.6762132

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Cadmium (Continued)

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	0.5683331
Theta Star	0.2435973
nu star	10.229997
A-D Test Statistic	0.6508479
5% A-D Critical Value	0.7521224
K-S Test Statistic	0.2366253
5% K-S Critical Value	0.2894453

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.1038336
Median	0.031
SD	0.2088856
k star	0.2212892
Theta star	0.4692212
Nu star	5.3109407
95% Percentile of Chisquare (2k)	2.219049
90% Percentile	0.3136301
95% Percentile	0.5206124
99% Percentile	1.0814547

Note: DL/2 is not a recommended method.

Data Distribution Test with Detected Values Only

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.1070833
SD		0.1983782
SE of Mean		0.0607407
95% KM UTL with	95% Coverage	0.6498461
95% KM Chebyshev UPL		1.0071026
95% KM UPL (t)		0.4778951
90% Percentile (z)		0.3613152
95% Percentile (z)		0.4333864
99% Percentile (z)		0.56858

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.5280195
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.6710645
95% WH Approx. Gamma UTL with	95% Coverage	1.1003193
95% HW Approx. Gamma UTL with	95% Coverage	1.6860863

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Calcium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Tolerance Factor	2.736		

Raw Statistics

Minimum	2050
Maximum	29800
Second Largest	27100
First Quartile	9457.5
Median	13200
Third Quartile	17825
Mean	14238.333
SD	8124.7801
Coefficient of Variation	0.5706272
Skewness	0.6459131

Log-Transformed Statistics

Minimum	7.6255951
Maximum	10.302264
Second Largest	10.207289
First Quartile	9.1545607
Median	9.4844878
Third Quartile	9.7882842
Mean	9.3702148
SD	0.7284687

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9461078
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9063006
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	36467.732
95% UPL (t)	29425.304
90% Percentile (z)	24650.658
95% Percentile (z)	27602.407
99% Percentile (z)	33139.398

Assuming Lognormal Distribution

95% UTL with 95% Coverage	86103.493
95% UPL (t)	45792.717
90% Percentile (z)	29845.371
95% Percentile (z)	38887.931
99% Percentile (z)	63887.979

Gamma Distribution Test

k star	2.1101902
Theta Star	6747.4171
MLE of Mean	14238.333
MLE of Standard Deviation	9801.6312
nu star	50.644565
A-D Test Statistic	0.2672138
5% A-D Critical Value	0.7396638
K-S Test Statistic	0.1666181
5% K-S Critical Value	0.247707

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	26210
95% Percentile	28315
99% Percentile	29503

Assuming Gamma Distribution

90% Percentile	27345.984
95% Percentile	33207.436
99% Percentile	46166.767
95% WH Approx. Gamma UPL	35191.405
95% HW Approx. Gamma UPL	36882.011
95% WH Approx. Gamma UTL with 95% Coverage	51325.736
95% HW Approx. Gamma UTL with 95% Coverage	56077.938

95% UTL with 95% Coverage	29800
95% Percentile Bootstrap UTL with 95% Coverage	29800
95% BCA Bootstrap UTL with 95% Coverage	29800
95% UPL	29800
95% Chebyshev UPL	51099.533
Upper Threshold Limit Based upon IQR	30376.25

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Chromium, Total

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	2.39
Maximum	11
Second Largest	9.13
First Quartile	4.725
Median	6.675
Third Quartile	8.4525
Mean	6.59
SD	2.5425506
Coefficient of Variation	0.3858195
Skewness	0.0232294

Log-Transformed Statistics

Minimum	0.8712934
Maximum	2.3978953
Second Largest	2.2115657
First Quartile	1.5511762
Median	1.8938236
Third Quartile	2.1338536
Mean	1.8050456
SD	0.4414583

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9837728
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9500903
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	13.546418
95% UPL (t)	11.342577
90% Percentile (z)	9.8484097
95% Percentile (z)	10.772124
99% Percentile (z)	12.504857

Assuming Lognormal Distribution

95% UTL with 95% Coverage	20.34582
95% UPL (t)	13.876914
90% Percentile (z)	10.705923
95% Percentile (z)	12.568326
99% Percentile (z)	16.979915

Gamma Distribution Test

k star	4.8350186
Theta Star	1.362973
MLE of Mean	6.59
MLE of Standard Deviation	2.9969972
nu star	116.04045
A-D Test Statistic	0.2065787
5% A-D Critical Value	0.7315261
K-S Test Statistic	0.1545819
5% K-S Critical Value	0.245779

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	9.114
95% Percentile	9.9715
99% Percentile	10.7943

Assuming Gamma Distribution

90% Percentile	10.603197
95% Percentile	12.165485
99% Percentile	15.471989
95% WH Approx. Gamma UPL	12.585702
95% HW Approx. Gamma UPL	12.843276
95% WH Approx. Gamma UTL with 95% Coverage	16.585234
95% HW Approx. Gamma UTL with 95% Coverage	17.277713

95% UTL with 95% Coverage	11
95% Percentile Bootstrap UTL with 95% Coverage	11
95% BCA Bootstrap UTL with 95% Coverage	11
95% UPL	11
95% Chebyshev UPL	18.125262
Upper Threshold Limit Based upon IQR	14.04375

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Cobalt

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	1.32
Maximum	7.56
Second Largest	3.41
First Quartile	1.825
Median	2.355
Third Quartile	2.97
Mean	2.74
SD	1.6518199
Coefficient of Variation	0.602854
Skewness	2.5407354

Log-Transformed Statistics

Minimum	0.2776317
Maximum	2.0228712
Second Largest	1.2267123
First Quartile	0.600636
Median	0.8565204
Third Quartile	1.0884945
Mean	0.8931227
SD	0.4658952

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.7077319
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9142055
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	7.2593793
95% UPL (t)	5.8276085
90% Percentile (z)	4.8568924
95% Percentile (z)	5.457002
99% Percentile (z)	6.5827078

Assuming Lognormal Distribution

95% UTL with 95% Coverage	8.7391408
95% UPL (t)	5.8356257
90% Percentile (z)	4.4379448
95% Percentile (z)	5.2564299
99% Percentile (z)	7.2207364

Gamma Distribution Test

k star	3.4410957
Theta Star	0.796258
MLE of Mean	2.74
MLE of Standard Deviation	1.4770738
nu star	82.586298
A-D Test Statistic	0.5969176
5% A-D Critical Value	0.7338463
K-S Test Statistic	0.1876387
5% K-S Critical Value	0.2461584

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile	3.372
95% Percentile	5.2775
99% Percentile	7.1035

Assuming Gamma Distribution

90% Percentile	4.720588
95% Percentile	5.5321243
99% Percentile	7.2786256
95% WH Approx. Gamma UPL	5.7339326
95% HW Approx. Gamma UPL	5.7459539
95% WH Approx. Gamma UTL with 95% Coverage	7.8572836
95% HW Approx. Gamma UTL with 95% Coverage	8.0177069

95% UTL with 95% Coverage	7.56
95% Percentile Bootstrap UTL with 95% Coverage	7.56
95% BCA Bootstrap UTL with 95% Coverage	7.56
95% UPL	7.56
95% Chebyshev UPL	10.234119
Upper Threshold Limit Based upon IQR	4.6875

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Copper

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	1.4
Maximum	12.9
Second Largest	9.7
First Quartile	3.085
Median	3.76
Third Quartile	7.3575
Mean	5.3183333
SD	3.5026739
Coefficient of Variation	0.6586037
Skewness	1.0292768

Log-Transformed Statistics

Minimum	0.3364722
Maximum	2.5572273
Second Largest	2.2721259
First Quartile	1.1219057
Median	1.3220224
Third Quartile	1.9939613
Mean	1.471901
SD	0.6700549

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9001081
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9761986
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	14.901649
95% UPL (t)	11.865588
90% Percentile (z)	9.8071905
95% Percentile (z)	11.079719
99% Percentile (z)	13.466771

Assuming Lognormal Distribution

95% UTL with 95% Coverage	27.253207
95% UPL (t)	15.246934
90% Percentile (z)	10.284222
95% Percentile (z)	13.11876
99% Percentile (z)	20.711349

Gamma Distribution Test

k star	2.0537007
Theta Star	2.5896341
MLE of Mean	5.3183333
MLE of Standard Deviation	3.711137
nu star	49.288816
A-D Test Statistic	0.2506016
5% A-D Critical Value	0.7398529
K-S Test Statistic	0.1729224
5% K-S Critical Value	0.2477928

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	9.543
95% Percentile	11.14
99% Percentile	12.548

Assuming Gamma Distribution

90% Percentile	10.279298
95% Percentile	12.509723
99% Percentile	17.448989
95% WH Approx. Gamma UPL	13.269134
95% HW Approx. Gamma UPL	13.625642
95% WH Approx. Gamma UTL with 95% Coverage	19.474075
95% HW Approx. Gamma UTL with 95% Coverage	20.721625

95% UTL with 95% Coverage	12.9
95% Percentile Bootstrap UTL with 95% Coverage	12.9
95% BCA Bootstrap UTL with 95% Coverage	12.9
95% UPL	12.9
95% Chebyshev UPL	21.209565
Upper Threshold Limit Based upon IQR	13.76625

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Iron

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	3620
Maximum	13400
Second Largest	10500
First Quartile	5412.5
Median	7275
Third Quartile	8200
Mean	7416.6667
SD	2716.3924
Coefficient of Variation	0.3662552
Skewness	0.8375724

Log-Transformed Statistics

Minimum	8.1942293
Maximum	9.50301
Second Largest	9.2591305
First Quartile	8.5963495
Median	8.8919418
Third Quartile	9.0086873
Mean	8.8510079
SD	0.3654514

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9488168
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9845832
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with	95% Coverage	14848.716
95% UPL (t)		12494.191
90% Percentile (z)		10897.864
95% Percentile (z)		11884.735
99% Percentile (z)		13735.94

Assuming Lognormal Distribution

95% UTL with	95% Coverage	18975.101
95% UPL (t)		13823.365
90% Percentile (z)		11151.761
95% Percentile (z)		12735.16
99% Percentile (z)		16336.791

Gamma Distribution Test

k star	6.378659
Theta Star	1162.7313
MLE of Mean	7416.6667
MLE of Standard Deviation	2936.5951
nu star	153.08782
A-D Test Statistic	0.182938
5% A-D Critical Value	0.7308304
K-S Test Statistic	0.1451334
5% K-S Critical Value	0.2455526

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	10387
95% Percentile	11805
99% Percentile	13081

Assuming Gamma Distribution

90% Percentile		11340.423
95% Percentile		12812.772
99% Percentile		15890.445
95% WH Approx. Gamma UPL		13168.403
95% HW Approx. Gamma UPL		13304.229
95% WH Approx. Gamma UTL with	95% Coverage	16859.565
95% HW Approx. Gamma UTL with	95% Coverage	17278.682

95% UTL with	95% Coverage	13400
95% Percentile Bootstrap UTL with	95% Coverage	13400
95% BCA Bootstrap UTL with	95% Coverage	13400
95% UPL		13400
95% Chebyshev UPL		19740.629
Upper Threshold Limit Based upon IQR		12381.25

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Lead

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics		Log-Transformed Statistics	
Minimum	2.56	Minimum	0.9400073
Maximum	12.5	Maximum	2.5257286
Second Largest	6.94	Second Largest	1.9373018
First Quartile	3.65	First Quartile	1.2916548
Median	4.635	Median	1.5332724
Third Quartile	6.1125	Third Quartile	1.8102264
Mean	5.3316667	Mean	1.581872
SD	2.652727	SD	0.4316504
Coefficient of Variation	0.4975418		
Skewness	1.9058126		

Background Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.8187344	Shapiro Wilk Test Statistic	0.9579494
Shapiro Wilk Critical Value	0.859	Shapiro Wilk Critical Value	0.859
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
95% UTL with 95% Coverage	12.589528	95% UTL with 95% Coverage	15.845214
95% UPL (t)	10.290187	95% UPL (t)	10.899533
90% Percentile (z)	8.7312731	90% Percentile (z)	8.4575053
95% Percentile (z)	9.6950143	95% Percentile (z)	9.8934581
99% Percentile (z)	11.502833	99% Percentile (z)	13.277104

Gamma Distribution Test		Data Distribution Test
k star	4.2619065	Data appear Gamma Distributed at 5% Significance Level
Theta Star	1.2510051	
MLE of Mean	5.3316667	
MLE of Standard Deviation	2.5826231	
nu star	102.28576	
A-D Test Statistic	0.3463001	
5% A-D Critical Value	0.7317843	
K-S Test Statistic	0.1315017	
5% K-S Critical Value	0.2458631	
Data appear Gamma Distributed at 5% Significance Level		

Nonparametric Statistics	
90% Percentile	6.873
95% Percentile	9.442
99% Percentile	11.8884

Assuming Gamma Distribution			
90% Percentile	8.7924511	95% UTL with 95% Coverage	12.5
95% Percentile	10.164398	95% Percentile Bootstrap UTL with 95% Coverage	12.5
99% Percentile	13.085546	95% BCA Bootstrap UTL with 95% Coverage	12.5
		95% UPL	12.5
		95% Chebyshev UPL	17.366786
95% WH Approx. Gamma UPL	10.511917	Upper Threshold Limit Based upon IQR	9.80625
95% HW Approx. Gamma UPL	10.584486		
95% WH Approx. Gamma UTL with 95% Coverage	14.050304		
95% HW Approx. Gamma UTL with 95% Coverage	14.391282		

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Magnesium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	665
Maximum	4330
Second Largest	4240
First Quartile	1527.5
Median	2420
Third Quartile	3640
Mean	2534.6667
SD	1302.1725
Coefficient of Variation	0.5137451
Skewness	0.0231388

Log-Transformed Statistics

Minimum	6.499787
Maximum	8.3733228
Second Largest	8.3523185
First Quartile	7.3312861
Median	7.776961
Third Quartile	8.1991978
Mean	7.6825006
SD	0.626058

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9286626
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9099391
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	6097.4106
95% UPL (t)	4968.7085
90% Percentile (z)	4203.4678
95% Percentile (z)	4676.5498
99% Percentile (z)	5563.9728

Assuming Lognormal Distribution

95% UTL with 95% Coverage	12032.845
95% UPL (t)	6993.5133
90% Percentile (z)	4840.7561
95% Percentile (z)	6077.0482
99% Percentile (z)	9310.7906

Gamma Distribution Test

k star	2.5881387
Theta Star	979.33959
MLE of Mean	2534.6667
MLE of Standard Deviation	1575.5315
nu star	62.115328
A-D Test Statistic	0.3668971
5% A-D Critical Value	0.7378043
K-S Test Statistic	0.150688
5% K-S Critical Value	0.2470295

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	4201
95% Percentile	4280.5
99% Percentile	4320.1

Assuming Gamma Distribution

90% Percentile	4645.8341
95% Percentile	5554.0997
99% Percentile	7538.8537
95% WH Approx. Gamma UPL	5857.5598
95% HW Approx. Gamma UPL	6065.3979
95% WH Approx. Gamma UTL with 95% Coverage	8323.4554
95% HW Approx. Gamma UTL with 95% Coverage	8917.8745

95% UTL with 95% Coverage	4330
95% Percentile Bootstrap UTL with 95% Coverage	4330
95% BCA Bootstrap UTL with 95% Coverage	4330
95% UPL	4330
95% Chebyshev UPL	8442.4746
Upper Threshold Limit Based upon IQR	6808.75

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Manganese

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Tolerance Factor	2.736		

Raw Statistics

Minimum	88
Maximum	918
Second Largest	218
First Quartile	116.75
Median	157.5
Third Quartile	189
Mean	211.90833
SD	225.98401
Coefficient of Variation	1.0664234
Skewness	3.2681929

Log-Transformed Statistics

Minimum	4.4773368
Maximum	6.8221974
Second Largest	5.3844951
First Quartile	4.7598604
Median	5.0594204
Third Quartile	5.241747
Mean	5.1114719
SD	0.6095261

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.497047
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.778352
Shapiro Wilk Critical Value	0.859

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with	95% Coverage	830.20059
95% UPL (t)		634.3213
90% Percentile (z)		501.5185
95% Percentile (z)		583.61895
99% Percentile (z)		737.62576

Assuming Lognormal Distribution

95% UTL with	95% Coverage	879.30804
95% UPL (t)		518.43151
90% Percentile (z)		362.35015
95% Percentile (z)		452.16769
99% Percentile (z)		685.01561

Gamma Distribution Test

k star	1.702281
Theta Star	124.48493
MLE of Mean	211.90833
MLE of Standard Deviation	162.41735
nu star	40.854744
A-D Test Statistic	1.5089305
5% A-D Critical Value	0.741029
K-S Test Statistic	0.3108029
5% K-S Critical Value	0.248327

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

90% Percentile	215.1
95% Percentile	533
99% Percentile	841

Assuming Gamma Distribution

90% Percentile		428.24654
95% Percentile		529.38203
99% Percentile		755.92226
95% WH Approx. Gamma UPL		551.1761
95% HW Approx. Gamma UPL		541.82764
95% WH Approx. Gamma UTL with	95% Coverage	830.0071
95% HW Approx. Gamma UTL with	95% Coverage	836.59023

Nonparametric Statistics

95% UTL with	95% Coverage	918
95% Percentile Bootstrap UTL with	95% Coverage	918
95% BCA Bootstrap UTL with	95% Coverage	918
95% UPL		918
95% Chebyshev UPL		1237.172
Upper Threshold Limit Based upon IQR		297.375

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Mercury

General Statistics

Number of Valid Data	12	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	8
Tolerance Factor	2.736	Percent Non-Detects	66.67%

Raw Statistics

Minimum Detected	0.0072
Maximum Detected	0.016
Mean of Detected	0.01155
SD of Detected	0.0036162
Minimum Non-Detect	0.0032
Maximum Non-Detect	0.0038

Log-transformed Statistics

Minimum Detected	-4.933674
Maximum Detected	-4.135167
Mean of Detected	-4.500387
SD of Detected	0.3302654
Minimum Non-Detect	-5.744604
Maximum Non-Detect	-5.572754

Data with Multiple Detection Limits

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

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

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	8
Number treated as Detected with Single DL	4
Single DL Non-Detect Percentage	66.67%

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

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

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

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.9846284
5% Shapiro Wilk Critical Value	0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.9697786
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.0049792
SD		0.005208
95% UTL	95% Coverage	0.0192282
95% UPL (t)		0.014714
90% Percentile (z)		0.0116534
95% Percentile (z)		0.0135455
99% Percentile (z)		0.0170947

Maximum Likelihood Estimate(MLE) Method

Mean		0.0116347
SD		0.0031317
95% UTL with	95% Coverage	0.0202031
95% UPL (t)		0.0174886
90% Percentile (z)		0.0156482
95% Percentile (z)		0.0167859
99% Percentile (z)		0.0189202

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-5.754942
SD (Log Scale)		0.9435336
95% UTL	95% Coverage	0.0418596
95% UPL (t)		0.0184762
90% Percentile (z)		0.0106122
95% Percentile (z)		0.0149511
99% Percentile (z)		0.0284401

Log ROS Method

Mean in Original Scale		0.0060963
SD in Original Scale		0.0044936
95% UTL with	95% Coverage	0.0294091
95% BCA UTL with	95% Coverage	0.016
95% Bootstrap (%) UTL with	95% Coverage	0.016
95% UPL (t)		0.0167029
90% Percentile (z)		0.011382
95% Percentile (z)		0.0144277
99% Percentile (z)		0.0225095

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Mercury (Continued)

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	3.387021
Theta Star	0.0034101
nu star	27.096168
A-D Test Statistic	0.2433494
5% A-D Critical Value	0.6570971
K-S Test Statistic	0.2180047
5% K-S Critical Value	0.3947312

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0038507
Median	0.000001
SD	0.0059917
k star	0.1675388
Theta star	0.0229837
Nu star	4.0209313
95% Percentile of Chisquare (2k)	1.8021629
90% Percentile	0.0115582
95% Percentile	0.0207102
99% Percentile	0.0466989

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.00865
SD		0.0027339
SE of Mean		0.0009113
95% KM UTL with	95% Coverage	0.0161299
95% KM Chebyshev UPL		0.0210534
95% KM UPL (t)		0.0137602
90% Percentile (z)		0.0121536
95% Percentile (z)		0.0131469
99% Percentile (z)		0.01501

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.0219134
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.0259129
95% WH Approx. Gamma UTL with	95% Coverage	0.0514241
95% HW Approx. Gamma UTL with	95% Coverage	0.0772426

Note: DL/2 is not a recommended method.

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Molybdenum

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Tolerance Factor	2.736		

Raw Statistics

Minimum	0.075
Maximum	0.41
Second Largest	0.24
First Quartile	0.11
Median	0.145
Third Quartile	0.2125
Mean	0.1695833
SD	0.0927964
Coefficient of Variation	0.5472024
Skewness	1.678649

Log-Transformed Statistics

Minimum	-2.590267
Maximum	-0.891598
Second Largest	-1.427116
First Quartile	-2.207275
Median	-1.931616
Third Quartile	-1.549018
Mean	-1.889957
SD	0.4889201

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.8467186
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9672022
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	0.4234743
95% UPL (t)	0.3430399
90% Percentile (z)	0.2885067
95% Percentile (z)	0.3222198
99% Percentile (z)	0.3854601

Assuming Lognormal Distribution

95% UTL with 95% Coverage	0.5756405
95% UPL (t)	0.3767927
90% Percentile (z)	0.2826966
95% Percentile (z)	0.3376466
99% Percentile (z)	0.4711592

Gamma Distribution Test

k star	3.4209594
Theta Star	0.0495719
MLE of Mean	0.1695833
MLE of Standard Deviation	0.0916873
nu star	82.103026
A-D Test Statistic	0.2829741
5% A-D Critical Value	0.7339489
K-S Test Statistic	0.1212111
5% K-S Critical Value	0.246171

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Gamma Distributed at 5% Significance Level

Nonparametric Statistics

90% Percentile	0.238
95% Percentile	0.3165
99% Percentile	0.3913

Assuming Gamma Distribution

90% Percentile	0.2925263
95% Percentile	0.3429493
99% Percentile	0.4514972
95% WH Approx. Gamma UPL	0.356808
95% HW Approx. Gamma UPL	0.3605989
95% WH Approx. Gamma UTL with 95% Coverage	0.4895036
95% HW Approx. Gamma UTL with 95% Coverage	0.5053578

95% UTL with 95% Coverage	0.41
95% Percentile Bootstrap UTL with 95% Coverage	0.41
95% BCA Bootstrap UTL with 95% Coverage	0.41
95% UPL	0.41
95% Chebyshev UPL	0.5905901
Upper Threshold Limit Based upon IQR	0.36625

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Nickel

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	2.27
Maximum	11.4
Second Largest	10.7
First Quartile	3.52
Median	4.39
Third Quartile	6.845
Mean	5.5441667
SD	3.0217137
Coefficient of Variation	0.5450258
Skewness	0.9972125

Log-Transformed Statistics

Minimum	0.8197798
Maximum	2.4336134
Second Largest	2.3702437
First Quartile	1.2542304
Median	1.4783918
Third Quartile	1.9231724
Mean	1.5841443
SD	0.5259678

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.879071
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9547631
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	13.811575
95% UPL (t)	11.192403
90% Percentile (z)	9.4166486
95% Percentile (z)	10.514443
99% Percentile (z)	12.573724

Assuming Lognormal Distribution

95% UTL with 95% Coverage	20.55681
95% UPL (t)	13.030488
90% Percentile (z)	9.5658473
95% Percentile (z)	11.580057
99% Percentile (z)	16.57223

Gamma Distribution Test

k star	3.0908995
Theta Star	1.7937066
MLE of Mean	5.5441667
MLE of Standard Deviation	3.1535073
nu star	74.181587
A-D Test Statistic	0.3270361
5% A-D Critical Value	0.73563
K-S Test Statistic	0.1639467
5% K-S Critical Value	0.2463779

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	10.346
95% Percentile	11.015
99% Percentile	11.323

Assuming Gamma Distribution

90% Percentile	9.7725877
95% Percentile	11.536109
99% Percentile	15.352735
95% WH Approx. Gamma UPL	12.059895
95% HW Approx. Gamma UPL	12.251022
95% WH Approx. Gamma UTL with 95% Coverage	16.75919
95% HW Approx. Gamma UTL with 95% Coverage	17.449877

95% UTL with 95% Coverage	11.4
95% Percentile Bootstrap UTL with 95% Coverage	11.4
95% BCA Bootstrap UTL with 95% Coverage	11.4
95% UPL	11.4
95% Chebyshev UPL	19.253337
Upper Threshold Limit Based upon IQR	11.8325

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Potassium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	284
Maximum	2110
Second Largest	1680
First Quartile	754
Median	1000
Third Quartile	1390
Mean	1080.1667
SD	527.84568
Coefficient of Variation	0.4886706
Skewness	0.3954455

Log-Transformed Statistics

Minimum	5.6489742
Maximum	7.6544432
Second Largest	7.4265491
First Quartile	6.6246055
Median	6.9027301
Third Quartile	7.2363793
Mean	6.8536438
SD	0.5720427

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9803606
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9531182
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	2524.3524
95% UPL (t)	2066.8243
90% Percentile (z)	1756.6281
95% Percentile (z)	1948.3955
99% Percentile (z)	2308.1193

Assuming Lognormal Distribution

95% UTL with 95% Coverage	4531.2481
95% UPL (t)	2759.805
90% Percentile (z)	1971.8866
95% Percentile (z)	2427.3863
99% Percentile (z)	3584.643

Gamma Distribution Test

k star	3.0324555
Theta Star	356.20198
MLE of Mean	1080.1667
MLE of Standard Deviation	620.28825
nu star	72.778932
A-D Test Statistic	0.1621481
5% A-D Critical Value	0.7359086
K-S Test Statistic	0.1129891
5% K-S Critical Value	0.2464311

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	1660
95% Percentile	1873.5
99% Percentile	2062.7
95% UTL with 95% Coverage	2110
95% Percentile Bootstrap UTL with 95% Coverage	2110
95% BCA Bootstrap UTL with 95% Coverage	2110
95% UPL	2110
95% Chebyshev UPL	3474.9423
Upper Threshold Limit Based upon IQR	2344

Assuming Gamma Distribution

90% Percentile	1911.8623
95% Percentile	2259.8551
99% Percentile	3013.7496
95% WH Approx. Gamma UPL	2367.3131
95% HW Approx. Gamma UPL	2439.3583
95% WH Approx. Gamma UTL with 95% Coverage	3294.8446
95% HW Approx. Gamma UTL with 95% Coverage	3498.1881

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Selenium

General Statistics

Number of Valid Data	12	Number of Detected Data	0
Number of Distinct Detected Data	0	Number of Non-Detect Data	12

Warning: All observations are Non-Detects (NDs), therefore all statistics and estimates should also be NDs!

Specifically, sample mean, UCLs, UPLs, and other statistics are also NDs lying below the largest detection limit!

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

The data set for variable Selenium was not processed!

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Silver

General Statistics

Number of Valid Data	12	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	8
Tolerance Factor	2.736	Percent Non-Detects	66.67%

Raw Statistics

Minimum Detected	0.039
Maximum Detected	0.057
Mean of Detected	0.051
SD of Detected	0.0082865
Minimum Non-Detect	0.031
Maximum Non-Detect	0.042

Log-transformed Statistics

Minimum Detected	-3.244194
Maximum Detected	-2.864704
Mean of Detected	-2.986953
SD of Detected	0.1760443
Minimum Non-Detect	-3.473768
Maximum Non-Detect	-3.170086

Data with Multiple Detection Limits

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

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

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	9
Number treated as Detected with Single DL	3
Single DL Non-Detect Percentage	75.00%

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

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

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

Background Statistics

Normal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.8254953
5% Shapiro Wilk Critical Value	0.748

Data appear Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

Shapiro Wilk Test Statistic	0.8028565
5% Shapiro Wilk Critical Value	0.748

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.028625
SD		0.0171572
95% UTL	95% Coverage	0.0755671
95% UPL (t)		0.0606955
90% Percentile (z)		0.0506128
95% Percentile (z)		0.0568461
99% Percentile (z)		0.0685386

Maximum Likelihood Estimate(MLE) Method

Mean		0.0434623
SD		0.0124361
95% UTL with	95% Coverage	0.0774875
95% UPL (t)		0.0667081
90% Percentile (z)		0.0593998
95% Percentile (z)		0.0639179
99% Percentile (z)		0.072393

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-3.698816
SD (Log Scale)		0.5412049
95% UTL	95% Coverage	0.1088179
95% UPL (t)		0.0680721
90% Percentile (z)		0.0495271
95% Percentile (z)		0.0602885
99% Percentile (z)		0.0871795

Log ROS Method

Mean in Original Scale		0.0366153
SD in Original Scale		0.0118848
95% UTL with	95% Coverage	0.0805629
95% BCA UTL with	95% Coverage	0.057
95% Bootstrap (%) UTL with	95% Coverage	0.057
95% UPL (t)		0.0618791
90% Percentile (z)		0.0517432
95% Percentile (z)		0.057794
99% Percentile (z)		0.0711177

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Silver (Continued)

Gamma Distribution Test with Detected Values Only

k star (bias corrected)	11.547537
Theta Star	0.0044165
nu star	92.380298
A-D Test Statistic	0.5371719
5% A-D Critical Value	0.6561116
K-S Test Statistic	0.3217342
5% K-S Critical Value	0.3938827

Data appear Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

Mean	0.0207403
Median	0.0125627
SD	0.0238505
k star	0.1961284
Theta star	0.1057486
Nu star	4.707082
95% Percentile of Chisquare (2k)	2.0313944
90% Percentile	0.0627173
95% Percentile	0.1074085
99% Percentile	0.2308435

Data Distribution Test with Detected Values Only

Data appear Normal at 5% Significance Level

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean		0.043
SD		0.0070119
SE of Mean		0.0023373
95% KM UTL with	95% Coverage	0.0621845
95% KM Chebyshev UPL		0.0748122
95% KM UPL (t)		0.0561067
90% Percentile (z)		0.0519861
95% Percentile (z)		0.0545335
99% Percentile (z)		0.0593121

Gamma ROS Limits with Extrapolated Data

95% Wilson Hilferty (WH) Approx. Gamma UPL		0.1241347
95% Hawkins Wixley (HW) Approx. Gamma UPL		0.1714757
95% WH Approx. Gamma UTL with	95% Coverage	0.2663301
95% HW Approx. Gamma UTL with	95% Coverage	0.4588943

Note: DL/2 is not a recommended method.

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Sodium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	25.1
Maximum	2320
Second Largest	1450
First Quartile	56.675
Median	79.85
Third Quartile	346.5
Mean	443.11667
SD	726.10687
Coefficient of Variation	1.6386359
Skewness	2.0592615

Log-Transformed Statistics

Minimum	3.2228678
Maximum	7.7493225
Second Largest	7.2793188
First Quartile	4.0341559
Median	4.3655406
Third Quartile	5.6699099
Mean	5.0053091
SD	1.473586

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.63915
Shapiro Wilk Critical Value	0.859

Data not Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.8833943
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	2429.7451
95% UPL (t)	1800.3674
90% Percentile (z)	1373.6601
95% Percentile (z)	1637.4562
99% Percentile (z)	2132.2939

Assuming Lognormal Distribution

95% UTL with 95% Coverage	8408.8536
95% UPL (t)	2344.3417
90% Percentile (z)	986.12742
95% Percentile (z)	1684.3625
99% Percentile (z)	4598.028

Gamma Distribution Test

k star	0.4843431
Theta Star	914.88185
MLE of Mean	443.11667
MLE of Standard Deviation	636.70982
nu star	11.624233
A-D Test Statistic	1.0990082
5% A-D Critical Value	0.779392
K-S Test Statistic	0.2650851
5% K-S Critical Value	0.2575698

Data not Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Lognormal at 5% Significance Level

Nonparametric Statistics

90% Percentile	1380.3
95% Percentile	1841.5
99% Percentile	2224.3

Assuming Gamma Distribution

90% Percentile	1206.7332
95% Percentile	1721.5877
99% Percentile	2991.5713
95% WH Approx. Gamma UPL	1866.3954
95% HW Approx. Gamma UPL	1922.8458
95% WH Approx. Gamma UTL with 95% Coverage	3542.7997
95% HW Approx. Gamma UTL with 95% Coverage	4013.7332

95% UTL with 95% Coverage	2320
95% Percentile Bootstrap UTL with 95% Coverage	2320
95% BCA Bootstrap UTL with 95% Coverage	2320
95% UPL	2320
95% Chebyshev UPL	3737.3807
Upper Threshold Limit Based upon IQR	781.2375

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Thallium

General Statistics

Number of Valid Data	12	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	10

Warning: Data set has only 2 Detected Values.

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

No statistics will be produced!

Tolerance Factor	2.736	Percent Non-Detects	83.33%

Raw Statistics

Minimum Detected	0.47
Maximum Detected	0.59
Mean of Detected	0.53
SD of Detected	0.0848528
Minimum Non-Detect	0.092
Maximum Non-Detect	0.12

Log-transformed Statistics

Minimum Detected	-0.755023
Maximum Detected	-0.527633
Mean of Detected	-0.641328
SD of Detected	0.1607889
Minimum Non-Detect	-2.385967
Maximum Non-Detect	-2.120264

Data with Multiple Detection Limits

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

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

Observations < Largest ND are treated as NDs

Single Detection Limit Scenario

Number treated as Non-Detect with Single DL	10
Number treated as Detected with Single DL	2
Single DL Non-Detect Percentage	83.33%

Warning: Data set has only 2 Distinct Detected Values.

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

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

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

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

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

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

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

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

Background Statistics

Normal Distribution Test with Detected Values Only

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

Data not Normal at 5% Significance Level

Lognormal Distribution Test with Detected Values Only

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

Data not Lognormal at 5% Significance Level

Assuming Normal Distribution

DL/2 Substitution Method

Mean		0.130125
SD		0.1885666
95% UTL	95% Coverage	0.6460433
95% UPL (t)		0.4825968
90% Percentile (z)		0.3717828
95% Percentile (z)		0.4402895
99% Percentile (z)		0.5687966

Assuming Lognormal Distribution

DL/2 Substitution Method

Mean (Log Scale)		-2.603504
SD (Log Scale)		0.920888
95% UTL	95% Coverage	0.919473
95% UPL (t)		0.4138857
90% Percentile (z)		0.2409084
95% Percentile (z)		0.3366275
99% Percentile (z)		0.6305276

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Thallium (Continued)

Maximum Likelihood Estimate(MLE) Method N/A

Log ROS Method

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

Gamma Distribution Test with Detected Values Only

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

Data not Gamma Distributed at 5% Significance Level

Assuming Gamma Distribution

Gamma ROS Statistics with Extrapolated Data

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

Data Distribution Test with Detected Values Only

Data do not follow a Discernable Distribution (0.05)

Nonparametric Statistics

Kaplan-Meier (KM) Method

Mean	0.48
SD	0.0331662
SE of Mean	0.0135401
95% KM UTL with 95% Coverage	0.5707429
95% KM Chebyshev UPL	0.6304715
95% KM UPL (t)	0.5419949
90% Percentile (z)	0.5225043
95% Percentile (z)	0.5345536
99% Percentile (z)	0.5571562

Gamma ROS Limits with Extrapolated Data

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

Note: DL/2 is not a recommended method.

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Vanadium

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
Tolerance Factor	2.736		

Raw Statistics

Minimum	9.35
Maximum	21.7
Second Largest	21.2
First Quartile	15.325
Median	16.75
Third Quartile	19.025
Mean	16.729167
SD	3.5412157
Coefficient of Variation	0.2116791
Skewness	-0.570676

Log-Transformed Statistics

Minimum	2.2353763
Maximum	3.0773123
Second Largest	3.0540012
First Quartile	2.7272568
Median	2.8182869
Third Quartile	2.9455473
Mean	2.7936775
SD	0.2351498

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9648825
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9144844
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	26.417933
95% UPL (t)	23.348464
90% Percentile (z)	21.267417
95% Percentile (z)	22.553948
99% Percentile (z)	24.967266

Assuming Lognormal Distribution

95% UTL with 95% Coverage	31.095008
95% UPL (t)	25.361271
90% Percentile (z)	22.087991
95% Percentile (z)	24.057925
99% Percentile (z)	28.239386

Gamma Distribution Test

k star	16.153164
Theta Star	1.0356588
MLE of Mean	16.729167
MLE of Standard Deviation	4.1624162
nu star	387.67594
A-D Test Statistic	0.305188
5% A-D Critical Value	0.7317512
K-S Test Statistic	0.1859669
5% K-S Critical Value	0.2451878

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	21.05
95% Percentile	21.425
99% Percentile	21.645

Assuming Gamma Distribution

90% Percentile	22.235847
95% Percentile	24.112166
99% Percentile	27.901344
95% WH Approx. Gamma UPL	24.483125
95% HW Approx. Gamma UPL	24.676999
95% WH Approx. Gamma UTL with 95% Coverage	28.941838
95% HW Approx. Gamma UTL with 95% Coverage	29.400197

95% UTL with 95% Coverage	21.7
95% Percentile Bootstrap UTL with 95% Coverage	21.7
95% BCA Bootstrap UTL with 95% Coverage	21.7
95% UPL	21.7
95% Chebyshev UPL	32.795258
Upper Threshold Limit Based upon IQR	24.575

Attachment 1
ProUCL Output

Note: Highlighted UTL is the Selected Background Threshold Value (BTV)

Zinc

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
Tolerance Factor	2.736		

Raw Statistics

Minimum	10.3
Maximum	38.8
Second Largest	30.9
First Quartile	14.85
Median	17.45
Third Quartile	25.65
Mean	20.316667
SD	8.6497329
Coefficient of Variation	0.4257457
Skewness	0.9535136

Log-Transformed Statistics

Minimum	2.3321439
Maximum	3.6584202
Second Largest	3.4307562
First Quartile	2.6971387
Median	2.8567674
Third Quartile	3.2436108
Mean	2.9335461
SD	0.4079079

Background Statistics

Normal Distribution Test

Shapiro Wilk Test Statistic	0.9164597
Shapiro Wilk Critical Value	0.859

Data appear Normal at 5% Significance Level

Lognormal Distribution Test

Shapiro Wilk Test Statistic	0.9695311
Shapiro Wilk Critical Value	0.859

Data appear Lognormal at 5% Significance Level

Assuming Normal Distribution

95% UTL with 95% Coverage	43.982336
95% UPL (t)	36.484887
90% Percentile (z)	31.401745
95% Percentile (z)	34.544211
99% Percentile (z)	40.438954

Assuming Lognormal Distribution

95% UTL with 95% Coverage	57.373469
95% UPL (t)	40.286405
90% Percentile (z)	31.699504
95% Percentile (z)	36.763107
99% Percentile (z)	48.544537

Gamma Distribution Test

k star	4.9913405
Theta Star	4.0703828
MLE of Mean	20.316667
MLE of Standard Deviation	9.0937677
nu star	119.79217
A-D Test Statistic	0.2657316
5% A-D Critical Value	0.7314556
K-S Test Statistic	0.1653392
5% K-S Critical Value	0.2457561

Data appear Gamma Distributed at 5% Significance Level

Data Distribution Test

Data appear Normal at 5% Significance Level

Nonparametric Statistics

90% Percentile	30.57
95% Percentile	34.455
99% Percentile	37.931

Assuming Gamma Distribution

90% Percentile	32.49131
95% Percentile	37.209765
99% Percentile	47.181375
95% WH Approx. Gamma UPL	38.424727
95% HW Approx. Gamma UPL	38.811575
95% WH Approx. Gamma UTL with 95% Coverage	50.478588
95% HW Approx. Gamma UTL with 95% Coverage	51.83657

95% UTL with 95% Coverage	38.8
95% Percentile Bootstrap UTL with 95% Coverage	38.8
95% BCA Bootstrap UTL with 95% Coverage	38.8
95% UPL	38.8
95% Chebyshev UPL	59.559517
Upper Threshold Limit Based upon IQR	41.85

TEST PIT INFORMATION

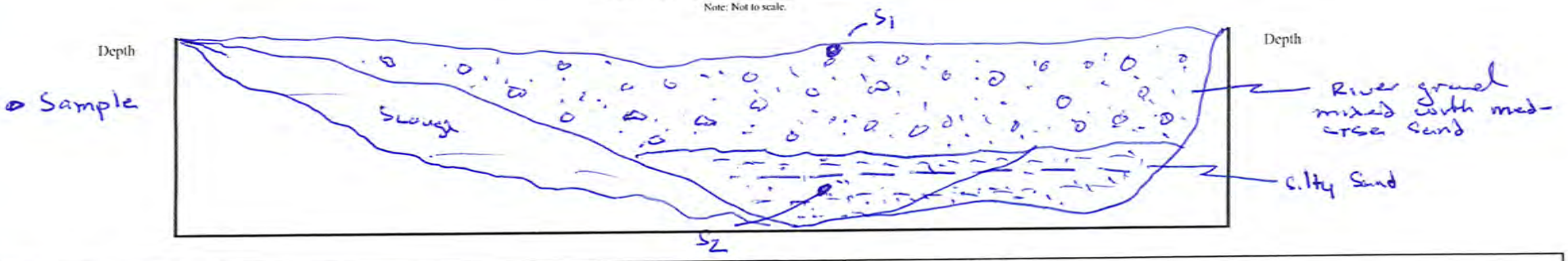
Site ID: 027BG001
Geol./Eng.: R. McDonald / E. Staes
Date: 07212010

Depth: 11'
Width: 3½'
Length: 16'

	North Stake	South Stake
Northing		
Easting		
Elevation		

Test Pit Description and Sample Locations

Note: Not to scale.



Depth	Lithology	Depth	Lithology
0-7	River gravel mixed with med-crse Sand 35% gravel, 75% Sand, LT gray-Tan, dry		
7-11	Silty Sand LT tan - buff fn-med crse Sand 90~~80~~% Sand 10% Silt, Dry		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GCMS (BNAs)	GCMS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	IMPA / EMPA	Thioglycol	DIMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	027BG001-01-072110	0.2-0.7	✓	SAA				X										
	027BG001-02-072110	10.5-11	✓	SAA				X										

Location Map

N

E W

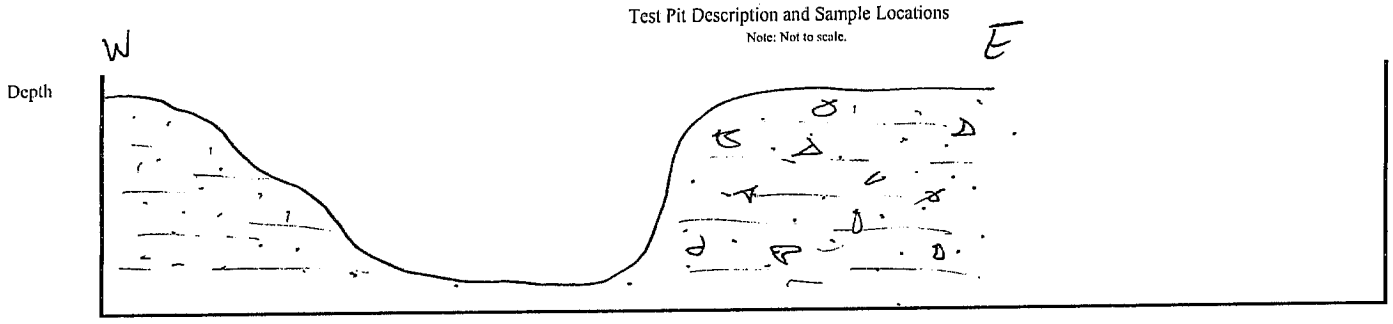
TEST PIT INFORMATION

Site ID: 028BG001
Geol./Eng.: K. McDonald
Date: 07142010

Depth: 9'
Width: 32"
Length: 15.5'

	North Stake	South Stake
Northing		
Easting		
Elevation		

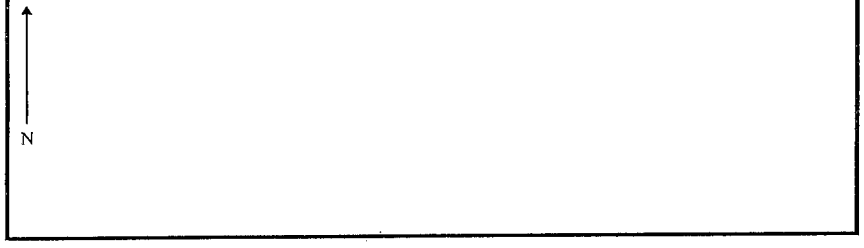
Test Pit Description and Sample Locations
Note: Not to scale.

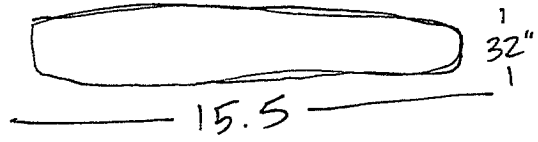


Depth	Lithology	Depth	Lithology
0-9'	silty sand & gravel, lt. reddish brown, subround to angular, pea to cobble sized, weakly bedded, loose, dry.		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	IMPA/EMPA	Thioglycol	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	028BG001-01-07142010	0.2-0.7	/	SAA				X										
	-02	9.0-5.5	/	SAA				X										

Location Map





TEST PIT INFORMATION

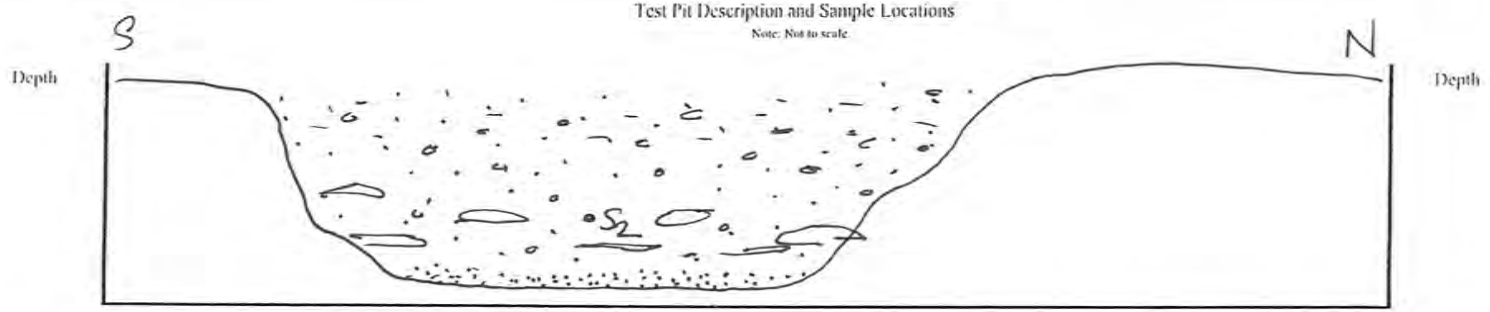
Site ID: YPG 029BG001
Geol./Eng.: R. McDonald
Date: 13 Dec. 2010

Depth: 9.5'
Width: 30"
Length: 16'

~~North Stake~~
Northing: 3637585
Easting: 074 7760
Elevation:

~~South Stake~~

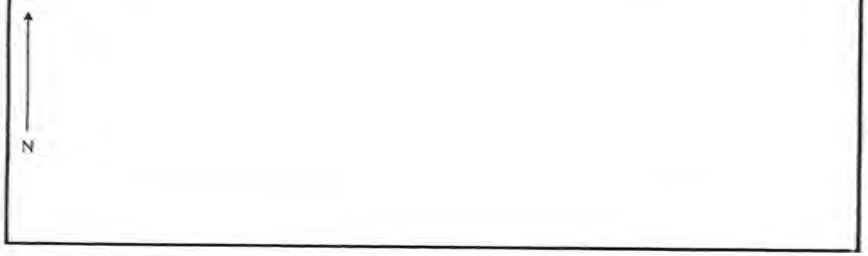
Test Pit Description and Sample Locations
Note: Not to scale

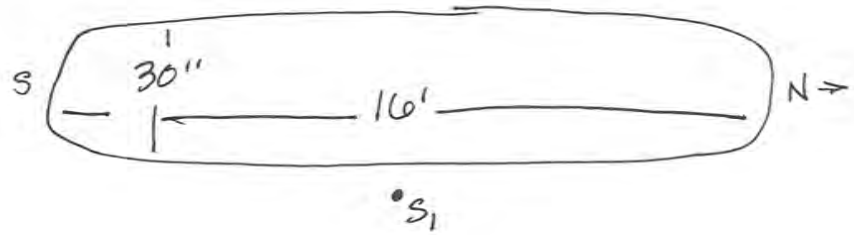


Depth	Lithology	Depth	Lithology
0-9.5'	Silty sand and gravel (GM); sand is med-coarse, gravel is pebble & cobble size subround-subang., dry, loose, lt. brn - lt. reddish brn.		
	0-3' are siltier		
	Intermittant hard clay (caliche?) from 7.5-9.5'		
	no visible staining		
@9.5'	Sand (SW), fine-med, lt tan-white, little silt		
	no visible staining		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	HPAs/EMPA	Thiodiglycol	DMP	pH	Asbestos	Grain A & B	Total Phos	VIT LAB
	029BG001-01-121310	0.2-0.7	—	GM as above														
	029BG001-02-121310	7-7.5	—	clay (caliche) as above														

Location Map





Background

TEST PIT INFORMATION

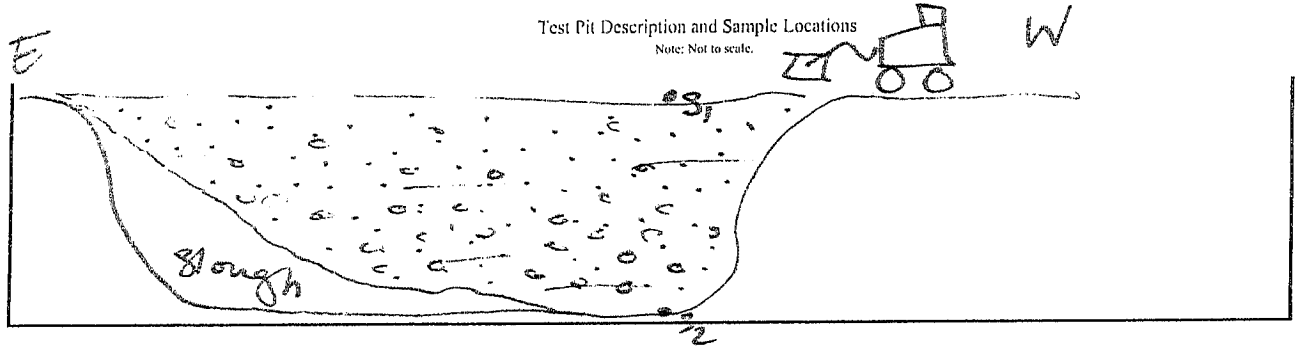
Page: 1 of 1

Site ID: 141BG001-01
Geol./Eng.: R McDonald
Date: 072822010

Depth: 10'
Width: 3'
Length: 13'

	North Stake	South Stake
Northing		
Easting		
Elevation		

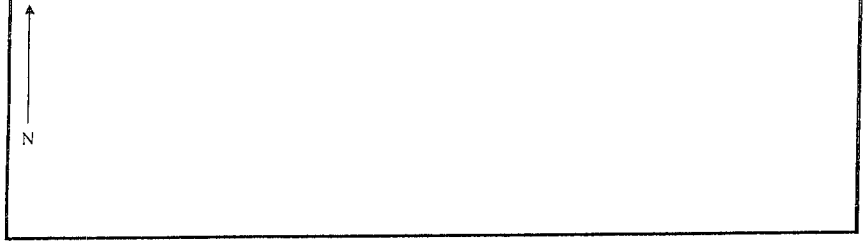
Test Pit Description and Sample Locations
Note: Not to scale.

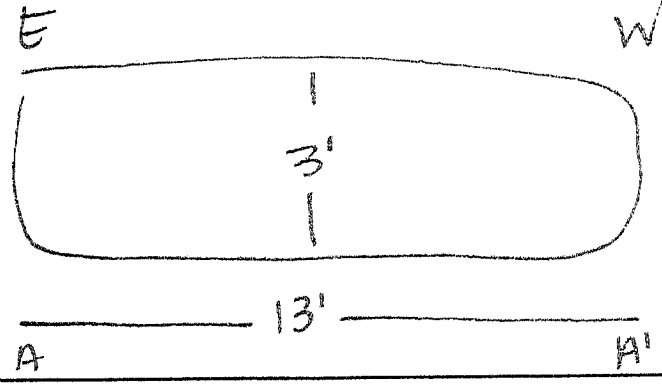


Depth	Lithology	Depth	Lithology
0-10	Silty sand & gravel (SM-GM), loose, gravel is pea-cobble angular-subrounded increasing grain width, weak bedding, tan-lt brown, no visible staining		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC/MS (BNAs)	GC/MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	EMPA, EMPA	Thiodiglycol	DMP	pH	Asbestos	Gross A & B	Total Phos	MT LAB
	141BG001-01-072810	0.2-0.7		SAA				X										
	141BG001-01-072810	9.5-10		SAA				X										

Location Map





178A

TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	YPG178BG4001	Depth:	8'	Northing		
Geol./Eng.	R. McDonald	Width:	3'	Easting		
Date:	20 Dec. 2010	Length:	18'	Elevation		

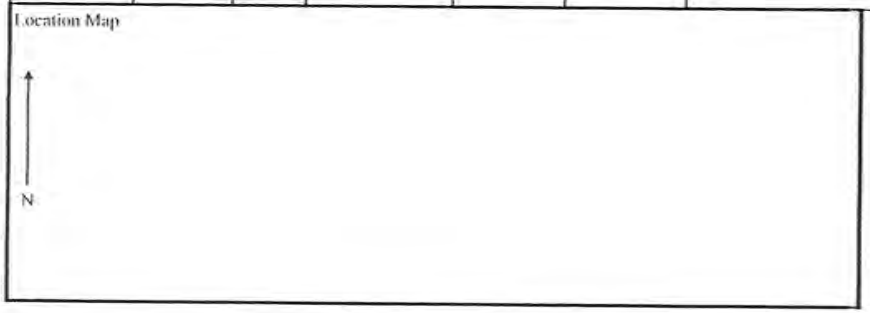
Test Pit Description and Sample Locations

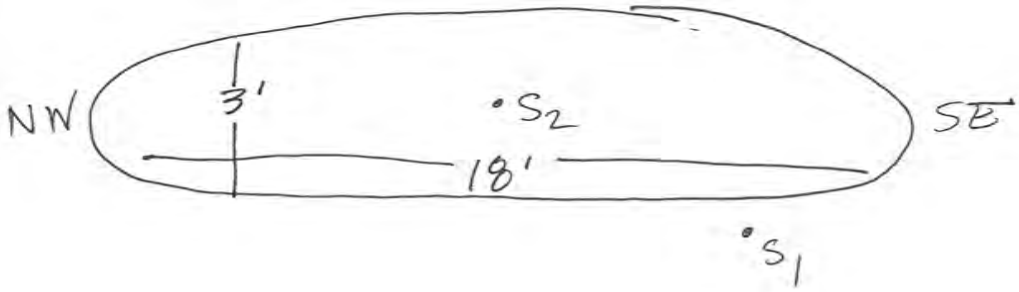
Note: Not to scale

Depth	Lithology	Depth	Lithology
0-6.5	Silty sand + gravel (GM) dry, loose, lt. reddish brn, gravel is subround-subangular, pea-cobble size, weak bedding throughout. No visible staining		
6.5-7.5 (3 pan)	sand (SW), lt tan, dry - sl. damp, no visible staining		
7.5-8	hard clay (caliche), reddish brn, inelastic, v. sl. damp, no visible staining.		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC MS (BNAs)	GC MS (Vols)	Explosives	TCL (Metals)	TOC	TPHC	LMPA/EMPA	Thallium	DIMP	pH	Asbestos	Gross α & β	Total Phos	MT Lab
	178BG4001-01-122010	0.2-0.7	~	GM as above														
	178BG4001-02-122010	7.5-8	~	in clay as above														

Location Map





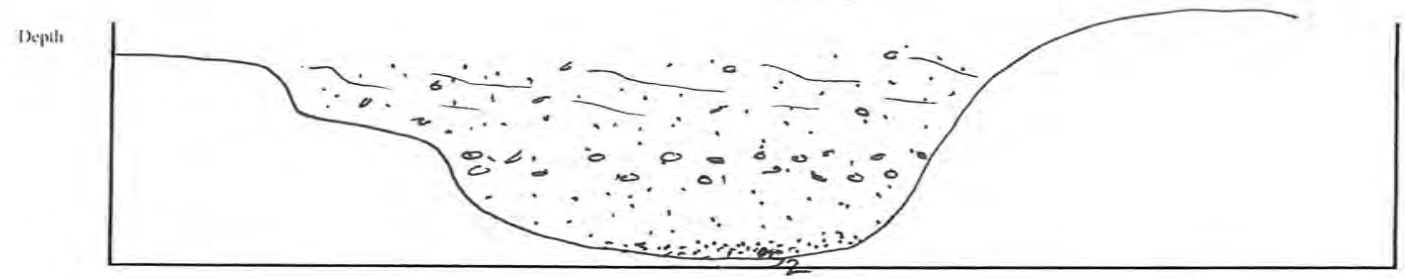
178B

TEST PIT INFORMATION

					North Stake	South Stake
Site ID:	YPG 178B 0002	Depth:	8.5'	Northing		
Geol./Eng.	R. McDonald	Width:	30"	Easting		
Date:	16 Dec. 2010	Length:	16'	Elevation		

Test Pit Description and Sample Locations

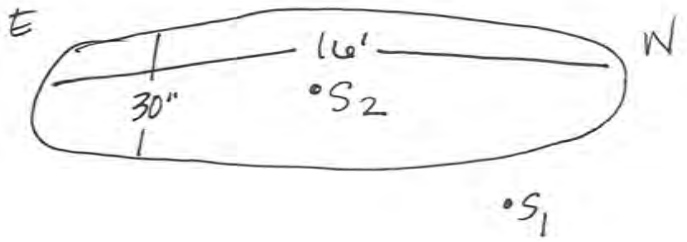
Note: Not to scale



Depth	Lithology	Depth	Lithology
0'-3'	silty sand & Gravel (SM-GM), cross-bedded, dry, loose, gravel is pea-size, no visible staining		
3-8.5'	silty sand w/ some gravel (SM), massive, dry, loose, gravel layer from approx. 5'-5.5', no visible staining		
@8.5'	silty sand (SW), lt. tan, sl. moist, fine-med, little (<10%) gravel, no visible staining		

Site ID	Field Sample #	Depth	Headspace	Sample Description	GC MS (BNAs)	GC MS (Vals)	Explosives	TCL (Metals)	TOC	TPHC	IMPA/ EMPA	Thodig/coal	DMP	pH	Asbestos	Gross A & B	Total Phos.	MT LAB
	178BG002-01-121610	0.2-0.7	—	SM-GM as above														
	178BG002-02-121610	8-8.5	—	SW as above														

Location Map



APPENDIX E

ECOLOGICAL RISK ASSESSMENT

APPENDIX E
ECOLOGICAL RISK ASSESSMENT

This ecological risk assessment (ERA) evaluates the potential for ecological impacts from potential exposure to chemicals of potential ecological concern (COPECs) in soils at YPG-178 at the U.S. Army Garrison Yuma Proving Ground (USAGYPG) in Yuma, Arizona. The results of this ERA provide a basis for decision in making regarding further action with respect to the COPECs in soils at the site.

Following USEPA (1997, 1998) guidance, the ERA process consists of four major components:

- Problem formulation
- Analysis
- Risk characterization
- Uncertainty analysis

Each step of the ERA process is discussed in detail below.

E.1 PROBLEM FORMULATION

Problem formulation is a systemic planning process that identifies the major factors to be considered in the ERA (USEPA 1997, 1998). This section includes the site descriptions, the approach for evaluation of available environmental data, selection of COPECs, exposure pathway characterization, development of a conceptual site model (CSM), and selection of assessment endpoints. Each is described below.

E.1.1 General Habitat Characterization

USAGYPG is a "U" shaped installation occupying approximately 1,300 square miles in located in southwestern Arizona just to the west of the Colorado River (Figure 1.1). The installation is 23 miles northeast of the City of Yuma along U.S. Highway 95, between Interstate Highways 8 and 10 (Figure 1.1). There are three wildlife refuges adjacent to USAYPG: 1) Cibola National Wildlife Refuge, 2) Imperial National Refuge, and 3) Kofa National Wildlife Refuge. The Cibola and Imperial National Refuge's are both located along the Colorado River to the west of USAGYPG, while the Kofa National Wildlife Refuge is located within and to the north of the "U" shaped boundary.

USAGYPG is located in the Sonoran Desert, a low elevation, hot, arid desert. It is characterized by high daytime temperatures with large daily temperature variations, low relative humidity, and very low average precipitation. The average monthly air temperature ranges from a low of 47.6 degrees Fahrenheit (°F) in January to a high of 106.8°F in July. The average annual

precipitation in Yuma and other areas along the lower Colorado River is very low, approximately 3.5 inches per year (National Weather Service, 2011).

No perennial lakes or streams occur within USAGYPG, however two major rivers flow through the adjacent desert. The Colorado River traverses a generally north-south direction west of USAGYPG with the mostly dry Gila River drainage traversing an east-west direction south of USAGYPG. Surface drainage on the northern and western part of USAGYPG flows into the Colorado River with the central and eastern parts of USAGYPG flowing into the Gila River (Figure 1.1).

E.1.2 Species at Yuma Proving Ground

More than 60 species of mammals have been observed at USAGYPG. Large mammal species that have been observed include the mule deer (*Odocoileus hemionus*), wild horse (*Equus caballus*), burro (*Equus asinus*), coyote (*Canis latrans*), mountain lion (*Puma concolor*), and kit fox (*Vulpes macrotis*). Small mammal species present at TEAD include mice (*Mus* spp. and *Peromyscus* spp.), pocket mice (*Chaetodipus* spp. and *Perognathus* spp.), kangaroo rats (*Dipodomys* spp.), bats (multiple genera), squirrels (*Ammospermophilus* spp. and *Spermophilus* spp.), and rabbits and hares (*Lepus* and *Sylvilagus* spp.) (Table E.1).

More than 141 species of birds have been observed at USAGYPG, including the red-tailed hawk (*Buteo jamaicencis*), rough-legged hawk (*Buteo lagopus*), bald eagle (*Haliaeetus leucocephalus*), turkey vulture (*Cathartes aura*), prairie falcon (*Falco mexicanus*), and six species of owls (Table E.1).

Thirty three species of reptiles have been observed on USAGYPG, including the Sonoran desert tortoise (*Gopherus morafkai*), Mohave fringe-toed lizard (*Uma scoparia*), collared lizard (*Crotaphytus collaris*), northern side blotched lizard (*Uta stansburiana*), western whiptail (*Aspidoscelis tigris*), gopher snake (*Pituophis catenifer*), and Mojave rattlesnake (*Crotalus scutulatus*) (Table E.1).

Three species of amphibians have been recorded at USAGYPG: Red-spotted toad (*Bufo punctatus*), Colorado River toad (*Bufo alvarius*), and Couch's spadefoot toad (*Scaphiopus couchii*) (Table E.1).

No fish have been recorded at USAGYPG.

Numerous plant species have been recorded at USAGYPG, including 7 Arizona special status species (Table E.1). The Nichol's turks' head cactus, a federally listed species, is listed in the current INRMP as occurring at YPG. The Nichol's turks' head cactus was reportedly photographed on the base in a 1994 plant survey; however, subsequent field surveys by the photographer, contract personnel, and USAGYPG staff have failed to find the plant (Command Technology Directorate et al., 2001). However, if the cactus is at USAGYPG, it is almost

certainly within the boundary of the proposed White Tanks Conservation Area (Laura Merrill, pers. comm.). Therefore, this species is assumed to not be present at YPG-178.

There are no federally listed threatened or endangered species known to occur on USAGYPG (Table E.1). However, 17 Arizona special status species have been observed at the facility. A list of amphibian, bird, mammal, and reptile species found at USAGYPG is presented in Table E.1.

E.1.3 Site Descriptions, Land Use, Wildlife, and Plants

The YPG-178 site is located approximately 2 miles south-southeast of the Main Administrative Area, north of Laguna Dam Road (Figure 2.1), and consists of multiple surface and shallow subsurface disposal sites located approximately 200 ft apart. These areas are located on low-lying bedrock outcrops among a series of small hills and have been designated YPG-178a and YPG-178b. The YPG-178a site is approximately 1.68 acres in size, and YPG-178b is approximately 0.78 acres (Figure 2.2). Disposal activities at the landfill reportedly occurred during the 1960s and 1970s (Jason, 2007). The future use of the YPG-178 site is expected to continue as undeveloped/vacant land.

Much of the site has been disturbed by past landfill disposal activities and there is little to no vegetation. In the undisturbed parts of the site, there are scattered small bushes and trees, which include bursage, creosote, and paloverde. The site is relatively flat with depressions (i.e., sinkholes) located in the south central region of the landfill. Debris observed on the ground surface was removed during a surface removal action that occurred in November 2009. Removed items include broken glass, metal banding, and a metal box and drum (Parsons, 2010).

While the Sonoran desert tortoise (*Gopherus morafkai*) is known to occur at USAGYPG (Grandmaison 2010), it has only been found in the northwestern corner of the base (Grandmaison 2010). The U.S. Geological Survey (USGS) (Nussear et al. 2009) has modeled the habitat preferences of desert tortoises and generated a map of the showing which areas are have suitable habitat in southern California and Arizona. Based on this habitat suitability map, YPG-178 does not contain suitable desert tortoise habitat; i.e., on a scale of 0 to 1 (with 1 being the most suitable habitat), the suitability for YPG-178 was estimated at 0.

E.1.4 Selection of Representative Ecological Receptors

Ecological receptors (i.e., representative species) include non-domesticated plants and wildlife that may reasonably be expected to inhabit or regularly forage at the site, given current and anticipated future site conditions. As generally recognized by ERA guidance documents, it is impractical to evaluate all possible ecological receptors for a given site. Instead, a few species representative of the habitat functions and trophic structure present are selected for evaluation in the ERA.

The species present at USAGYPG are shown in Table E.1. Plants and terrestrial invertebrates were selected for evaluation. In addition, one mammal and one bird species were

selected for evaluation from each of the major trophic guilds; i.e., herbivores, insectivores, and carnivores. Special status species, and those species with small home ranges, occurring on the base were preferentially selected for evaluation. Species that are primarily associated with the rivers and the farmlands bordering the base were not selected for evaluation. Note that although there are several special status bat species that occur on the base, bats have larger home ranges than shrews and mice, which were selected for evaluation instead because evaluation of species with smaller home ranges will result in a more conservative risk estimates. The representative species selected for evaluation are as follows:

Plants:

- Terrestrial plants

Invertebrates:

- Terrestrial (soil dwelling) invertebrates

Mammals:

- Desert shrew (*Notiosorex crawfordi*)
- Little pocket mouse (*Perognathus longimembris*)
- Kit fox (*Vulpes macrotis*)

Birds:

- Gambel's quail (*Callipepla gambelii*)
- Verdin (*Auriparus flaviceps*)
- American kestrel (*Falco sparverius*)

Reptiles:

- Sonoran desert tortoise (*Gopherus morafkai*)

Although the Mohave fringe-toed lizard (*Uma scoparia*) occurs at YPG (AGFD 2008) and is an Arizona species of special concern, it is "restricted to sparsely vegetated areas that concentrate fine sands such as dunes and large washes in arid environments" (AGFD 2008). Since there are no dunes or fine sands at YPG-179a and b, the Mohave fringe-toed lizard is unlikely to be present and was not selected for evaluation.

E.1.5 Selection of Chemicals of Potential Ecological Concern

Chemicals of potential ecological concern (COPECs) are those chemicals detected in environmental media at the site for which exposure may result in adverse ecological effects. The selection of COPECs consisted of a five step process, as follows:

- Data review
- Exclusion of essential nutrients
- Identification of metals elevated above background
- Comparison of maximum detects to ecological screening levels

- Comparison of upper confidence limits (UCL) to risk-based screening levels

COPECs were selected for three separate areas: YPG-178a, YPG-178b (excluding Area 7), and Area 7. This COPEC selection process is described below.

E.1.5.1 Data Review

The data collected at the site is presented in detail in Section 4. Briefly, 14 samples were collected at YPG-178a, including two field duplicates and 18 samples were collected at YPG-178b, excluding the two samples that were collected from Area 7. All samples collected at YPG-178a and B were analyzed for SVOCs (USEPA Method 8270C), VOCs (USEPA Method 8260B), explosives (USEPA Method 8330), and metals (USEPA Method 6010B, Method 7471A for mercury). Soil samples were collected from surface soils (0.2-0.7 ft bgs) at all sampling locations, with subsurface samples collected at depths up to 8 ft bgs (Table 4.2).

Data quality was evaluated in Appendix C. As part of the data quality assessment, the data was assigned qualifiers. Data without qualifiers were considered appropriate for risk assessment purposes; i.e., these data met the criteria prescribed in the applicable Quality Assurance Project Plan (Appendix A, Parsons, 2010). Following USEPA guidance (1989, 1992), data with J qualifiers were used for risk assessment purposes. U and UJ qualified data were considered to be below laboratory detection limits (i.e., nondetect) but usable for risk assessment purposes. NJ qualified data were treated as detects but are likely to be false positives (Appendix C). R qualified data were excluded from this risk assessment (USEPA 1989, 1992).

E.1.5.2 Exclusion of Essential Nutrients

Essential nutrients are toxic only at very high doses (i.e., much higher than those associated with exposure at the site) were not selected as COPECs. These include calcium, magnesium, potassium, iron, and sodium (USEPA 1989).

E.1.5.3 Background

Metals are naturally occurring in soils. To determine which metals are present at the site due to past releases, the maximum detected concentrations at the site were compared with statistically derived background threshold values (BTVs). Metals detected at concentrations less than the BTVs were assumed to be present at naturally occurring concentrations and were not evaluated further. Metals detected at concentrations exceeding the BTVs were evaluated further. The derivation of the BTVs is presented in Appendix D.

E.1.5.4 Comparison of Maximum Detect to Ecological Screening Levels

The maximum detected concentrations were compared to ecological screening levels derived from the following hierarchy of sources:

1. USEPA (2011) Ecological Soil Screening Levels

2. Los Alamos National Laboratory (2011) EcoRisk Database v3.0
3. USEPA Region 4 (2001) Ecological Screening Values
4. USEPA Region 5 (2003) Ecological Screening Levels

Chemicals with maximum detected concentrations less than the ecological screening levels were assumed not to be present at concentrations with the potential to cause adverse effects and were eliminated as COPECs.

For aluminum, USEPA (2003a) states that "potential ecological risks associated with aluminum in soils is [sic] identified based on the measured soil pH. Aluminum is identified as a COPC [chemical of potential concern] only for those soils with a soil pH less than 5.5. The technical basis for this procedure is that the soluble and toxic forms of aluminum are only present in soil under [sic] soil pH values of less than 5.5." The soils within USAGYPG and the YPG-178a and b site, are predominately slightly to moderately alkaline, with pH values between 7.4 to 8.4 (Table 2.1 and Section 2.1.3). Therefore, aluminum was eliminated as a COEPC and not evaluated further in this ERA.

E.1.5.5 Comparison of UCL to Risk-Based Screening Levels

In the last step, 95% upper confidence limits (UCLs) on the mean were calculated using USEPA's (2010) ProUCL v4.1.01 software and compared to the ecological screening levels derived in the previous step. Those chemicals with UCLs greater than ecological screening levels were selected as COPECs. The output from ProUCL is presented as Attachment 1 to this Appendix.

Using the process outlined above, the COPECs selected for each area are as follows:

- YPG-178a (Table E.2):
  - Antimony
  - Copper
  - Lead
  - Mercury
  - Zinc
- YPG-178b, excluding Area 7 (Table E.3):
  - Antimony
  - Lead
  - Mercury
  - Zinc
- Area 7 (Table E.4):
  - None

The maximum detected concentrations, UCLs, BTVs, ecological screening levels, and results of the comparisons are shown in Tables E.2 through E.4.

E.1.6 Exposure-Pathway Analysis and Conceptual Site Model

Ecological receptors may be at-risk from exposures to COPECs if there is a complete exposure pathway between the COPEC source and the receptor. Results of the soil sampling activities conducted during this RFI indicate that COPECs are present in site soils. In addition, the ingestion of plants and animals from these sites may expose animals to site-related chemicals via food-web transfers. There is no surface water or sediment USAGYPG and it is assumed that groundwater has not been affected. Thus, ecological receptors are assumed to be exposed to COPECs via the following pathways:

- Dermal contact with soils
- Incidental ingestion of soils
- Ingestion of site-associated biota
- Inhalation of contaminants emitted from soils

These exposure pathways form the basis for the assessment endpoints and the CSM, which is graphically illustrated in Figure E.1.

E.1.6.1 Soil Exposure Pathways

Wildlife can incidentally ingest soils while foraging or during other activities; e.g., during dust bathing, preening, grooming (USEPA 1993). Some animals (e.g., deer and cows) may also intentionally ingest soils to supplement their trace mineral intake (Beyer et al. 1994). Thus, soil ingestion was assumed to be a complete exposure pathway.

Plants present at the site may be exposed to contaminants in soils through root contact, and some contaminants may be taken up into the vegetation and then consumed by herbivorous organisms. Similarly, invertebrates potentially residing in contaminated soils would contact and potentially incorporate these contaminants.

Wildlife exposures to chemicals in soil via dermal contact will not be evaluated in this ERA. USEPA (2003b) states that "Although dermal exposure through direct contact with soil can be considered a complete exposure pathway for birds and mammals, this exposure pathway is usually considered to be incidental due to low frequency and/or duration of exposure and the relative contribution to risk compared to oral exposures... Feathers of birds, fur on mammals, and scales on reptiles are believed to reduce dermal exposure by limiting the contact of the skin surface with the contaminated media."

USEPA (2003b) also states that inhalation exposures are generally insignificant. Therefore, exposures via the inhalation of COPECs emitted from soils were assumed to be insignificant and were not evaluated here.

For most plants, most of the root mass and uptake process usually occurs in fairly shallow soils. Globally, 95% of all plants have rooting depths between 1.3 and 5 ft bgs. In particular, the maximum rooting depth of crops and pasture species is (on average) between 3 and 5 ft bgs

(Breuer et al., 2003; Schenk and Jackson, 2002). Schenk and Jackson (2009) have also modeled ecosystem rooting depths in North America and their maps show that the mean 95% ecosystem rooting depth is approximately 5.5 to 6.2 ft bgs (1.7 to 1.9 meters) in the area surrounding YPG-178. Therefore, plants were assumed to be exposed to soils up to 6 ft bgs.

In general, terrestrial invertebrates are assumed to burrow up to 6 ft bgs. Non-burrowing animals are generally assumed to be exposed to soils from 0-2 inches bgs. Therefore, the non-burrowing animals evaluated in this HRA (i.e., desert shrew, Gambel's quail, verdin, and American kestrel), were assumed to be exposed to soils from 0-2 inches bgs. If suitable soils are present, the Sonoran desert tortoise will dig burrows up to 6 ft deep on the slopes of rocky foothills (USACE 2006). Therefore, the Sonoran desert tortoise was assumed to be exposed to soils up to 6 ft bgs. Kit fox dens extend approximately 1.3-3 meters bgs (Arjo et al. 2003). Therefore, it was assumed the kit foxes may be exposed to soils as deep as 10 ft bgs. Little pocket mice typically have tunnels that reach up to approximately 2 ft bgs (Kenagy 1973). In contrast, desert shrews do not generally burrow and nest on the surface (Hoffmeister and Goodpaster 1962).

At both sites YPG 178a and b, the shallowest samples were collected from 0-0.7 feet bgs, with the next samples collected at 5.5 ft bgs and lastly 8 ft bgs. Therefore, soil data from 0-0.7 ft bgs were used to represent exposures to receptors assumed to be exposed to 0-2 inches bgs, receptors that are assumed to be exposed to soils up to 6 ft bgs were evaluated for exposures to 0-5.5 ft bgs, and receptors that are assumed to be exposed to soils up to 10 ft bgs were evaluated for exposures to 0-8 ft bgs.

Based on this information, the following exposure intervals were used to estimate exposures:

- Terrestrial plants: 0-5.5 ft bgs
- Terrestrial invertebrates: 0-5.5 ft bgs
- Desert shrew: 0-0.7 ft bgs
- Kit fox: 0-8 ft bgs
- Little pocket mouse: 0-0.7 ft bgs
- Gambel's quail: 0-0.7 ft bgs
- Verdin: 0-0.7 ft bgs
- American kestrel: 0-0.7 ft bgs
- Sonoran desert tortoise: 0-5.5 ft bgs

E.1.6.2 Food Web Exposure Pathways

Wildlife may be exposed to the COPECs at the site via the consumption of food items (e.g., plants, and invertebrates). Wildlife exposures via the consumption of food items from the site were assumed to be a complete exposure pathway and were quantitatively evaluated.

E.1.6.3 Surface Water Exposure Pathways

There is no surface water or sediment at the site. Therefore, surface water and sediment exposure pathways are assumed to be incomplete.

E.1.6.4 Groundwater Exposure Pathways

It is expected that groundwater occurs at approximately 115 ft bgs at the site (Section 2.2.4.2). Since groundwater does not come to the surface at the site, and most plants do not have roots that extend to 100 ft bgs, groundwater exposure pathways were assumed to be incomplete.

E.1.6.5 Exposure Pathway Summary and Conceptual Site Model

The ecological receptors used in this ERA were assumed to be exposed to the COPECs at the site via the consumption of food items (e.g., plants and invertebrates) and the incidental ingestion of soil while foraging. These exposure pathways were quantitatively evaluated in the ERA and are illustrated in Figure E.1.

E.1.7 Selection of Assessment Endpoints

In accordance with USEPA (1997) guidance for ecological risk assessment, assessment endpoints are "explicit expressions of the actual environmental values (e.g., ecological resources) that are to be protected." USEPA (1998) further states that "once ecological values are selected as potential assessment endpoints, they need to be operationally defined. Two elements are required to define an assessment endpoint." The two elements are 1) an ecological entity: and 2) "the characteristic about the entity of concern that is important to protect and potentially at risk" (USEPA 1998). An "ecological entity" can be a species (e.g., the desert shrew), a functional group of species (e.g., plants), a community (e.g., soil invertebrates), an ecosystem (e.g., sediment benthos), or a specific valued habitat (e.g., high desert). Here, several different species and groups of species, representing a broad range of potential ecological receptors, were selected (see Section E.1.4) for evaluation in this ERA. The characteristics to be protected include survival, reproduction, and development.

The interpretation of available site-specific and biological information and an understanding of the structure and function of the terrestrial communities at the site were used to identify general assessment endpoints for the ERA. The following assessment endpoints were selected for this analysis: development (including growth), survivorship, and reproduction in populations of the selected ecological receptors (Section E.1.4).

These general assessment endpoints, and their measurable attributes, represent the basic complete exposure pathways relevant to addressing the potential for ecological hazards due to the presence of site-specific COPECs.

E.2 ANALYSIS

The purpose of the Analysis Phase is to 1) characterize the potential types of effects that might occur in receptors if exposed to site-related contaminants:, and 2) quantify the exposure for complete exposure pathways. This section presents the derivation of effects and exposure estimates.

E.2.1 Selection of Toxicity Reference Values

Toxicity reference values (TRVs) are used to evaluate the potential hazards from exposure to each COPEC. Numerical values chosen for a TRV are based on a specific, "assessment endpoint"- (i.e., unaffected development, survivorship, or reproduction of the representative species as described in Section E.1.4). Since adverse reproductive and developmental effects generally occur at lower exposures than mortality, TRVs protective of reproductive and developmental effects were assumed to be protective of mortality. Population persistence was assumed to be maintained if reproduction and growth were not affected.

The numerical values used as TRVs are called "measures of effect." From each toxicity study, there are multiple potential numerical values that can be used as measures of effect. The measures of effect used in this ERA were the no observable adverse effect levels (NOAELs) and lowest observable adverse effect levels (LOAELs) protective of reproductive and developmental (including growth) effects.

Toxicity reference values for mammals and birds were obtained from the following hierarchy of sources:

1. USEPA (2011) Ecological Soil Screening Levels (Eco-SSLs)
2. Los Alamos National Laboratory (2011) EcoRisk Database v3.0
3. US Army Center for Health Promotion & Preventive Medicine Wildlife Toxicity Assessment program
4. Navy/Biological Technical Assistance Group (BTAG) Toxicity Reference Values as updated by the California Department of Toxic Substances Control (DTSC 2009)
5. Peer-reviewed academic literature

In the Eco-SSLs, only NOAEL-based TRVs are derived. These were determined by USEPA as the lesser of the 1) geometric mean of all NOAELs for growth and reproduction and 2) the highest bounded NOAEL[1] lower than the lowest bounded LOAEL[2] for reproduction, growth, and survival. The NOAEL-based TRVs reported by USEPA were used here. Because the LOAELs for each study reviewed during the development of the EcoSSLs are also provided, LOAEL-based TRVs were calculated here as the geometric mean of the LOAELs from the acceptable

[1]A bounded NOAEL is a NOAEL from a study that also produced a LOAEL

[2]A bounded LOAEL is a LOAEL from a study that also produced a NOAEL

studies with the same endpoint(s) that were used to derive the NOAEL-based TRVs. Since the data presented in the EcoSSLs are from multiple chronic oral exposure studies using animals of multiple body weights and LOAELs were not used to extrapolate to NOAELs (and vice versa), no uncertainty factors were applied to TRVs derived from the EcoSSLs.

For TRVs taken from the LANL (2011) EcoRisk Database, the uncertainty factors used by LANL (2011) were used here. For TRVs derived from the academic literature, the following uncertainty factors were used:

- Uncertainty Factors Used to Derive Toxicity Reference Values

Extrapolation Goal	Test-Study Result	Uncertainty Factor
NOAEL	NOAEL	1
	LOAEL	5
	Overt Effect-Level	10
	LD_{50} (median lethal dose)	15
LOAEL	NOAEL	0.2 (=1/5)
	LOAEL	1
	Overt Effect-Level or LD_{50}	5
Chronic Duration	Single dose or <5 days	15
	A few weeks	10
	A few months	5
	Chronic; lifetime	1

For plants and invertebrates, the following hierarchy of sources for TRVs (expressed as soil screening levels) was used:

1. USEPA (2011) Eco-SSLs
2. Los Alamos National Laboratory (2011) EcoRisk Database v3.0
3. Canadian Council of Ministers of the Environment (2011) Canadian Environmental Quality Guidelines
4. Efroymson. et al. (1997)
5. Peer-reviewed academic literature

For antimony, no soil screening level protective of plants is available from USEPA (2011). The screening values from LANL (2010) and Efroymson et al. (1997) were based on an unspecified plant species exposed to antimony for an unspecified duration and an unspecified

effect. Therefore, the screening values from LANL (2010) and Efroymson et al. (1997) are not considered usable. The following screening levels for plants are available from the academic literature:

- He and Yang (1999): evaluated effects of antimony on rice but did not statistically analyze their data. However, RIVM (2005) reports an EC_{10} of 56 mg/kg from this study based on reduced biomass.
- Oorts et al. (2008): evaluated effects of antimony on barley and lettuce and derived an EC_{10} of 510 mg/kg.
- Pan et al. (2011) evaluated effects of antimony on corn and found a NOAEL and LOAEL of 0 and 10 mg/kg, respectively, for reduced root biomass and total root length.

Oorts et al. (2008) state that other studies on the toxicity of antimony to plants are confounded by the ions bound to the antimony added to soils (e.g., $SbCl_3$ or $KSb(OH)_6$) that may affect soil pH and/or salinity. Only the experiment by Oorts et al. (2008) demonstrated that the toxic effects of antimony were not confounded by pH or salinity effects. Therefore, the EC_{10} derived by Oorts et al. (2008) of 510 mg/kg is used here.

The TRVs selected for use in this ERA for plant and invertebrate, avian, mammalian, and reptilian receptors are provided in Tables E.5 through E.8.

E.2.2 Exposure Characterization

For plants and invertebrates, measured soil concentrations may be used directly to assess exposures. However, the TRVs used to assess the potential toxic effects of chemical exposures to avian, mammalian, and reptilian receptors are expressed in terms of an average daily dose (ADD), which is defined as the average mass of the chemical ingested, in milligram $(mg)_{chemical}$/kilogram $(kg)_{Body\ Weight\ (BW)}$-day. Therefore, it is necessary to develop reasonable estimates of the doses to which the ecological receptors may be exposed at each site. The exposure dose is estimated as a function of the concentrations in environmental media (e.g., soil), biotransfer through the food web, and the manner in which receptors use the location (e.g., length of time a receptor is expected to forage at the location based on their home range size, seasonal behavior, dietary composition, and food ingestion rates). The equation used to estimate the ADD is as follows:

$$ADD = IR_F \times \left[\left(C_p \times df_p\right) + \left(C_i \times df_i\right) + \left(C_m \times df_m\right) + \left(C_s \times df_s\right)\right] \times AUF$$

where:

ADD = Average daily dose (mg chemical ingested per kg body weight per day [mg/kg-day])

IR_F = Food ingestion rate (kg_{food}-dry weight [dw]/kg_{BW}-day)

C_p = COPEC concentration in plants (mg/kg-dw)

df_p = Dietary fraction consisting of terrestrial plants

C_i = COPEC concentration in terrestrial invertebrates (mg/kg-dw)

df_i = Dietary fraction consisting of terrestrial invertebrates

C_m = COPEC concentration in small mammals/birds (mg/kg-dw)

df_m = Dietary fraction consisting of small mammals/birds

C_s = COPEC concentration in soil (mg/kg-dw)

df_s = Dietary fraction consisting of soil

AUF = Area Use Factor; ratio of the size of the site to the receptor-specific foraging area

Each of the variables used to estimate ADD is explained below and summarized in Table E.9.

E.2.2.1 Body Weight (BW)

Body weight is the average weight of each ecological receptor and is used to determine food ingestion rates and is negatively related to exposure and hazard estimates. Where available, the body weight of the smaller sex was used.

Mammals:

- Desert Shrew: Body weighs have been summarized in USACHPPM (2006). Adult body weights range from 3.5 to 4.5 grams (g), with an average of 4 g for adults. Therefore, the mean body weight of 4 g was used.
- Kit Fox: Average body weighs have been summarized in USACHPPM (2006) as follows:
  - Arizona
    - Females: 1.67 ± standard error of 0.04 kg
    - Females: 1.87 ± standard error of 0.06 kg
    - Males: 1.77 ± standard error of 0.06 kg
    - Males: 1.82 ± standard error of 0.06 kg
    - Both sexes: 1.76 ± standard error of 0.05 kg
  - California
    - Males: 2.4 ± standard error of 0.01 kg
    - Females: 2.1 ± standard error of 0.01 kg
  - Utah
    - Males: 2.06 kg (range 1.7-2.5 kg)
    - Females: 1.91 kg (range 1.6-2.1 kg)

To provide a protective risk assessment, the lowest reported mean body weight from Arizona of 1.67 kg was used.

- Little pocket mouse: The mean body weight for mice in the Owens valley of California is 7.1 g ± standard error of 0.11 g, with a range of 6.3 to 8.0 g (Kenagy 1973). Therefore, a mean body weight of 7.1 g was used.

Birds:

- American kestrel: Body weights have been summarized in USEPA (1993) and USACHPPM (2006). Average adult body weights range from 103 to 138 g. No body

weight data from Arizona was presented. Therefore, to provide a protective risk assessment, the lowest reported mean body weight from of 103 g was used.

- Gambel's quail: Average body weights have been summarized by Brown et al. (1998), as follows:
  - Arizona
    - Females: 167.4 g (range 157–176 g)
    - Males: 171.1 g (range 164–180 g)
    - Both sexes: 169.3 g (range 157–180 g)
    - Both sexes: range 160-175 g
  - New Mexico
    - Females: 177.3 ± standard deviation of 10 g
    - Males: 181.8 ± standard deviation of 10 g

To provide a protective risk assessment, the lowest reported mean body weight from Arizona of 167.4 g was used.

- Verdin: Average body weights have been summarized by Webster (1999). Winter body weights in Riverside County California were 6.9 ± standard deviation of 0.2 g during the winter and 6.3 ± standard deviation of 0.6 g during the summer. To provide a protective risk assessment, the lowest reported mean body weight of 6.3 g was used.

Reptiles:

- Sonoran desert tortoise: The Cal/Ecotox Database[3] presents body weight data from a large number of studies, most of which are unpublished reports. Only one study in the Cal/Ecotox Database reported results for the Sonoran desert tortoise; i.e., desert tortoises collected east of the Colorado River. That study reported mean body weights for males and females of 3.28 kg (with a standard deviation of 0.56 kg) and 2.65 kg (with a standard deviation of 0.39), respectively. Specimens were collected from Washington County (UT) and Mohave County (AZ). To provide a protective risk assessment, the mean body weight for females of 2.65 kg was used.

E.2.2.2 Food Ingestion Rate (IR_F)

The food ingestion rate is the amount of food an ecological receptor consumes on a daily basis. Food ingestion rates vary with many factors, including metabolic rate, the energy devoted to growth and reproduction, and composition of the diet. The metabolic rate of free-ranging animals is a function of several factors, including ambient temperature, activity levels, and body weight (USEPA 1993). For most wild animals, experimentally derived dietary intake rates are not available. However, Nagy (2001) has provided equations that can be used to estimate the metabolically required dietary intake rate from the average body weight of a species. Since Nagy (2001) derived equations for several different groups of birds and mammals, the equations provided by Nagy (2001) that best fits the data (i.e., the Class with the highest correlation

[3] http://www.oehha.ca.gov/scripts/cal_ecotox/species.asp

coefficient $[r]^2$, with an r^2 of one indicating the equation perfectly matches the data) was used to estimate the dietary intake rate for each receptor. The equations applicable to each receptor, and their respective r^2 values, are as follows:

Mammals:

Desert shrew - carnivores, $r^2 = 0.954$, equation:

$$IR_D(kg\text{-}dw/day) = 0.153 \times (BW)^{0.834} \times \frac{1\ kg}{1{,}000\ g}$$

Kit fox – carnivores, $r^2 = 0.954$, equation:

$$IR_D(kg\text{-}dw/day) = 0.153 \times (BW)^{0.834} \times \frac{1\ kg}{1{,}000\ g}$$

Little pocket mouse - mammals, $r^2 = 0.947$, equation:

$$IR_D(kg\text{-}dw/day) = 0.323 \times (BW)^{0.744} \times \frac{1\ kg}{1{,}000\ g}$$

Birds:

American kestrel – birds, $r^2 = 0.940$

$$IR_D(\text{kg-dw/day}) = 0.638 \times (BW)^{0.685} \times \frac{1\ kg}{1{,}000\ g}$$

Gambel's quail – Galliformes, $r^2 = 0.992$, equation:

$$IR_D(\text{kg-dw/day}) = 0.088 \times (BW)^{0.891} \times \frac{1\ kg}{1{,}000\ g}$$

Verdin – desert birds, $r^2 = 0.961$, equation:

$$IR_D(\text{kg-dw/day}) = 0.407 \times (BW)^{0.681} \times \frac{1\ kg}{1{,}000\ g}$$

Reptiles:

Sonoran desert tortoise – reptiles, $r^2 = 0.952$

$$IR_D(\text{kg-dw/day}) = 0.0111 \times (BW)^{0.920} \times \frac{1\ kg}{1{,}000\ g}$$

where:

IR_D (kg-dw/day) = dietary intake rate, or the amount of food ingested per day in dry weight

BW = average body weight (g)

The estimated dietary intake rates (IR_D) are presented in Table E.7. The dietary intake rates are then body weight normalized, as follows:

$$IR_F = \frac{IR_D}{BW}$$

where:

IR_D = dietary intake rate (kg-dw/day)

IR_F = body weight normalized amount of food ingested per day (kg-dw/kg-day)

BW = average body weight (g)

The estimated food ingestion rates based on the average body weight and dietary intake rate presented above are presented in Table E.9.

E.2.2.3 Dietary Fraction (df)

Most ecological receptors consume a variety of food items. However, for the purposes of an ecological risk assessment, it is necessary to know what fraction of the total amount of food consumed (on average) is composed of plant matter, small mammals, insects, etc. This is discussed below for each ecological receptor.

Mammals:

- Desert shrew: Dietary information is available from USACHPPM (2006), which states that their main source of food is insects but, "occasionally they will eat … carrion such as dead birds, mammals, and reptiles but will not eat live rodents." However, quantitative information on the consumption of birds, mammals, and reptiles was not available. Therefore, birds, mammals, and reptiles were assumed to represent 1% of the desert shrew's diet, with the remaining 99% assumed to be invertebrates.
- Kit fox: According to USACHPPM (2006), kit foxes are almost exclusively carnivorous. While kit foxes do consume insects, USACHPPM (2006) did not provide a quantitative estimate of insect consumption. Therefore, insects were assumed to represent 1% of the kit foxes diet, with the remaining 99% assumed to be small mammals and birds.
- Little pocket mouse: Quantitative dietary information for this species is available from two sources, as follows:
  - Bradley and Mauer (1973), Clark County, Nevada, by % volume of stomach contents
    - Plants: 99%
    - Insects: 1%
  - Lemen and Freeman (1986), Goldfield, Nevada by % coverage of stomach contents
    - Plants: 96.4%
    - Insects: 2.9%

Both of these estimates are very similar. However, % volume provides a more accurate estimate of the amount of material consumed. Therefore, the little pocket mouse was assumed to have a diet of 99% plant matter and 1% insects.

Birds:

- American kestrel: Dietary composition has been summarized by USEPA (1993) and USACHPPM (2006). Kestrels prey on a variety of small animals, including invertebrates (e.g., worms, spiders, scorpions, beetles, and grasshoppers), amphibians and reptiles (e.g., frogs, lizards, and snakes), and a wide variety of small-to medium-sized birds and

mammals. USEPA (1993) and USACHPPM (2006) summarize the results of three dietary studies, as follows:

- California-open areas, woods: 32.6% invertebrates, 63.9% small mammals/birds/herpetofauna, 3.5% other
- Florida-woodlands: 51% invertebrates, 49% small mammals/birds/herpetofauna
- California-hayfields, pasture: 25% invertebrates, 71.3% small mammals/birds/herpetofauna, 3.7% not specified

The average dietary intake[4] of these three studies was used assumed to be representative of the diets of American kestrels at the site and is as follows:

  - Terrestrial invertebrates: 36.2%
  - Small mammals/birds: 63.8%

- Gambel's quail: Dietary composition studies on the Gamble's quail have been summarized by Brown et al. (1998), who states that Gambel's quail consumes seeds, grass, leaves, fruit, berries, and insects. Quantitative information on the diet of Gambel's quail are available as follows:
  - Brown et al. (1998), southern Arizona, by frequency
    - Plants: 92%
    - Insects: 7%
  - Hungerford (1962), southern Arizona, by frequency
    - Plants: 95.2%
    - Insects: 4.8%
  - Campbell (1957), New Mexico, by %volume of stomach contents
    - Plants: 98.4%
    - Insects: 1.6%

Only one study (Campbell 1957) was available that quantified the diets of Gambel's quails by % volume, therefore, that study was selected as the basis for assuming that the diet of Gambel's quail is 98.4% plants and 1.6% insects.

- Verdin: Dietary composition has been summarized Webster (1999), who states that the verdin's diet consists of scale insects, caterpillars, jumping spiders, aphids, beetles, wasp larvae, leafhoppers, some berries, nectar, palm fruits, and seedpods of legumes. However, quantitative information was not available on the composition of the verdin's diet. Therefore, it was assumed that plants made up 1% of the verdin's diet, with the remaining 99% assumed to be invertebrates.

Reptiles:

- Sonoran desert tortoise: Dietary composition has been summarized van Devender (2002). Sonoran desert tortoises in Arizona have been documented to eat 199 species of plants including herbs (55.3%), grasses (17.6%), woody plants (22.1%), and succulents (5.0%), Therefore, it was assumed that plants made up 100% of the Sonoran desert tortoise's diet.

[4] with "other" or unspecified fractions assumed to be small mammals/birds/herpetofauna

E.2.2.4 Soil Ingestion (df_s)

Soil ingestion rates are available for a handful of non-domesticated wildlife species from the academic literature. The relevant literature is surveyed below for each species.

Mammals:

- Desert shrew: The soil ingestion rate for this species has not been determined. Talmage and Walton (1980) are often cited as the source for a 13% soil ingestion rate for the short-tail shrew. However, Talmage and Walton (1980) state that they obtained that information from a study by Garten (1980). Unfortunately, Garten (1980) did not sample short-tail shrews (*Blarina brevicauda*), or any other species from the shrew family (Soricidae). Therefore, the 13% soil ingestion rate reported by Talmage and Walton (1980) cannot be used. However, based on unpublished data from Garten, USEPA (2007) estimated a mean soil ingestion rate of 1.1% for the short-tail shrew. Since that is the only available information available for any species of shrew, a soil ingestion rate of 1.1% was assumed for the desert shrew.
- Kit fox: The soil ingestion rate for this species has not been determined. Beyer et al. (1994) reported a mean soil ingestion rate of 2.8% in the red fox (*Vulpes vulpes*). Therefore, a soil ingestion rate of 2.8% was assumed for the kit fox.
- Little pocket mouse: the soil ingestion rate has not been determined for this species or for any other species in the same family (Heteromyidae). Soil ingestion rates are available for several other small mouse-like mammals from the family Cricetidae: white-footed mouse (<2%), meadow vole (2.4%) (Beyer et al. 1994), and the hispid cotton rat (2.8%) (Garten 1980). The only other rodents for which soil ingestion rates are available are the black-tailed prairie dog (7.7%) and the white-tailed prairie dog (2.7%) (Beyer et al.. 1994), which are both significantly larger the little pocket mouse. Therefore, it was assumed that that soil ingestion rate of the hispid cotton rat should be protective of the soil ingestion rate of the little pocket mouse and a soil ingestion rate of 2.8% was assumed.

Birds:

- American kestrel: USACHPPM (2006) states that soil ingestion is likely to be negligible and consist only of that associated with prey that are consumed. However, USEPA (2007) estimated a mean soil ingestion rate for the red-tailed hawk (*Buteo jamaicensis*) of 2.6%. Assuming that the soil ingestion rate of the red-tailed hawk is representative of the American kestrel, a soil ingestion rate of 2.6% was assumed here.
- Gambel's quail: The soil ingestion rate has not been determined for this species. However, Beyer et al. (1994) provide a soil ingestion rate of 9.3% for the wild turkey. Since wild turkeys are in the same order as Gambel's quail (i.e., Galliformes), both species forage on the ground, and both species have a similar diet (i.e., mostly plant matter with some insects), it was assumed that the soil ingestion rate of wild turkeys would be representative of Gambel's quail. Therefore, a soil ingestion rate of 9.3% was used.
- Verdin: the soil ingestion rate has not been determined for this species. Johnson et al. (2007) measured the ingestion rates of several other species of Passeriformes, including the eastern bluebird (<2%), eastern phoebe (<2%), prairie warbler (<2%), and the brown

thrasher (7%). These birds all eat insects, like the mountain verdin. The eastern phoebe and the prairie warbler catch insects either while flying or on tree limbs, as does the verdin. Therefore, the verdin was assumed to have a soil ingestion rate similar to that of the eastern phoebe (<2%) and the prairie warbler (<2%). To provide a protective risk assessment, a soil ingestion rate of 2% was assumed.

Reptiles:

- Sonoran desert tortoise: the soil ingestion rate has not been determined for this species. It has, however been documented that tortoises intentionally consume soil, probably for mineral supplementation (Esque and Peters 1992; Marlow and Tollestrup, 1982). Since there is no available information, but it is known that desert tortoises intentionally ingest soil, a soil ingestion rate of 5% was assumed.

Note that because the dietary intake rate presented above (Section E.2.2.2) is the metabolically required amount of food that must be ingested, and soils are not assumed to have any metabolic value, the amount of soil ingested is assumed to be in addition to the amount of food ingested. Therefore, the total dietary proportions, when soil is included will be greater than 100% (e.g., 105% for the Sonoran desert tortoise).

E.2.2.5 Foraging Area and Area Use Factor (AUF)

The AUF is the ratio of the size of the site to the receptor-specific foraging area/home range. When ecological receptors have foraging areas larger than a site, they are assumed to obtain only a portion of their total dietary intake from the site. That portion is assumed to be equal to the AUF. This section presents the foraging areas for each of the receptors and estimated AUFs.

Mammals:

- Desert shrew: The home range of this species has not been measured. However, USACHPPM (2006) estimated that the home range of adult desert shrews should be between 0.2 and 1.75 acres, based on body weight. To provide a health protective risk assessment, the smallest home range of 0.2 acres was used.
- Kit fox: Studies on the average home ranges for kit foxes have been summarized by USACHPPM (2006), as follows:
  - San Jaoquin Valley, California: 642-1,285 acres
  - Western Arizona
    - Males: 3,039 ± a standard error of 247 acres
    - Females: 2,422 ± 346 acres
    - Both sexes: 2,768 ± 232 acres
  - California : 2866 ± 222 acres

To provide a health protective risk assessment, the smallest average home range reported from Arizona (2,422 acres) was used.

- Little pocket mouse: Home range information is available from several sources, as follows:
  - Burge and Jorgensen (1973), Nevada (assuming 95% confidence and 99% coverage)

        - Males: 38.88 meter (m) radius
        - Females: 36.09 m radius
    - Jorgensen (1968), Nevada:
        - Males: 41.89 m radius
        - Females: 44.45 m radius
    - Maza et al. (1973), Nevada (assuming 99% coverage)
        - Male: 53.7 m radius
        - Female: 60.3 m radius
        - Both sexes: 57.0 m radius
    - Kenagy (1973), Owens Valley, California: maximum distance moved less than 50 m.

Since none of the available studies are from Arizona, the smallest home range radius (36.09 m radius) was converted to an area (i.e., area = πr^2) of 1.0 acres.

Birds:

- American kestrel: USACHPPM (2006) summarizes the available home range data for kestrels, as follows:
    - California (winter):
        - Female: 31.6 hectare (ha) ± 10.7 standard deviation (78 ± 26 acres)
        - Male: 13.1 ha ± 2.0 standard deviation (32 ± 4.9 acres)
        - Mean: 154 ha (range, <452 ha) (381 acres)
    - Wyoming (summer): 202 ha ± 131 standard deviation (499 acres)
    - Michigan: 131 ha ± 100 standard deviation (324 acres)

  To provide a protective assessment, the smallest reported home range of 32 acres was used.
- Gambel's quail: Gullion (1962) reported that home ranges of Gambel's quail ranged from of 19 to 95 acres, with an average of 35.7 acres. Therefore, a home range of 35.7 acres was used.
- Verdin: Home range information is available from several sources, as follows:
    - Taylor (1971), Maricopa County, Arizona.: 23.7 acres (8.9 and 31.2 acres) (breeding territory)
    - Webster (1999), Doña Ana County, New Mexico.
        - Breeding territory: 19.8 acres
        - Nonbreeding territory: 48.4 acres
    - Webster (1999), Riverside County, California.: 48.4 acres

  The home range of 23.7 acres for the only study from Arizona (Taylor. 1971) was used.

Reptiles:

- Sonoran desert tortoise: Home range information is available from two sources, as follows:
    - Barrett (1990), Picacho Mountains, Arozina:
        - Males: 63.8 ± standard error of 20.4 acres
        - Females: 37.9 ± 13.6 acres
        - Range for both sexes: 7.0 to 132.0 acres
    - Riedle et al. (2008), Florence Military Reservation. Arizona
        - Males: 82.5 ± standard deviation of 71.6 acres

- Females: 44.0 ± 42.6 acres
- Range for both sexes: 7.7 to 230.1 acres

o Averill-Murray (2002) summarizes several studies from Arizona, as follows:

- Harcuvar Mountains
  - Males: 22.7 acres (range 2.5-55.1 acres)
  - Females: 11.6 acres (range 6.7-18.5 acres)
- Little Shipp Wash
  - Males: 53.6 acres (range 37.6-77.8 acres)
  - Females: 57.6 acres (range 8.4-127.3 acres)
- Mazatzal Mountains
  - Females: 31.6 acres (range 5.7-125.3 acres)
- San Pedro Valley
  - Males: 27.2 acres (range 9.6-54.9 acres)
  - Females: 6.4 acres (range 2.7-14.8 acres)
- Tortolita Mountains
  - Males: 40.3 acres (range 8.2-62.3 acres)
  - Females: 32.4 acres (20.0-53.4)

As all reported home ranges are from Arizona, the smallest reported home range of 6.4 acres was used.

Using the above home ranges, the area use factors were calculated as follows (Table E.9):

YPG-178a – 1.68 acres

- Desert shrew: 1.68 acres/0.2 acres ≥ 1, therefore, 1 was used
- Kit fox: 1.68 acres/2,422 acres = 0.0007
- Little pocket mouse: 1.68 acres/1.0 acres ≥ 1, therefore, 1 was used
- American kestrel: 1.68 acres/32 acres = 0.053
- Gambel's quail: 1.68 acres/35.7 acres = 0.047
- Verdin: 1.68 acres/23.7 acres = 0.071
- Sonoran desert tortoise: 1.68 acres/6.4 acres = 0.26

YPG-178b – 0.76 acres

- Desert shrew: 0.76 acres/0.2 acres ≥ 1, therefore, 1 was used
- Kit fox: 0.76 acres/2,422 acres = 0.0003
- Little pocket mouse: 0.76 acres/1.0 acres = 0.8
- American kestrel: 0.76 acres/32 acres = 0.024
- Gambel's quail: 0.76 acres/35.7 acres = 0.021
- Verdin: 0.76 acres/23.7 acres = 0.032
- Sonoran desert tortoise: 0.76 acres/6.4 acres = 0.12

E.2.2.6 Exposure Point Concentrations (C_s, C_p, C_i)

An exposure point concentration (EPC) is the concentration of a particular chemical in an environmental medium (e.g., soil), at the point of contact with the receptor. An EPC was calculated for soils, invertebrates, small mammal/bird prey, and plants. EPCs for soil and food items (plants, invertebrates, and small mammal/bird prey) were estimated based on the corresponding soil intervals presented in Section E.1.6.1 above. Soil EPCs are provided in Tables E.10 and E.11.

EPCs were calculated as the lesser of the UCL or the maximum detected concentration within the respective soil interval. As discussed in Section E.1.5.5 UCLs were calculated using the most recent version of USEPA's ProUCL software. At the time the report was prepared, this was v4.1.01. ProUCL output is provided in Attachment 1.

Since plants, invertebrates, and small mammals were not sampled, bioaccumulation models were used to predict concentrations in these organisms. The models used were taken from the following hierarchy of sources:

1. USEPA (2011) Eco-SSLs
2. Los Alamos National Laboratory (2011) EcoRisk Database v3.0
3. Ecological risk assessment protocol for hazardous waste combustion facilities (USEPA 1999)
4. Bechtel Jacobs Company (1998)
5. Peer-reviewed academic literature

The bioaccumulation models may take several different forms. USEPA (2011) provides both bioaccumulation factors and regression models. The bioaccumulation models used and predicted EPCs are provided in Tables E.12 through E.14.

To provide a basis for comparison, EPCs were also estimated for background conditions.

E.3 RISK CHARACTERIZATION

Risk characterization involves two components: hazard estimates and risk description. For vertebrates, hazard estimates are based on the comparison of average daily dose to the chemical- and receptor-specific TRVs and are expressed as a hazard quotient (HQ):

$$HQ = \frac{Average\ daily\ dose\ (ADD)}{Toxicity\ Reference\ Value\ (TRV)}$$

For invertebrates and plants, the HQ is calculated by dividing the soil EPC by the benchmark concentration, as follows:

$$HQ = \frac{Soil\ Exposure\ Point\ Concentration\ (EPC)}{Benchmark\ Concentration}$$

The HQ provides a mathematically derived index that expresses the relationship between the ADD and derived TRV. A NOAEL-based HQ of 1 is the threshold at or below which the contaminant is unlikely to cause adverse ecological effects: NOAEL-based HQs greater than 1 indicates that exposures exceeds a no-effect dose and does not necessarily indicate that adverse effects will occur. LOAEL-based HQs better indicate the potential for adverse effects to receptors because they are based on effect-based toxicological data. Thus, LOAEL-based HQs greater than 1 indicate that adverse effects may occur, but whether or not significant effects would actually occur cannot be judged with certainty. Menzie et al. (1993) recommended the following guidelines for interpreting HQs or HIs:

- Adverse effects are not expected for HQ or HI values less than one.
- A low potential for adverse effects may be indicated by HQ or HI values between one and 10.
- A significant potential for adverse effects on ecological receptors and communities may be indicated by HQ or HI values greater than 10, particularly if they exceed a value of 100.

The second component of the risk characterization step is the risk description. The risk description is an interpretation of the risks estimated for the assessment endpoints. It includes an "evaluation of the lines of evidence supporting or refuting the risk estimates and interpretation of the significance of the adverse effects on the assessment endpoints" (USEPA 1998).

To provide an estimate of the incremental hazards contributed by exposures at the site compared to background, ADDs and HQs were also estimated for background conditions. The plant and invertebrate screening levels and HQs are shown in Table E.15. Calculated ADDs, and the resulting HQs, are provided in Tables E.16 and E.17.

E.3.1 Hazard Estimates

E.3.1.1 Site 178a

Five COPECs were selected for the site: antimony, copper, lead, mercury, and zinc (Section E.1.5.5). Only the EPC for lead exceeded the screening level for plants (Table E.15). None of the EPCs for the other COPECs exceeded the screening levels for plants and none of the EPCs exceeded the screening levels for invertebrate receptors.

For the vertebrate receptors, the NOAEL-based HQs were greater than one for the desert shrew, American kestrel, and the verdin due to assumed exposures to antimony and copper (Table E.16). However, none of the LOAEL-based HQs, or the HIs (i.e., summation of the HQs), exceeded the threshold value of one.

E.3.1.2 Site 178b

Four COPECs were selected for the site: antimony, lead, mercury, and zinc (Section E.1.5.5). The EPC for lead exceeded the screening level for plants and the EPC for zinc

exceeded the screening levels for both plants and invertebrates. All of the other EPCs were below the screening levels for plants and invertebrates (Table E.15).

For the vertebrate receptors, the NOAEL-based HQs were greater than one for the desert shrew, American kestrel, and the verdin due to assumed exposures to antimony, lead, and zinc (Table E.17). However, none of the LOAEL-based HQs, or the HIs (i.e., summation of the HQs), exceeded the threshold value of one.

E.3.2 Risk Description

E.3.2.1 Site 178a

For plants, the HQ for assumed exposure to lead is approximately two, indicating that assumed exposures to lead in soils may result in adverse effects. The HQs for assumed plant and invertebrate exposures to all of the other COPECs were less than one, indicating that adverse effects are unlikely.

For the vertebrate receptors, the LOAEL-based HQs and HIs (i.e., the sum of all HQs for an individual receptor) were less than the threshold value of one for all receptors (Table E.16). This indicates that adverse effects to vertebrate receptors from assumed exposures to soil at YPG-178a are unlikely.

E.3.2.2 Site 178b

For plants, the HQs for assumed exposure to lead and zinc are approximately two and six, respectively. For invertebrates, the HQ for assumed exposure to zinc was approximately 8 (Table E.15). This indicates that site related exposures to lead may result in adverse effects for plants and that site related exposures to zinc may result in adverse effects for both plants and invertebrates. The HQs for assumed plant and invertebrate exposures to all of the other COPECs were less than one, indicating that adverse effects are unlikely.

For the vertebrate receptors, the LOAEL-based HQs and HIs (i.e., the sum of all HQs for an individual receptor) were less than the threshold value of one for all receptors (Table E.16). This indicates that adverse effects to vertebrate receptors from assumed exposures to soil at YPG-178b are unlikely.

E.4 UNCERTAINTY ANALYSIS

All risk assessments involve the use of assumptions, professional judgment, and imperfect data to varying degrees, which results in uncertainty in the final hazard estimates. Uncertainties associated with the ecological risk assessment are qualitatively evaluated here.

The soil samples collected at part of this RFI used to calculate the soil EPCs were generally biased samples; i.e., sampling was biased toward areas of contamination. Thus, the soil EPCs presented here are likely to be representative of the most contaminated areas at the site and are

unlikely to be representative of true site-wide average concentrations. Thus, the risks estimated here are likely to be over estimated.

Exposure estimates in this ERA incorporate an assumption of 100% bioavailability for all COPECs in soils. This is likely to result in an over-estimation of exposure, as it is unlikely that all of the COPECs are 100% bioavailable in soil. Actual ADDs are expected to be less than what was estimated in this ERA.

The bioaccumulation models used in this ERA are not site-specific. Therefore, the actual concentrations of EPCs in plants, terrestrial invertebrates, and small mammals/birds may differ from what was assumed here. Additionally, bioaccumulation is expected to differ among species of plants, terrestrial invertebrates, and small animals, as well as by site-specific soil properties. Therefore, the bioaccumulation models used here represent a degree of uncertainty in the assessments.

The exposure parameters used to estimate average daily intakes are generally the most conservative available; i.e., of the available data, the parameter values that would result in the highest exposure levels were used. Thus, it is anticipated that the exposures at the site are unlikely to be lower than what has been estimated here. However, it should also be noted that the exposure parameters used in this ERA are not taken from the populations at USAGYPG and the actual exposure parameters may differ somewhat from what was assumed in this ERA.

No TRVs were available to assess the potential effects of exposures of reptiles to antimony, copper, mercury and zinc. Thus, HQs could not be calculated for these metals and it is likely that the hazards to reptiles have been under estimated.

No TRVs were available that are specific to the species evaluated in this ERA. Thus, the degree to which the TRVs used here reflect the toxicity to the species evaluated is uncertain.

Actual annual average food ingestion rates for the species investigated in this ERA were not available. Therefore, the food ingestion rates were based on regression models of metabolic rates for mammals, birds, and reptiles (Nagy, 2001). Since the field measurements were not made at USAGYPG-178 for the species investigated here, there is some uncertainty regarding the accuracy of the estimated food ingestion rates.

For most of the species assessed in this ERA, soil ingestion rates have not been measured and it was necessary to extrapolate a soil ingestion rate based on similar species. This may have resulted in some uncertainty in the exposures estimated for soil ingestion.

For several receptors at both sites, NOAEL-based HQs exceeded the threshold value of one for while the LOAEL-based HQs were less than one for several COPECs. Although adverse effects may occur at concentrations less than the LOAELs but greater than the NOAELs, this is expected to be a minor source of uncertainty when considered in the light of the accompanying estimated LOAEL-based HQs and hazard indexes.

Using the HQ method to assess hazards to ecological receptors includes intrinsic uncertainties. Limitations of this method (Tannenbaum et al., 2003) include:

- HQs are not measures of a potential hazard to ecological health, but only indicate if estimated exposure exceeds a particular toxicological value.
- HQs generally lack population-level relevance. The TRVs used in this ERA are based on responses of individuals. However, populations of ecological receptors are the focus of assessment-endpoint specifications for ERAs (in the absence of special-status species).
- HQ values in ERA seemingly indicate a linear relationship (e.g., an HQ=100 appears to be 100-fold worse than an HQ=1), whereas the underlying toxicological relationships may not be linear.
- Conservatism, assumptions, and uncertainties (particularly the use of "uncertainty factors" in deriving proxy values for no-effect TRVs) can combine to produce highly elevated HQ values that reflect toxicologically implausible conditions (e.g., extant conditions could be interpreted to be acutely lethal with respect to chemical concentrations, yet habitat is present and occupied by organisms).

It was also assumed in this ERA that the effects of exposures to multiple COPECs were additive. However, in some cases, the effects of exposures to multiple chemicals may result in synergistic (i.e., greater than additive) or antagonistic (i.e., less than additive) effects.

The sources of uncertainty discussed should be considered when evaluating this ERA as the basis for further action at the site. However, the generally conservative nature of the ERA process and the assumptions used in this ERA, should result in a generally health-protective assessment.

E.5 REFERENCES

Arizona Game and Fish Department (AGFD). 2008. Threatened, Endangered and Sensitive Species Surveys. Yuma Proving Ground. La Paz and Yuma Counties, Arizona.

Arjo WM, Bennett TJ, Kozlowski AJ. 2003. Characteristics of current and historical kit fox (*Vulpes macrotis*) dens in the Great Basin Desert. Canadian Journal of Zoology 81:96-102.

Averill-Murray RC, Martin BE, Bailey SC, Wirt EB. 2002. Activity and behavior of the Sonoran desert tortoise in Arizona. Pages 135-158 in The Sonoran Desert tortoise: natural history, biology and conservation. Tuscon: The University of Arizona Press. Edited by van Devender TR.

Barrett SL. 1990. Home range and habitat of the desert tortoise (*Xerobates agassizi*) in the Picacho Mountains of Arizona. Herpetologica, 46:202-206.

Bechtel Jacobs Company. 1998. Empirical models for the uptake of inorganic chemicals from soil by plants. BJC/OR-133, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Beyer WN, Connor EE, and Gerould S. 1994. Estimates of soil ingestion by wildlife. Journal of Wildlife Management. 58:375-382.

Bradley WG, Mauer RA. 1973. Rodents of a creosote-bush community in southern Nevada. Southwestern Naturalist 17:333-344.

Breuer L, Eckhardt K, and Frede H-G.- 2003. Plant parameter values for models in temperate climates. Ecological Modeling 169: 237–293.

Brown DE, Hagelin JC, Taylor M, and Galloway J. 1998. Gambel's quail (*Callipepla gambelii*), The Birds of North America Online. Ithaca: Cornell Lab of Ornithology; Available online at: http://bna.birds.cornell.edu/bna/species/321

Burge JR, Jorgensen CD. 1973. Home range of small mammals: a reliable estimate. Journal of Mammalogy 54:483-488.

Campbell H. 1957. Fall foods of Gambel's quail (*Lophortyx gambelii*) in New Mexico. Southwestern Naturalist 2:122-128.

Canadian Council of Ministers of the Environment. 2011. Canadian Environmental Quality Guidelines. Available online at: http://ceqg-rcqe.ccme.ca/

Command Technology Directorate, Gutierrez-Palmenberg, and Jason Associates. 2001. Range Wide Environmental Impact Statement. Yuma: U.S. Army Proving Ground Yuma and La Paz Counties, Arizona.

Department of Toxic Substances Control (DTSC). 2009. U.S. EPA Region 9 Biological Technical Assistance Group (BTAG) recommended toxicity reference values for mammals and birds.

Efroymson RA,Will ME, Suter GW, Wooten AC. 1997. Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Terrestrial Plants: 1997 Revision. ES/ER/TM-85/R3. Prepared for the U.S. Department of Energy, Office of Environmental Management. Prepared by Lockheed Martin Energy Systems, Inc., for the East Tennessee Technology Park, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

Esque TC, Peters EL. 1992. Ingestion of bones, stones, and soil by desert tortoises. Fish and Wildlife Research 13:105-111.

Garten CT. 1980. Ingestion of soil by hispid cotton rats, white-footed mice, and eastern chipmunks. Journal of Mammalogy 61: 136-137.

Grandmaison DD. 2010. Landscape-level habitat associations and phylogenetics of desert tortoises on southwestern Arizona military ranges managed by the Army, Air Force, and Marines. Project 08-385.

Gullion GW. 1962. Organization and movements of coveys of a Gambel quail population. The Condor 64: 402-415.

He M, Yang J. 1999. Effects of different forms of antimony on rice during the period of germination and growth and antimony concentration in rice tissue. Science of the Total Environment 243/244: 149-155.

Hoffmeister DF, Goodpaster WW. 1962 Life history of the desert shrew, *Notiosorex crawfordi*. Southwestern Naturalist 7:236-252.

Hungerford CR. 1962. Adaptations shown in selection of food by Gambel quail. Condor 64:213-219.

Johnson MS, Wickwire WT, Quinn MJ Jr, Ziolkowski DJ Jr, Burmistrov D, Menzie CA, Geraghty C, Minnich M, Parsons PJ. 2007. Are songbirds at risk from lead at small arms ranges? An application of the spatially explicit exposure model. Environmental Toxicology and Chemistry 26: 2215–2225.

Jorgensen CD. 1968. Home range as a measure of probable interactions among populations of small mammals. Journal of Mammalogy 49:104-112.

Kaplan DI, Sajwan KS, Adriano DC, Gettier S. 1990. Phytoavailability and toxicity of beryllium and vanadium. Water, Air, and Soil Pollution 53:203-212.

Kenagy GJ. 1973. Daily and seasonal patterns of activity and energetics in a heteromyid rodent community. Ecology 54:1201-1219.

Lemen CA, Freeman PW. 1986. Interference competition in a heteromyid community in the Great Basin of Nevada, USA. Oikos 46:390–396.

Los Alamos National Laboratory (LANL). 2011. Ecorisk Database (Release 3.0): LA-UR-11-5650. Available online at: http://www.lanl.gov/environment/cleanup/ecorisk.shtml

Marlow RW, Tollestrup K. 1982. Mining and exploitation of natural mineral deposits by the desert tortoise, *Gopherus agassizii*. Animal Behavior 30:475-478.

Maza BG, French NR, Aschwanden AP. 1973. Home range dynamics in a population of heteromyid rodents. Journal of Mammalogy 54:405-425.

Menzie CA, Cura J, Freshman J, and Svirsky S. 1993. Evaluating ecological risks and developing remedial objectives at forested wetland systems in New England. In: Application of Ecological Risk Assessment to Hazardous Waste Site Remediation. Workshop Proceedings, USEPA Science Advisory Board.

Nagy KA. 2001. Food requirements of wild animals: Predictive equations for free-living mammals, reptiles, and birds. Nutrition Abstracts and Reviews, Series B: Livestock Feeds and Feeding 71:21R-32R.

National Weather Service (NWS). 2011. New 1981-2010 Climate Normals. http://www.wrh.noaa.gov/psr/pns/2011/July/newNormals.php

Nussear KE, Esque TC, Inman RD, Gass L, Thomas KA, Wallace CSA, Blainey, JB, Miller, DM, and Webb RH. 2009. Modeling habitat of the desert tortoise (*Gopherus agassizii*) in the Mojave and parts of the Sonoran Deserts of California, Nevada, Utah, and Arizona. U.S. Geological Survey Open-File Report 2009-1102.

Oorts K, Smolders E, Degryse F, Buekers J, Gascó G, Cornelis G, Mertens J. 2008. Solubility and toxicity of antimony trioxide (Sb_2O_3) in soil. Environmental Science and Technology 42: 4378–4383.

Pan X, Zhang D, Chen X, Bao A, Li L. 2011. Antimony accumulation, growth performance, antioxidant defense system and photosynthesis of *Zea mays* in response to antimony pollution in soil. Water, Air, & Soil Pollution 215:517–523.

Parsons. 2010. Final RCRA Facility Investigation Work Plan for Inactive Landfills and Muggins Mountain OB/OD Sites for U.S. Army Garrison Yuma Proving Ground. May.

Riedle JD, Averill-Murray RC, Lutz CL, Bolen DK. 2008. Habitat use by desert tortoises (*Gopherus agassizii*) on alluvial fans in the Sonoran desert, south-central Arizona. Copeia 2:414–420.

Rijksinstituut voor Volksgezondheid en Milieu (RIVM). 2005. Environmental risk limits for nine trace elements. RIVM report 601501029/2005.

Schenk HJ and, Jackson RB. 2002. The global biogeography of roots. Ecological Monographs 72:311-328.

Schenk HJ and Jackson RB. 2009. ISLSCP II ecosystem rooting depths. In Hall FG, Collatz G, Meeson B, Los S, Brown de Colstoun E, Landis D. (eds.). ISLSCP Initiative II Collection. Data set. Available on-line at http://daac.ornl.gov/. doi:10.3334/ORNLDAAC/929

Talmage SS, Walton BT. 1993. Food chain transfer and potential renal toxicity of mercury to small mammals at a contaminated terrestrial field site. Ecotoxicology 2:243-256.

Tannenbaum LV, Johnson MS, and Bazar M. 2003. Application of the hazard quotient method in remedial decisions: a comparison of human and ecological risk assessments. Human and Ecological Risk Assessment 9:387–401.

Taylor WK. 1971. A breeding biology study of the Verdin, *Auriparus flaviceps* (Sundevall) in Arizona. American Midland Naturalist 85: 289-328.

Tetra Tech EM Inc. 1998. *Final RCRA Facility Report*. U.S. Army Yuma Proving Ground, AZ. August.

United States Army Center for Health Promotion and Preventive Medicine (USACHPPM). 2006. Development of terrestrial exposure and bioaccumulation information for ecological risk assessments.

United States Army Corps of Engineers (USACE). 2006. Screening level ecological risk assessments of some military munitions and obscurant-related compounds for selected threatened and endangered species. ERDC-TR-06-11.

United States Environmental Protection Agency (USEPA). 1989. Risk Assessment Guidance for Superfund (RAGS). Human Health Evaluation Manual Part A. Interim Final. OSWER 9285.701A. EPA/540/1-89/002.

USEPA. 1992. Guidance for data usability in risk assessment (Part A) Final. Publication Number 9285.7-09A.

USEPA. 1993. Wildlife exposure factors handbook. EPA/600/R-93/187a.

USEPA. 1997. Ecological risk assessment guidance for Superfund: process for designing and conducting ecological risk assessments, Interim Final. EPA 540-R-97-006.

USEPA. 1998. Guidelines for ecological risk assessment. EPA/630/R-95/002F. Risk Assessment Forum.

USEPA. 1999. Screening level ecological risk assessment protocol for hazardous waste combustion facilities. EPA530-D-99-001A.

USEPA. 2003a. Ecological soil screening level for aluminum. Interim final. OSWER Directive 9285.7-60.

USEPA. 2003b. Guidance for developing ecological soil screening levels (Eco-SSLs). Evaluation of dermal contact and inhalation exposure pathways for the purpose of setting Eco-SSLs. OSWER Directive 92857-55.

USEPA. 2007. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs) Exposure factors and bioaccumulation models for derivation of wildlife Eco-SSLs. OSWER Directive 9285.7-55.

USEPA. 2010. ProUCL Version 4.1 User guide. statistical software for environmental applications for data sets with and without nondetect observations. EPA/600/R-07/041.

USEPA. 2011. Ecological Soil Screening Levels. Available online at: http://www.epa.gov/ecotox/ecossl/

USEPA. Region 4. 2001. Supplemental Guidance to RAGS: Region 4 Bulletins, Ecological Risk Assessment. Available online at: http://www.epa.gov/region4/waste/ots/ecolbul.html

USEPA. Region 5. 2003. Ecological Screening Values. Available online at: http://www.epa.gov/reg5rcra/ca/edql.htm

van Devender TR. 2002. The Sonoran Desert tortoise: natural history, biology and conservation. Tuscon: The University of Arizona Press.

Webster MD. 1999. Verdin (*Auriparus flaviceps*). The Birds of North America Online. Ithaca: Cornell Lab of Ornithology; Available online at: http://bna.birds.cornell.edu/bna/species/470

TABLES

TABLE E.1

LIST OF SPECIES AT YUMA PROVING GROUND

RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b

U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Amphibia	Red-spotted toad	*Bufo punctatus*	Carnivore					
Amphibia	Colorado River toad	*Bufo alvarius*	Carnivore					
Amphibia	Couch's spadefoot toad	*Scaphiopus couchii*	Carnivore					
Aves	Cooper's hawk	*Accipiter cooperii*	Carnivore			X	X	
Aves	Sharp-shinned hawk	*Accipiter striatus*	Carnivore			X	X	X
Aves	Spotted sandpiper	*Actitis macularius*	Insectivore				X	
Aves	White-throated swift	*Aeronautes saxatalis*	Insectivore			X		
Aves	Red-winged blackbird	*Agelaius phoeniceus*	Herbivore				X	X
Aves	Black-throated sparrow	*Amphispiza bilineata*	Omnivore			X		
Aves	Northern pintail	*Anas acuta*	Omnivore			X	X	
Aves	American wigeon	*Anas americana*	Herbivore			X	X	X
Aves	Northern shoveler	*Anas clypeata*	Insectivore			X	X	
Aves	Green-winged teal	*Anas crecca*	Omnivore			X	X	
Aves	Cinnamon teal	*Anas cyanoptera*	Omnivore			X	X	
Aves	Blue-winged teal	*Anas discors*	Omnivore			X	X	
Aves	Mallard	*Anas platyrhynchos*	Omnivore			X	X	
Aves	Gadwall	*Anas strepera*	Omnivore			X	X	X
Aves	Golden eagle	*Aquila chrysaetos*	Carnivore			X		
Aves	Black-chinned hummingbird	*Archilochus alexandri*	Omnivore			X	X	X
Aves	Great blue heron	*Ardea herodias*	Carnivore			X	X	X
Aves	Long-earned owl	*Asio otus*	Carnivore			X		
Aves	Burrowing owl	*Athene cunicularia*	Carnivore			X		
Aves	Verdin	*Auriparus flaviceps*	Insectivore			X		
Aves	Cedar waxwing	*Bombycilla cedrorum*	Omnivore			X	X	X
Aves	Great horned owl	*Bubo virginianus*	Carnivore			X		
Aves	Cattle egret	*Bubulcus ibis*	Carnivore			X	X	X
Aves	Bufflehead	*Bucephala albeola*	Insectivore			X	X	
Aves	Zone-tailed hawk	*Buteo albonotatus*	Carnivore			X		
Aves	Red-tailed hawk	*Buteo jamaicensis*	Carnivore			X		
Aves	Rough-legged hawk	*Buteo lagopus*	Carnivore			X		

TABLE E.1
LIST OF SPECIES AT YUMA PROVING GROUND
RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Aves	Gambel's quail	*Callipepla gambelii*	Herbivore					
Aves	Costa's hummingbird	*Calypte costae*	Omnivore			X		
Aves	Cactus wren	*Campylorhynchus brunneicapillus*	Omnivore			X		
Aves	House finch	*Carpodacus mexicanus*	Herbivore			X		
Aves	Turkey vulture	*Cathartes aura*	Carnivore			X		
Aves	Hermit thrush	*Catharus guttatus*	Omnivore			X		
Aves	Swainson's thrush	*Catharus ustulatus*	Omnivore			X	X	
Aves	Canyon wren	*Catherpes mexicanus*	Insectivore			X		
Aves	Vaux's swift	*Chaetura vauxi*	Insectivore			X		
Aves	Killdeer	*Charadrius vociferus*	Insectivore			X		X
Aves	Lesser nighthawk	*Chordeiles acutipennis*	Insectivore			X		
Aves	Northern harrier	*Circus cyaneus*	Carnivore			X		
Aves	Northern flicker	*Colaptes auratus*	Insectivore			X		
Aves	Gilded flicker	*Colaptes chrysoides*	Insectivore			X		
Aves	Rock dove	*Columba livia*	Herbivore					
Aves	Inca dove	*Columbina inca*	Herbivore			X		
Aves	Common ground dove	*Columbina passerina*	Herbivore			X		
Aves	Olive-sided flycatcher	*Contopus cooperi*	Insectivore			X	X	
Aves	Western wood-peewee	*Contopus sordidulus*	Insectivore			X	X	
Aves	Common raven	*Corvus corax*	Omnivore			X		
Aves	Yellow-rumped warbler	*Dendroica coronata*	Omnivore			X		
Aves	Black-throated gray warbler	*Dendroica nigrescens*	Insectivore			X		
Aves	Hermit warbler	*Dendroica occidentalis*	Insectivore			X	X	X
Aves	Yellow warbler	*Dendroica petechia*	Insectivore			X	X	X
Aves	Townsend's warbler	*Dendroica townsendi*	Insectivore			X	X	
Aves	Pacific-slope flycatcher	*Empidonax difficilis*	Insectivore			X		
Aves	Hammond's flycatcher	*Empidonax hammondii*	Insectivore			X		
Aves	Gray flycatcher	*Empidonax wrightii*	Insectivore			X		
Aves	Horned lark	*Eremophila alpestris*	Herbivore			X		

TABLE E.1
LIST OF SPECIES AT YUMA PROVING GROUND
RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Aves	Merlin	*Falco columbarius*	Carnivore			X		
Aves	Prairie falcon	*Falco mexicanus*	Carnivore			X		
Aves	American peregrine falcon	*Falco peregrinus*	Carnivore	Delisted	WSC	X	X	
Aves	American kestrel	*Falco sparverius*	Carnivore			X		
Aves	Greater roadrunner	*Geococcyx californianus*	Omnivore			X		
Aves	Common yellowthroat	*Geothlypis trichas*	Insectivore			X	X	X
Aves	Sandhill crane	*Grus canadensis*	Omnivore			X	X	X
Aves	Bald eagle	*Haliaeetus leucocephalus*	Carnivore	Delisted	WSC	X	X	
Aves	Black-necked stilt	*Himantopus mexicanus*	Insectivore			X	X	X
Aves	Barn swallow	*Hirundo rustica*	Omnivore			X		
Aves	Baltimore oriole	*Icterus galbula*	Omnivore			X		
Aves	Scott's oriole	*Icterus parisorum*	Omnivore			X		
Aves	Loggerhead shrike	*Lanius ludovicianus*	Carnivore			X		
Aves	California gull	*Larus californicus*	Carnivore			X	X	X
Aves	Ring-billed gull	*Larus delawarensis*	Carnivore			X	X	X
Aves	Belted Kingfisher	*Megaceryle alcyon*	Carnivore		WSC	X	X	
Aves	Western Screech-Owl	*Megascops kennicottii*	Carnivore			X		
Aves	Gila woodpecker	*Melanerpes uropygialis*	Omnivore			X		
Aves	Elf owl	*Micrathene whitneyi*	Insectivore			X		
Aves	Northern mockingbird	*Mimus polyglottos*	Omnivore			X		
Aves	Brown-headed cowbird	*Molothrus ater*	Omnivore			X		
Aves	Ash-throated flycatcher	*Myiarchus cinerascens*	Insectivore			X		
Aves	Brown-crested flycatcher	*Myiarchus tyrannulus*	Insectivore			X		
Aves	Long-billed curlew	*Numenius americanus*	Carnivore			X		
Aves	Black-crowned night-heron	*Nycticorax nycticorax*	Omnivore			X	X	X
Aves	MacGillivray's warbler	*Oporornis tolmiei*	Herbivore			X		
Aves	Sage thrasher	*Oreoscoptes montanus*	Omnivore			X		
Aves	Ruddy duck	*Oxyura jamaicensis*	Insectivore			X	X	
Aves	Osprey	*Pandion haliaetus*	Carnivore		WSC	X	X	
Aves	House sparrow	*Passer domesticus*	Herbivore					X
Aves	Lazuli bunting	*Passerina amoena*	Omnivore			X		

TABLE E.1
LIST OF SPECIES AT YUMA PROVING GROUND
RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Aves	California brown pelican	*Pelecanus occidentalis*	Carnivore			X	X	
Aves	Cliff Swallow	*Petrochelidon pyrrhonota*	Insectivore			X		
Aves	Phainopepla	*Phainopepla nitens*	Omnivore			X		
Aves	Common poorwill	*Phalaenoptilus nuttallii*	Insectivore			X		
Aves	Wilson's phalarope	*Phalaropus tricolor*	Insectivore			X	X	X
Aves	Black-headed grosbeak	*Pheucticus melanocephalus*	Omnivore					
Aves	Ladder-backed woodpecker	*Picoides scalaris*	Insectivore			X		
Aves	Abert's towhee	*Pipilo aberti*	Omnivore			X	X	
Aves	Green-tailed towhee	*Pipilo chlorurus*	Omnivore			X		
Aves	Western tanager	*Piranga ludoviciana*	Insectivore			X		
Aves	Eared grebe	*Podiceps nigricollis*	Insectivore			X	X	
Aves	Blue-gray gnatcatcher	*Polioptila caerulea*	Insectivore			X		
Aves	Black-tailed gnatcatcher	*Polioptila melanura*	Insectivore			X		
Aves	Purple martin	*Progne subis*	Insectivore			X		
Aves	Vermilion flycatcher	*Pyrocephalus rubinus*	Insectivore			X		
Aves	Great-tailed grackle	*Quiscalus mexicanus*	Omnivore			X		X
Aves	American avocet	*Recurvirostra americana*	Omnivore			X	X	
Aves	Ruby-crowned kinglet	*Regulus calendula*	Insectivore			X		
Aves	Rock wren	*Salpinctes obsoletus*	Insectivore			X		
Aves	Black phoebe	*Sayornis nigricans*	Insectivore			X	X	X
Aves	Say's phoebe	*Sayornis saya*	Insectivore			X		
Aves	Rufous hummingbird	*Selasphorus rufus*	Omnivore			X		
Aves	Lesser goldfinch	*Spinus psaltria*	Herbivore				X	X
Aves	Black-chinned sparrow	*Spizella atrogularis*	Omnivore			X		
Aves	Brewer's sparrow	*Spizella breweri*	Insectivore			X		
Aves	Chipping sparrow	*Spizella passerina*	Herbivore			X		X
Aves	Northern rough-winged swallow	*Stelgidopteryx serripennis*	Insectivore			X	X	
Aves	Eurasian Collared dove	*Streptopelia decaocto*	Herbivore					X
Aves	Western meadowlark	*Sturnella neglecta*	Omnivore			X		X

TABLE E.1
LIST OF SPECIES AT YUMA PROVING GROUND
RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Aves	European starling	*Sturnus vulgaris*	Omnivore				X	X
Aves	Tree swallow	*Tachycineta bicolor*	Insectivore			X	X	
Aves	Violet-green swallow	*Tachycineta thalassina*	Insectivore			X		
Aves	Bendire's thrasher	*Toxostoma bendirei*	Omnivore			X		
Aves	Crissal thrasher	*Toxostoma crissale*	Insectivore			X		
Aves	Le Conte's thrasher	*Toxostoma lecontei*	Omnivore			X		
Aves	Brown thrasher	*Toxostoma rufum*	Omnivore			X		
Aves	Greater yellowlegs	*Tringa melanoleuca*	Carnivore			X	X	X
Aves	House wren	*Troglodytes aedon*	Insectivore			X		
Aves	American Robin	*Turdus migratorius*	Omnivore			X		
Aves	Western kingbird	*Tyrannus verticalis*	Insectivore			X		
Aves	Cassin's kingbird	*Tyrannus vociferans*	Insectivore			X		
Aves	Barn owl	*Tyto alba*	Carnivore			X		
Aves	Orange-crowned warbler	*Vermivora celata*	Insectivore			X		
Aves	Golden-winged warbler	*Vermivora chrysoptera*	Insectivore			X		
Aves	Lucy's warbler	*Vermivora luciae*	Insectivore			X		
Aves	Nashville warbler	*Vermivora ruficapilla*	Insectivore			X		
Aves	Virginia's warbler	*Vermivora virginiae*	Insectivore			X		
Aves	Bell's vireo	*Vireo bellii arizonae*	Insectivore			X	X	
Aves	Cassin's vireo	*Vireo cassinii*	Insectivore			X	X	
Aves	Warbling vireo	*Vireo gilvus*	Insectivore			X		
Aves	Wilson's warbler	*Wilsonia pusilla*	Insectivore			X		
Aves	White-winged dove	*Zenaida asiatica*	Herbivore			X		
Aves	Mourning dove	*Zenaida macroura*	Herbivore			X		
Aves	White-crowned sparrow	*Zonotrichia leucophrys*	Omnivore			X		
Mammalia	Harris' antelope squirrel	*Ammospermophilus harrisii*	Herbivore					
Mammalia	White-tailed antelope squirrel	*Ammospermophilus leucurus*	Herbivore					
Mammalia	Pallid bat	*Antrozous pallidus*	Insectivore					
Mammalia	Ringtail	*Bassariscus astutus*	Omnivore					

TABLE E.1
LIST OF SPECIES AT YUMA PROVING GROUND
RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Mammalia	Coyote	*Canis latrans*	Omnivore					
Mammalia	Bailey's pocket mouse	*Chaetodipus baileyi*	Herbivore					
Mammalia	Long-tailed pocket mouse	*Chaetodipus formosus*	Herbivore					
Mammalia	Rock pocket mouse	*Chaetodipus intermedius*	Herbivore					
Mammalia	Desert pocket mouse	*Chaetodipus penicillatus*	Herbivore					
Mammalia	Townsend's big-eared bat	*Corynorhinus townsendii*	Insectivore					
Mammalia	Desert kangaroo rat	*Dipodomys deserti*	Herbivore					
Mammalia	Merriam's kangaroo rat	*Dipodomys merriami*	Herbivore					
Mammalia	Big brown bat	*Eptesicus fuscus*	Insectivore					
Mammalia	Burro	*Equus asinus*	Herbivore					
Mammalia	Horse	*Equus caballus*	Herbivore					
Mammalia	Porcupine	*Erethizon dorsatum*	Herbivore					
Mammalia	Spotted bat	*Euderma maculatum*	Insectivore		WSC			
Mammalia	Western mastiff bat	*Eumops perotis*	Insectivore					
Mammalia	Allen's big-eared bat	*Idionycteris phyllotis*	Insectivore					
Mammalia	Silver-haired bat	*Lasionycteris noctivagans*	Insectivore				X	
Mammalia	Western red bat	*Lasiurus blossevillii*	Insectivore		WSC		X	
Mammalia	Hoary bat	*Lasiurus cinereus*	Insectivore					
Mammalia	Southern yellow bat	*Lasiurus ega*	Insectivore					
Mammalia	Western yellow bat	*Lasiurus xanthinus*	Insectivore		WSC			
Mammalia	Black-tailed jack rabbit	*Lepus californicus*	Herbivore					
Mammalia	Bobcat	*Lynx rufus*	Carnivore					
Mammalia	California leaf-nosed bat	*Macrotus californicus*	Insectivore		WSC			
Mammalia	Striped skunk	*Mephitis mephitis*	Omnivore					
Mammalia	House mouse	*Mus musculus*	Omnivore				X	X
Mammalia	California myotis	*Myotis californicus*	Insectivore					
Mammalia	Western small-footed bat	*Myotis ciliolabrum*	Insectivore					
Mammalia	Arizona myotis	*Myotis occultus*	Insectivore				X	
Mammalia	Cave myotis	*Myotis velifer*	Insectivore					
Mammalia	Long-legged myotis	*Myotis volans*	Insectivore					
Mammalia	Yuma myotis	*Myotis yumanensis*	Insectivore				X	

TABLE E.1
LIST OF SPECIES AT YUMA PROVING GROUND
RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Mammalia	White-throated woodrat	*Neotoma albigula*	Herbivore					
Mammalia	Desert woodrat	*Neotoma lepida*	Herbivore					
Mammalia	Desert shrew	*Notiosorex crawfordi*	Insectivore					
Mammalia	Pocketed free-tailed bat	*Nyctinomops femorosaccus*	Insectivore					
Mammalia	Big free-tailed bat	*Nyctinomops macrotis*	Insectivore					
Mammalia	Mule deer	*Odocoileus hemionus*	Herbivore					
Mammalia	Muskrat	*Ondatra zibethicus*	Herbivore				X	
Mammalia	Southern grasshopper mouse	*Onychomys torridus*	Omnivore					
Mammalia	Desert bighorn sheep	*Ovis canadensis mexicana*	Herbivore					
Mammalia	Arizona pocket mouse	*Perognathus amplus*	Herbivore					
Mammalia	Little pocket mouse	*Perognathus longimembris*	Herbivore					
Mammalia	Brush mouse	*Peromyscus boylii*	Omnivore					
Mammalia	Canyon mouse	*Peromyscus crinitus*	Omnivore					
Mammalia	Cactus mouse	*Peromyscus eremicus*	Omnivore					
Mammalia	Deer mouse	*Peromyscus maniculatus*	Omnivore					
Mammalia	Western pipistrelle	*Pipistrellus hesperus*	Insectivore					
Mammalia	Racoon	*Procyon lotor*	Omnivore				X	X
Mammalia	Mountain lion	*Puma concolor*	Carnivore					
Mammalia	Round-tailed ground squirrel	*Spermophilus tereticaudus*	Herbivore					
Mammalia	Rock Squirrel	*Spermophilus variegatus*	Herbivore					
Mammalia	Spotted skunk	*Spilogale putorius*	Omnivore					
Mammalia	Desert cottontail	*Sylvilagus audubonii*	Herbivore					
Mammalia	Brazilian free-tailed bat	*Tadarida brasiliensis*	Insectivore					
Mammalia	American badger	*Taxidea taxus*	Carnivore					
Mammalia	Botta's pocket gopher	*Thomomys bottae*	Herbivore					
Mammalia	Gray fox	*Urocyon cinereoargenteus*	Carnivore				X	X
Mammalia	Kit fox	*Vulpes macrotis*	Carnivore					
Reptilia	Glossy snake	*Arizona elegans*	Carnivore					
Reptilia	Western whiptail	*Aspidoscelis tigris*	Carnivore					

TABLE E.1
LIST OF SPECIES AT YUMA PROVING GROUND
RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Reptilia	Zebra-tailed lizard	*Callisaurus draconoides*	Insectivore					
Reptilia	Rosy boa	*Charina trivirgata gracia*	Carnivore					
Reptilia	Western shovel-nosed snake	*Chionactis occipitalis*	Carnivore					
Reptilia	Western banded gecko	*Coleonyx variegatus*	Insectivore					
Reptilia	Western diamondback rattlesnake	*Crotalus atrox*	Carnivore					
Reptilia	Sidewinder	*Crotalus cerastes*	Carnivore					
Reptilia	Speckled rattlesnake	*Crotalus mitchellii*	Carnivore					
Reptilia	Mojave rattlesnake	*Crotalus scutulatus*	Carnivore					
Reptilia	Collared lizard	*Crotaphytus collaris*	Carnivore					
Reptilia	Great Basin collared lizard	*Crotaphytus bicintores*	Carnivore					
Reptilia	Desert iguana	*Dipsosaurus dorsalis*	Herbivore					
Reptilia	Long-nosed leopard lizard	*Gambelia wislizenii*	Carnivore					
Reptilia	Morafka's desert tortoise (aka Sonoran)	*Gopherus morafkai*	Herbivore		WSC			
Reptilia	Mediterranean house gecko	*Hemidactylus turcicus*	Insectivore					
Reptilia	Night snake	*Hypsiglena torquata*	Carnivore					
Reptilia	Common kingsnake	*Lampropeltis getula*	Carnivore					X
Reptilia	Western slender blind snake	*Leptotyphlops humilis*	Insectivore					
Reptilia	Coachwhip	*Masticophis flagellum*	Carnivore					
Reptilia	Western coral snake	*Micruroides euryxanthus*	Carnivore					
Reptilia	Desert horned lizard	*Phrynosoma platyrhinos*	Insectivore					
Reptilia	Spotted leaf-nosed snake	*Phyllorhynchus decurtatus*	Carnivore					
Reptilia	Gopher snake	*Pituophis catenifer*	Carnivore					
Reptilia	Long-nosed snake	*Rhinocheilus lecontei*	Carnivore					
Reptilia	Western patch-nosed snake	*Salvadora hexalepis*	Carnivore					
Reptilia	Common chuckwalla	*Sauromalus ater*	Herbivore					
Reptilia	Desert spiny lizard	*Sceloporus magister*	Insectivore					

TABLE E.1

LIST OF SPECIES AT YUMA PROVING GROUND

RCRA FACILITY INVESTIGATION REPORT - YPG-178a and b

U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Class[1,2,3]	Common Name	Scientific Name	Trophic Level	Federal Status	Arizona Status	Migratory Bird Treaty Act	Associated with Colorado & Gila Rivers[4]	Associated with Farmlands[4]
Reptilia	Ground snake	*Sonora semiannulata*	Insectivore					
Reptilia	Mohave fringe-toed lizard	*Uma scoparia*	Insectivore		WSC			
Reptilia	Long-tailed brush lizard	*Urosaurus graciosus*	Insectivore					
Reptilia	Tree lizard	*Urosaurus ornatus*	Insectivore				X	
Reptilia	Side-blotched lizard	*Uta stansburiana*	Insectivore					
Plants	Nichol's turkshead cactus	*Echinocactus horizonthalonius var. nicholii*	Plants	Endangered	HS			
Plants	Crucifixion thorn (Thorn of Christ)	*Castela emoryi*	Plants		HS			
Plants	Engelman's hedgehog cactus	*Echinocereus engelmannii*	Plants		SR			
Plants	Nichol's hedgehog cactus	*Echinocereus nicholii*	Plants		SR			
Plants	California barrel cactus	*Ferocactus cylindraceus*	Plants		SR			
Plants	Candy barrel cactus	*Ferocactus wislizeni*	Plants		SR			
Plants	Graham's nipple cactus	*Mammillaria grahamii*	Plants		SR			
Plants	Queen of the Night	*Peniocereus greggii*	Plants		SR			

Definitions:

WSC - Wildlife of Special Concern in Arizona.
HS- Highly Safeguarded
SR- Salvage Restricted

Notes:

1 - Includes only those species that have been observed at YPG
2 - For birds, the list presented here does not include "accidentals" (i.e., present as a result of weather events) or vagrants, unless the bird was also observed as breeding at YPG
3 - For plants, only special status species are shown
4 - Although these species may occasionally be found at Yuma Proving Ground (YPG), they are primarily associated with surface water and/or farmland and their presence at YPG is restricted to areas adjacent to surface water and/or farmland

TABLE E.2
CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN - YPG-178a
Ash Debris Areas 1, 2, 3, & 4
RCRA FACILITY INVESTIGATION REPORT

U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Group	Chemical	Max Detect[(1)] (mg/kg)	UCL[(1)] (mg/kg)	BTV (mg/kg)	ESL (mg/kg)	ESL Source	MaxD Exceeds BTV	MaxD Exceeds ESL	UCL Exceeds ESL	COPEC
Metals	Aluminum	4,080	-	12,000	NA[(2)]	Eco-SSL	No	NA	-	No
	Antimony	1.87	1.334	-	0.27	Eco-SSL	NA	Yes	Yes	Yes
	Arsenic	5.75	-	6.6	18	Eco-SSL	No	No	-	No
	Barium	285	-	290	330	Eco-SSL	No	No	-	No
	Cadmium	0.95	0.252	0.65	0.36	Eco-SSL	Yes	Yes	No	No
	Chromium, Total	14.4	-	14	26[(3)]	Eco-SSL	Yes	No	-	No
	Cobalt	3.61	-	7.9	13	Eco-SSL	No	No	-	No
	Copper	52.9	30.51	15	28	Eco-SSL	Yes	Yes	Yes	Yes
	Lead	271	247.7	14	11	Eco-SSL	Yes	Yes	Yes	Yes
	Manganese	695	-	920	220	Eco-SSL	No	Yes	-	No
	Mercury	0.068	0.0182	0.016	0.013	LANL ESL	Yes	Yes	Yes	Yes
	Molybdenum	1.6	-	0.49	17	LANL ESL	Yes	No	-	No
	Nickel	11.9	-	14	38	Eco-SSL	No	No	-	No
	Selenium	0.21	-	-	0.52	Eco-SSL	NA	No	-	No
	Silver	0.71	-	0.062	4.2	Eco-SSL	Yes	No	-	No
	Vanadium	20.2	-	26	7.8	Eco-SSL	No	Yes	-	No
	Zinc	279	134.6	44	46	Eco-SSL	Yes	Yes	Yes	Yes

Notes:

1 For 0-8 ft bgs
2 ESL is not applicable for alumnium because aluminum is identified as a COPC only for those soils with a soil pH less than 5.5 and the pH at the site is higher than 5.5.
3 as Chromium III

Definitions:

COPEC - Chemical of potential ecological concern
ESL - Ecological Screening Level
Eco-SSL - United States Environmnetal Protection Agency (USEPA) Ecological Soil Screening Level (http://www.epa.gov/ecotox/ecossl/)
LANL ESL - Los Alamos National Laboratory, EcoRisk Database v3.0 (http://www.lanl.gov/environment/cleanup/ecorisk.shtml)
BTV - Background threshold value
Max Detect - Maximum detected value
NA - Not applicable
UCL - Upper Confident Level
Shaded - exceeded screening levels.

TABLE E.3
CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN - YPG-178b
Ash Debris Areas 5 & 6
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Group	Chemical	Max Detect[(1)] (mg/kg)	UCL[(1)] (mg/kg)	BTV (mg/kg)	ESL (mg/kg)	ESL source	MaxD Exceeds BTV	MaxD Exceeds ESL	UCL Exceeds ESL	COPEC
Metals	Aluminum	5,470	-	12,000	NA[(2)]	Eco-SSL	No	NA	-	No
	Antimony	4.34	0.979	-	0.27	Eco-SSL	NA	Yes	Yes	Yes
	Arsenic	8.42	-	6.6	18	Eco-SSL	Yes	No	-	No
	Barium	218	-	290	330	Eco-SSL	No	No	-	No
	Beryllium	0.13	-	0.92	21	Eco-SSL	No	No	-	No
	Cadmium	0.63		0.65	0.36	Eco-SSL	No	Yes	-	No
	Chromium, Total	10.2	-	14	26[(3)]	Eco-SSL	No	No	-	No
	Cobalt	2.71	-	7.9	13	Eco-SSL	No	No	-	No
	Copper	42.7	21.58	15	28	Eco-SSL	Yes	Yes	No	No
	Lead	203	197.8	14	11	Eco-SSL	Yes	Yes	Yes	Yes
	Manganese	767	-	920	220	Eco-SSL	No	Yes	-	No
	Mercury	0.093	0.0244	0.016	0.013	LANL ESL	Yes	Yes	Yes	Yes
	Molybdenum	0.6	-	0.49	17	LANL ESL	Yes	No	-	No
	Nickel	5.87	-	14	38	Eco-SSL	No	No	-	No
	Silver	4.1	-	0.062	4.2	Eco-SSL	Yes	No	-	No
	Vanadium	20.6	-	26	7.8	Eco-SSL	No	Yes	-	No
	Zinc	1,060	407.2	44	46	Eco-SSL	Yes	Yes	Yes	Yes
Organics	Benzo(g,h,i)perylene	0.222	-	NA	1.1[(4)]	Eco-SSL	NA	No	-	No
	Dibenz(a,h)anthracene	0.0146	-	NA	1.1[(4)]	Eco-SSL	NA	No	-	No
	Indeno(1,2,3-c,d)pyrene	0.201	-	NA	1.1[(4)]	Eco-SSL	NA	No	-	No
	Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	0.013	-	NA	27	LANL ESL	NA	No	-	No

Notes:

1 For 0-8 ft bgs
2 ESL is not applicable for alumnium because aluminum is identified as a COPC only for those soils with a soil pH less than 5.5 and the pH at the site is higher than 5.5.
3 as Chromium III
4 High molecular weight PAH

Definitions:

COPEC - Chemical of potential ecological concern
ESL - Ecological Screening Level
Eco-SSL - United States Environmnetal Protection Agency (USEPA) Ecological Soil Screening Level (http://www.epa.gov/ecotox/ecossl/)

TABLE E.3
CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN - YPG-178b
Ash Debris Areas 5 & 6
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

LANL ESL - Los Alamos National Laboratory, EcoRisk Database v3.0 (http://www.lanl.gov/environment/cleanup/ecorisk.shtml)
BTV - Background threshold value
Max Detect - Maximum detected value
NA - Not applicable
UCL - Upper Confident Level
Shaded - exceeded screening levels.

TABLE E.4
CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN - YPG-178b
Ash Debris Area 7
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Group	Chemical	Max Detect[1] (mg/kg)	UCL[1] (mg/kg)	BTV (mg/kg)	ESL		MaxD Exceeds		UCL Exceeds	COPEC
					(mg/kg)	source	BTV	ESL	ESL	
Metals	Aluminum	2,510	-	12,000	NA[2]	Eco-SSL	No	NA	-	No
	Arsenic	3.29	-	6.6	18	Eco-SSL	No	No	-	No
	Barium	132	-	290	330	Eco-SSL	No	No	-	No
	Cadmium	0.017	-	0.65	0.36	Eco-SSL	No	No	-	No
	Chromium, Total	5.38	-	14	26[3]	Eco-SSL	No	No	-	No
	Cobalt	1.39	-	7.9	13	Eco-SSL	No	No	-	No
	Copper	1.73	-	15	28	Eco-SSL	No	No	-	No
	Lead	3.82	-	14	11	Eco-SSL	No	No	-	No
	Manganese	58	-	920	220	Eco-SSL	No	No	-	No
	Molybdenum	0.13	-	0.49	17	LANL ESL	No	No	-	No
	Nickel	2.3	-	14	38	Eco-SSL	No	No	-	No
	Silver	0.069	-	0.062	4.2	Eco-SSL	Yes	No	-	No
	Vanadium	15.3	-	26	7.8	Eco-SSL	No	Yes	-	No
	Zinc	13	-	44	46	Eco-SSL	No	No	-	No

Notes:

1 For 0-8 ft bgs

2 ESL is not applicable for alumnium because aluminum is identified as a COPC only for those soils with a soil pH less than 5.5 and the pH at the site is higher than 5.5.

3 as Chromium III

Definitions:

COPEC - Chemical of potential ecological concern
ESL - Ecological Screening Level
Eco-SSL - United States Environmnetal Protection Agency (USEPA) Ecological Soil Screening Level (http://www.epa.gov/ecotox/ecossl/)
LANL ESL - Los Alamos National Laboratory, EcoRisk Database v3.0 (http://www.lanl.gov/environment/cleanup/ecorisk.shtml)
BTV - Background threshold value
Max Detect - Maximum detected value

TABLE E.4
CHEMICALS OF POTENTIAL ECOLOGICAL CONCERN - YPG-178b
Ash Debris Area 7
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

NA - Not applicable
UCL - Upper Confident Level
Shaded - exceeded screening levels.

TABLE E.5
SOIL SCREENING LEVELS FOR PLANTS AND INVERTEBRATES - YPG-178a and b
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

COPEC	Plant Screening-Benchmark Concentration (mg/kg)	Source	Invertebrate Screening-Benchmark Concentration (mg/kg)	Source
Antimony	510	Oorts et al. (2008)	78	USEPA (2011)
Copper	70	USEPA (2011)	80	USEPA (2011)
Lead	120	USEPA (2011)	1,700	USEPA (2011)
Mercury	34	LANL (2011)	0.05	LANL (2011)
Zinc	160	USEPA (2011)	120	USEPA (2011)

Definitions:

COPEC = chemical of potential ecological concern
kg = kilogram
mg = milligram

TABLE E.6
TOXICITY REFERENCE VALUES FOR BIRDS - YPG-178a and b
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

COPEC	Test Species	Test Effect Dose (mg/kg-day)		Exposure Route	Effect	Source	Total Uncertainty Factors		TRV (mg/kg-day)	
		NOAEL[1]	LOAEL				NOAEL	LOAEL	NOAEL-based	LOAEL-based
Antimony	-	-	-	-	-	-	-	-	-	-
Copper	Chicken, duck, quail, turkey	4.05	34.87	Oral	Reproduction, growth	USEPA (2011)	1	1	4.05	34.87
Lead	Chicken, dove, duck, kestrel, quail	1.63	44.63	Oral	Reproduction, growth	USEPA (2011)	1	1	1.63	44.63
Mercury	Quail, japanese	0.019	0.19	Oral	Reproduction	LANL (2011)	0.1	1	0.019	0.19
Zinc	Chicken, duck, quail, turkey	66.1	171.44	Oral	Reproduction, growth	USEPA (2011)	1	1	66.1	171.44

Definitions:

COPEC = Chemical of potential ecological concern
EcoSSL = USEPA Ecological Screening Levels
kg = kilogram
LOAEL = Lowest observed adverse effect level
mg = milligram
NOAEL = No observed adverse effect level
TRV = Toxicity reference value

Notes:

1 - Value is the lesser of the 1) geometric mean of all NOAELs and 2) the highest bounded NOAEL for reproduction, growth or survival.
2 - No toxicity data available. 2,4-Dinitrotoluene used as a surrogate.

TABLE E.7
TOXICITY REFERENCE VALUES FOR MAMMALS - YPG-178a and b
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

COPEC	Test Species	Test Effect Dose (mg/kg-day)		Exposure Route	Effect	Source	Total Uncertainty Factors		TRV (mg/kg-day)	
		NOAEL[1]	LOAEL				NOAEL	LOAEL	NOAEL-based	LOAEL-based
Antimony	Rat, mouse	0.059	2.76	Oral	Reproduction, growth	USEPA (2011)	1	1	0.059	2.76
Copper	Cow, shrew, goat, guinea pig, horse, mink, mouse, pig, rabbit, rat, sheep	5.6	82.70	Oral	Reproduction, growth	USEPA (2011)	1	1	5.6	82.70
Lead	Cow, rat, dog, guinea pig, hamster, horse, mouse, pig, rabbit, sheep,	4.7	186.40	Oral	Reproduction, growth	USEPA (2011)	1	1	4.7	186.4
Mercury	Mink	1.41	14.10	Oral	Reproduction	LANL (2011)	1	10	1.41	14.1
Zinc	Cow, hamster, mink, mouse, pig, rabbit, rat, sheep, buffalo	75.4	297.58	Oral	Reproduction, growth	USEPA (2011)	1	1	75.4	297.58

Definitions:

COPEC = Chemical of potential ecological concern
EcoSSL = USEPA Ecological Screening Levels
LOAEL = Lowest observed adverse effect level
kg = kilogram
mg = milligram
NOAEL = No observed adverse effect level
TRV = Toxicity reference value

Notes:

1 - for NOAELs from USEPA (2001), value is the lesser of the 1) geometric mean of all NOAELs and 2) the highest bounded NOAEL for reproduction, growth or survival.

TABLE E.8
TOXICITY REFERENCE VALUES FOR REPTILES - YPG-178a and b
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

COPEC	Test Species	Test Effect Dose (mg/kg-day)		Exposure Route	Effect	Source	Uncertainty Factors			TRV (mg/kg-day)	
		NOAEL	LOAEL				Study Duration	Endpoint	Total	NOAEL-based	LOAEL-based
Antimony	-	-	-	-	-	-	-	-	-	-	-
Copper	-	-	-	-	-	-	-	-	-	-	-
Lead	Western fence lizard	1	10	diet	Reduced testes, food consumption, and body fat, enlarged kidneys	Salice et al. (2009)	10	1	10	0.1	1
Mercury	-	-	-	-	-	-	-	-	-	-	-
Zinc	-	-	-	-	-	-	-	-	-	-	-

Definitions:

COPEC = Chemical of potential ecological concern
EcoSSL = USEPA Ecological Screening Levels
kg = kilogram
LOAEL = Lowest observed adverse effect level
mg = milligram
NOAEL = No observed adverse effect level
TRV = Toxicity reference value

Notes:

1 - No toxicity data available. 2,4-Dinitrotoluene used as a surrogate.

TABLE E.9
EXPOSURE PARARMETERS FOR WILDLIFE RECEPTORS - YPG-178a and b
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Receptor	Average Body Weight (kg)	Dietary Intake Rate (kg-dw/day)	Food Ingestion Rate (kg-dw/kg-day)	Dietary Fraction				Foraging Area (acres)	Area Use Factor AUF (Unitless)	
				Soils	Terrestrial Plants	Terrestrial Invertebrates	Terrestrial Small Mammals/ Birds			
	BW	IR_D	IR_F	df_s	df_P	df_I	df_m		YPG-178 a	YPG-178 b
Mammals										
Desert shrew	0.004	4.86E-04	0.12	0.011	0	0.99	0.01	0.2	1.0	1.0
Kit fox	1.67	7.45E-02	0.045	0.028	0	0.01	0.99	2,422	0.0007	0.0003
Little pocket mouse	0.0071	1.39E-03	0.20	0.028	0.99	0.01	0	1.0	1.0	0.8
Birds										
American kestrel	0.103	1.53E-02	0.15	0.026	0	0.362	0.638	32	0.053	0.024
Gambel's quail	0.1674	8.43E-03	0.05	0.093	0.984	0.016	0	35.7	0.047	0.021
Verdin	0.0063	1.43E-03	0.23	0.02	0.01	0.99	0	23.7	0.071	0.032
Reptiles										
Sonoran desert tortoise	2.65	1.57E-02	0.0059	0.05	1	0	0	6.4	0.26	0.12

Definitions:

df_s = Dietary fraction consisting of soil
df_P = Dietary fraction consisting plants
df_I = Dietary fraction consisting invertebrates
df_m = Dietary fraction consisting small mammals/birds
kg = kilogram
mg = milligram

TABLE E.10
EXPOSURE POINT CONCENTRATION - YPG-178a
Ash Debris Areas 1, 2, 3, & 4
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Analyte	Number of Results		Percent Detections	Detected Results		ProUCL Distribution[1]	ProUCL UCL[2]	EPC[3]
	Total	Detects		Minimum	Maximum			
0-0.7 feet bgs								
Antimony	9	1	11%	0.2	0.2	-	-	0.2
Copper	9	9	100%	1.39	4.34	95% Approximate Gamma UCL	2.731	2.731
Lead	9	9	100%	2.36	5.13	95% Approximate Gamma UCL	3.759	3.759
Mercury	9	2	22%	0.0063	0.0087	95% KM (t) UCL	0.00723	0.00723
Zinc	9	9	100%	7.83	23.5	95% Student's -t UCL	15.55	15.55
0-5.5 feet bgs								
Antimony	13	2	15%	0.2	1.87	97.5% KM (Chebyshev) UCL	1.418	1.418
Copper	13	13	100%	1.39	52.9	95% Chebyshev (Mean, Sd) UCL	32.61	32.61
Lead	13	13	100%	2.36	271	99% Chebyshev (Mean, Sd) UCL	265.9	265.9
Mercury	13	6	46%	0.0044	0.068	95% KM (t) UCL	0.0193	0.0193
Zinc	13	13	100%	7.83	279	95% Chebyshev (Mean, Sd) UCL	143.7	143.7
0-8 feet bgs								
Antimony	14	2	14%	0.2	1.87	97.5% KM (Chebyshev) UCL	1.334	1.334
Copper	14	14	100%	1.39	52.9	95% Chebyshev (Mean, Sd) UCL	30.51	30.51
Lead	14	14	100%	2.36	271	99% Chebyshev (Mean, Sd) UCL	247.7	247.7
Mercury	14	7	50%	0.0044	0.068	95% KM (t) UCL	0.0182	0.0182
Zinc	14	14	100%	7.83	279	95% Chebyshev (Mean, Sd) UCL	134.6	134.6
Background								
Antimony	12	0	0%	-	-	-	-	-
Copper	12	12	100%	1.4	12.9	95% Student's -t UCL	7.134	7.134
Lead	12	12	100%	2.56	12.5	95% Approximate Gamma UCL	6.821	6.821
Mercury	12	2	17%	0.0072	0.012	95% KM (t) UCL	0.00869	0.00869
Zinc	12	12	100%	10.3	38.8	95% Student's-t UCL	24.8	24.8

Definitions:

EPC = exposure point concentration

UCL - 95% upper confidence limit

Notes:

1 - The method and distribution used by ProUCL version 4.1.01 to calculate the recommended UCL

2 - The 1st recommended UCL from ProUCL.

3 - The lesser of the maximum detected concentration and the UCL.

TABLE E.11
EXPOSURE POINT CONCENTRATION - YPG-178b
Ash Debris Areas 5 &6
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

Analyte	Number of Results		Percent Detections	Detected Results		ProUCL Distribution[1]	ProUCL UCL[2]	EPC[3]
	Total	Detects		Minimum	Maximum			
0-0.7 feet bgs								
Antimony	10	1	10%	0.16	0.16	-	-	0.16
Lead	10	10	100%	2.73	5.73	95% Student's -t UCL	4.703	4.703
Mercury	10	1	10%	0.016	0.016	-	-	0.016
Zinc	10	10	100%	11.5	22.8	95% Student's -t UCL	17.69	17.69
0-5.5 feet bgs								
Antimony	15	3	20%	0.16	4.34	95% KM (t) UCL	1.145	1.145
Lead	15	15	100%	2.73	203	99% Chebyshev (Mean, Sd) UCL	232.5	203.0
Mercury	15	4	27%	0.01	0.093	95% KM (t) UCL	0.0274	0.0274
Zinc	15	15	100%	10.6	1060	99% Chebyshev (Mean, Sd) UCL	908.7	908.7
0-8 feet bgs								
Antimony	18	3	17%	0.16	4.34	95% KM (t) UCL	0.979	0.979
Lead	18	18	100%	2.73	203	99% Chebyshev (Mean, Sd) UCL	197.8	197.8
Mercury	18	4	22%	0.01	0.093	95% KM (t) UCL	0.0244	0.0244
Zinc	18	18	100%	10.6	1060	95% Chebyshev (Mean, Sd) UCL	407.2	407.2
Background								
Antimony	12	0	0%	-	-	-	-	-
Lead	12	12	100%	2.56	12.5	95% Approximate Gamma UCL	6.821	6.821
Mercury	12	2	17%	0.0072	0.012	95% KM (t) UCL	0.00869	0.00869
Zinc	12	12	100%	10.3	38.8	95% Student's-t UCL	24.8	24.8

Definitions:

EPC = exposure point concentration

UCL - 95% upper confidence limit

Notes:

1 - The method and distribution used by ProUCL version 4.1.01 to calculate the recommended UCL

2 - The 1st recommended UCL from ProUCL.

3 - The lesser of the maximum detected concentration and the UCL.

TABLE E.12

PREDICTED COPEC CONCENTRATIONS IN PLANTS YPG-178a and b

RCRA FACILITY INVESTIGATION REPORT

U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

MRS/COPEC	Soil EPC (Cs) (mg/kg)		Uptake Parameters		Concentration in Plants (Cp) (mg/kg)	
	YPG-178a	YPG-178b	PUF (kg soil dw / kg plant dw)	Source	YPG-178a	YPG-178b
Site (0-5.5 ft bgs)						
Antimony	1.418	1.145	ln(Cp) = 0.938 * ln(Cs) - 3.233	USEPA (2007)	5.47E-02	4.48E-02
Copper	32.61	-	$\ln(C_p) = 0.394 * \ln(C_s) + 0.668$	USEPA (2007)	7.70E+00	-
Lead	265.9	203	$\ln(C_p) = 0.561 * \ln(C_s) - 1.328$	USEPA (2007)	6.07E+00	5.22E+00
Mercury	0.0193	0.0274	$C_p = 0.663 * C_s$	USEPA (2007)	1.28E-02	1.82E-02
Zinc	143.7	908.7	$\ln(C_p) = 0.554 * \ln(C_s) + 1.575$	USEPA (2007)	7.57E+01	2.10E+02
Background						
Antimony	-	-	ln(Cp) = 0.938 * ln(Cs) - 3.233	USEPA (2007)	-	-
Copper	7.134	-	$\ln(C_p) = 0.394 * \ln(C_s) + 0.668$	USEPA (2007)	4.23E+00	4.23E+00
Lead	6.821	6.821	$\ln(C_p) = 0.561 * \ln(C_s) - 1.328$	USEPA (2007)	7.78E-01	7.78E-01
Mercury	0.00869	0.00869	$C_p = 0.663 * C_s$	USEPA (2007)	5.76E-03	5.76E-03
Zinc	24.8	24.8	$\ln(C_p) = 0.554 * \ln(C_s) + 1.575$	USEPA (2007)	2.86E+01	2.86E+01

Definitions:

C_p = concentration in terrestrial plants

C_s = concentration in soil

COPEC = Chemical of potential ecological concern

EPC = Exposure point concentration

dw = dry weight

kg = kilogram

mg = milligram

PUF = Plant uptake factor

TABLE E.13

PREDICTED COPEC CONCENTRATIONS IN INVERTEBRATES YPG-178a and b

RCRA FACILITY INVESTIGATION REPORT

U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

	Soil EPC (Cs) (mg/kg)		Uptake Parameters		Concentration in Invertebrates (Ci) (mg/kg)	
MRS/COPEC	YPG-178a	YPG-178b	BAF (kg soil dw / kg invertebrate dw)	Source	YPG-178a	YPG-178b
Site (0-5.5 ft bgs)						
Antimony	1.418	1.145	Ci = Cs	USEPA (2007)	1.42E+00	1.15E+00
Copper	32.61	-	$C_i = 0.515 * C_s$	USEPA (2007)	1.68E+01	-
Lead	265.9	203	$\ln(C_i) = 0.807 * \ln(C_s) - 0.218$	USEPA (2007)	7.28E+01	5.85E+01
Mercury	0.0193	0.0274	$C_i = 3.93 * C_s$	LANL (2011)	7.58E-02	1.08E-01
Zinc	143.7	908.7	$\ln(C_i) = 0.328 * \ln(C_s) + 4.449$	USEPA (2007)	4.36E+02	7.99E+02
Background						
Antimony	-	-	Ci = Cs	USEPA (2007)	-	-
Copper	7.134	-	$C_i = 0.515 * C_s$	USEPA (2007)	3.67E+00	-
Lead	6.821	6.821	$\ln(C_i) = 0.807 * \ln(C_s) - 0.218$	USEPA (2007)	3.79E+00	3.79E+00
Mercury	0.00869	0.00869	$C_i = 3.93 * C_s$	LANL (2011)	3.42E-02	3.42E-02
Zinc	24.8	24.8	$\ln(C_i) = 0.328 * \ln(C_s) + 4.449$	USEPA (2007)	2.45E+02	2.45E+02

Definitions:

BAF = earthworm bioaccumulation factor

C_i = concentration in terrestrial invertebrates

C_s = concentration in soil

COPEC = Chemical of potential ecological concern

dw = dry weight

EPC = Exposure point concentration

kg = kilogram

mg = milligram

TABLE E.14

PREDICATED COPEC CONCENTRATIONS IN SMALL MAMMALS/BIRDS - YPG-178a and b

RCRA FACILITY INVESTIGATION REPORT

U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

MRS/COPEC	Soil EPC (C_s) (mg/kg) (mg/kg)		Uptake Parameters		Small Mammals/Birds (C_m) (mg/kg)	
	YPG-178a	YPG-178b	BAF (kg soil dw / kg mammal dw)	Source	YPG-178a	YPG-178b
Site (0-5.5 ft bgs)						
Antimony	1.418	1.145	Cm = 0.001*50*Cs	USEPA (2007)	7.09E-02	5.73E-02
Copper	32.61	-	$\ln(Cm) = 0.1444 * \ln(Cs) + 2.042$	USEPA (2007)	1.27E+01	-
Lead	265.9	203	$\ln(C_m) = 0.4422 * \ln(C_s) + 0.0761$	USEPA (2007)	1.27E+01	1.13E+01
Mercury	0.0193	0.0274	$C_m = 0.649 * C_s$	LANL (2011)	1.25E-02	1.78E-02
Zinc	143.7	908.7	$\ln(C_m) = 0.0706 * \ln(C_s) + 4.3632$	USEPA (2007)	1.11E+02	1.27E+02
Background						
Antimony	-	-	Cm = 0.001*50*Cs	USEPA (2007)	-	-
Copper	7.134	-	$\ln(Cm) = 0.1444 * \ln(Cs) + 2.042$	USEPA (2007)	1.02E+01	-
Lead	6.821	6.821	$\ln(C_m) = 0.4422 * \ln(C_s) + 0.0761$	USEPA (2007)	2.52E+00	2.52E+00
Mercury	0.00869	0.00869	$C_m = 0.649 * C_s$	LANL (2011)	5.64E-03	5.64E-03
Zinc	24.8	24.8	$\ln(C_m) = 0.0706 * \ln(C_s) + 4.3632$	USEPA (2007)	9.85E+01	9.85E+01

Definitions:

BAF = bioaccumulation factor

C_m = concentration in small mammals/birds

C_s = concentration in soil

COPEC = Chemical of potential ecological concern

dw = dry weight

EPC = Exposure point concentration

kg = kilogram

mg = milligram

TABLE E.15
HAZARD QUOTIENTS FOR PLANTS AND INVERTEBRATES - YPG-178 a and b
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

COPEC	Soil EPC (mg/kg)		Screening Benchmarks (mg/kg)		Hazard Quotients YPG-178a (unitless)		Hazard Quotients YPG-178b (unitless)	
	YPG-178a	YPG-178b	Plants	Invertebrates	Plants	Invertebrates	Plants	Invertebrates
Site (0-5.5 ft bgs)								
Antimony	1.4	1.1	510	78	3E-03	2E-02	2E-03	1E-02
Copper	32.6	-	70	80	5E-01	4E-01	-	-
Lead	265.9	203	120	1700	2E+00	2E-01	2E+00	1E-01
Mercury	0.0193	0.0274	34	0.05	6E-04	4E-01	8E-04	5E-01
Zinc	143.7	908.7	160	120	9E-01	1E+00	6E+00	8E+00
Background								
Antimony	-	-	510	78	-	-	-	-
Copper	7.134	-	70	80	1E-01	9E-02	-	-
Lead	6.821	6.821	120	1700	6E-02	4E-03	6E-02	4E-03
Mercury	0.00869	0.00869	34	0.05	3E-04	2E-01	3E-04	2E-01
Zinc	24.8	24.8	160	120	2E-01	2E-01	2E-01	2E-01

Definitions:
COPEC = Chemical of potential ecological concern
EPC = Exposure point concentration
kg = kilogram
mg = milligram
Cells shaded blue indicate an HQ>1

TABLE E.16
AVERAGE DAILEY DOSES and HAZARD QUOTIENTS FOR WILDLIFE RECEPTORS - YPG-178a
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

	Mammals			Birds			Reptiles
COPEC	Desert shrew (0-0.7 ft bgs)	Kit fox (0-8 ft bgs)	Little pocket mouse (0-0.7 ft bgs)	American kestrel (0-0.7 ft bgs)	Gambel's quail (0-0.7 ft bgs)	Verdin (0-0.7 ft bgs)	Sonoran desert tortoise (0-5.5 ft bgs)
Average Daily Dose (mg/kg-day)							
Antimony	1.7E-01	3.8E-03	1.4E-02	8.3E-02	3.9E-03	3.2E-01	4.3E-04
Copper	2.0E+00	5.7E-01	1.5E+00	2.1E+00	4.0E-01	3.8E+00	4.8E-02
Lead	8.8E+00	6.0E-01	1.3E+00	5.1E+00	3.6E-01	1.6E+01	5.7E-02
Mercury	9.2E-03	5.9E-04	2.7E-03	5.3E-03	7.0E-04	1.7E-02	7.7E-05
Zinc	5.3E+01	5.1E+00	1.6E+01	3.4E+01	4.1E+00	9.8E+01	4.6E-01
NOAEL-based HQ (unitless)							
Antimony	2.9E+00	6.4E-02	2.5E-01	-	-	-	-
Copper	3.6E-01	1.0E-01	2.7E-01	5.20E-01	9.77E-02	9.33E-01	-
Lead	1.9E+00	1.3E-01	2.8E-01	3.13E+00	2.21E-01	1.00E+01	5.7E-01
Mercury	6.5E-03	4.2E-04	1.9E-03	2.77E-01	3.67E-02	8.96E-01	-
Zinc	7.0E-01	6.8E-02	2.1E-01	5.14E-01	6.21E-02	1.48E+00	-
Total Hazard Index	6	0.4	1	4	0.4	13	0.6
LOAEL-based HQ (unitless)							
Antimony	6.2E-02	1.4E-03	5.2E-03	-	-	-	-
Copper	2.5E-02	6.9E-03	1.9E-02	6.0E-02	1.1E-02	1.1E-01	-
Lead	4.7E-02	3.2E-03	7.2E-03	1.1E-01	8.1E-03	3.7E-01	5.7E-02
Mercury	6.5E-04	4.2E-05	1.9E-04	2.8E-02	3.7E-03	9.0E-02	-
Zinc	1.8E-01	1.7E-02	5.2E-02	2.0E-01	2.4E-02	5.7E-01	-
Total Hazard Index	0.3	0.03	0.08	0.4	0.05	1	0.06

Definitions:

ADD = Average daily dose (mg chemical ingested per kg body weight per day [mg/kg-day])

COPEC = Chemical of potential ecological concern

EPC = Exposure point concentration

kg = kilogram

mg = milligram

Cells shaded blue indicate an HQ>1

TABLE E.17
AVERAGE DAILEY DOSES and HAZARD QUOTIENTS FOR WILDLIFE RECEPTORS - YPG-178b
RCRA FACILITY INVESTIGATION REPORT
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

	Mammals			Birds			Reptiles
COPEC	Desert shrew (0-0.7 ft bgs)	Kit fox (0-8 ft bgs)	Little pocket mouse (0-0.7 ft bgs)	American kestrel (0-0.7 ft bgs)	Gambel's quail (0-0.7 ft bgs)	Verdin (0-0.7 ft bgs)	Sonoran desert tortoise (0-5.5 ft bgs)
Average Daily Dose (mg/kg-day)							
Antimony	1.4E-01	3.0E-03	1.2E-02	6.7E-02	3.2E-03	2.6E-01	2.7E-04
Lead	7.1E+00	5.3E-01	1.1E+00	4.2E+00	3.1E-01	1.3E+01	3.1E-02
Mercury	1.3E-02	8.3E-04	3.8E-03	7.5E-03	9.9E-04	2.4E-02	1.1E-04
Zinc	9.6E+01	6.0E+00	4.2E+01	5.5E+01	1.1E+01	1.8E+02	1.2E+00
NOAEL-based HQ (unitless)							
Antimony	2.3E+00	5.2E-02	2.0E-01	-	-	-	-
Lead	1.5E+00	1.1E-01	2.4E-01	2.6E+00	1.9E-01	8.1E+00	3.1E-01
Mercury	9.2E-03	5.9E-04	2.7E-03	3.9E-01	5.2E-02	1.3E+00	-
Zinc	1.3E+00	7.9E-02	5.6E-01	8.3E-01	1.7E-01	2.7E+00	-
Total Hazard Index	5	0.2	1.0	4	0.4	12	0.3
LOAEL-based HQ (unitless)							
Antimony	5.0E-02	1.1E-03	4.2E-03	-	-	-	-
Lead	3.8E-02	2.8E-03	6.1E-03	9.4E-02	6.9E-03	2.9E-01	3.1E-02
Mercury	9.2E-04	5.9E-05	2.7E-04	3.9E-02	5.2E-03	1.3E-01	-
Zinc	3.2E-01	2.0E-02	1.4E-01	3.2E-01	6.5E-02	1.0E+00	-
Total Hazard Index	0.4	0.02	0.2	0.5	0.08	1	0.03

Definitions:

ADD = Average daily dose (mg chemical ingested per kg body weight per day [mg/kg-day])

COPEC = Chemical of potential ecological concern

EPC = Exposure point concentration

kg = kilogram

mg = milligram

Cells shaded blue indicate an HQ>1

TABLE E.18
AVERAGE DAILEY DOSES and HAZARD QUOTIENTS FOR WILDLIFE RECEPTORS - BACKGROUND CONDITIONS
RCRA FACILITY INVESTIGATION REPORT - YPG-178 A & B
U.S. ARMY GARRISON YUMA PROVING GROUND, ARIZONA

	Mammals			Birds			Reptiles
COPEC	Desert shrew (0-0.7 ft bgs)	Kit fox (0-8 ft bgs)	Little pocket mouse (0-0.7 ft bgs)	American kestrel (0-0.7 ft bgs)	Gambel's quail (0-0.7 ft bgs)	Verdin (0-0.7 ft bgs)	Sonoran desert tortoise (0-5.5 ft bgs)
Average Daily Dose (mg/kg-day)							
Antimony	-	-	-	-	-	-	-
Copper	4.6E-01	4.6E-01	8.7E-01	1.2E+00	2.5E-01	8.6E-01	2.7E-02
Lead	4.7E-01	1.2E-01	2.0E-01	4.7E-01	7.4E-02	8.8E-01	6.6E-03
Mercury	4.1E-03	2.8E-04	1.2E-03	2.4E-03	3.5E-04	7.7E-03	3.7E-05
Zinc	3.0E+01	4.5E+00	6.2E+00	2.3E+01	1.7E+00	5.5E+01	1.8E-01
NOAEL-based HQ (unitless)							
Antimony	-	-	-	-	-	-	-
Copper	8.3E-02	8.3E-02	1.5E-01	2.9E-01	6.1E-02	2.1E-01	-
Lead	1.0E-01	2.6E-02	4.2E-02	2.9E-01	4.5E-02	5.4E-01	6.6E-02
Mercury	2.9E-03	2.0E-04	8.7E-04	1.3E-01	1.9E-02	4.1E-01	-
Zinc	3.9E-01	6.0E-02	8.2E-02	3.4E-01	2.6E-02	8.3E-01	-
Total Hazard Index	0.6	0.2	0.3	1	0.2	2	0.07
LOAEL-based HQ (unitless)							
Antimony	-	-	-	-	-	-	-
Copper	5.6E-03	5.6E-03	1.0E-02	3.4E-02	7.1E-03	2.5E-02	-
Lead	2.5E-03	6.5E-04	1.0E-03	1.0E-02	1.6E-03	2.0E-02	6.6E-03
Mercury	2.9E-04	2.0E-05	8.7E-05	1.3E-02	1.9E-03	4.1E-02	-
Zinc	1.0E-01	1.5E-02	2.1E-02	1.3E-01	1.0E-02	3.2E-01	-
Total Hazard Index	0.1	0.02	0.03	0.2	0.02	0.4	0.007

Definitions:

ADD = Average daily dose (mg chemical ingested per kg body weight per day [mg/kg-day])
COPEC = Chemical of potential ecological concern
EPC = Exposure point concentration
kg = kilogram
mg = milligram
Cells shaded blue indicate an HQ>1

FIGURES

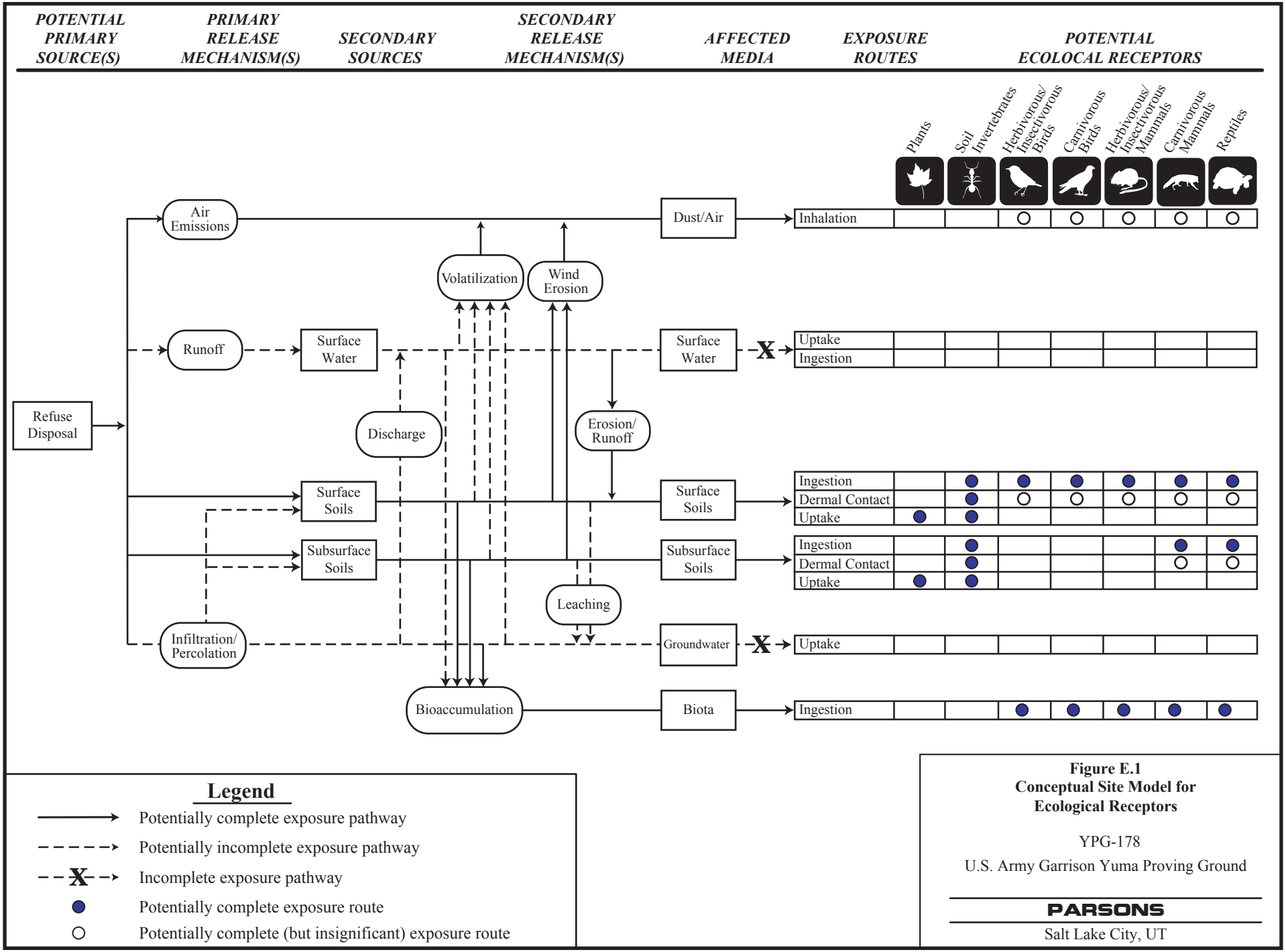


Figure E.1
Conceptual Site Model for Ecological Receptors

YPG-178

U.S. Army Garrison Yuma Proving Ground

PARSONS

Salt Lake City, UT

Attachment E-1
ProUCL Output for 0-0.7 feet bgs
YPG-178a Landfill

ANTIMONY

General Statistics

Number of Valid Data	9	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	8
		Percent Non-Detects	88.89%

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

Attachment E-1
ProUCL Output for 0-0.7 feet bgs
YPG-178a Landfill

COPPER

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	1.39	Minimum of Log Data	0.329
Maximum	4.34	Maximum of Log Data	1.468
Mean	2.107	Mean of log Data	0.678
Geometric Mean	1.97	SD of log Data	0.366
Median	1.82		
SD	0.929		
Std. Error of Mean	0.31		
Coefficient of Variation	0.441		
Skewness	2.022		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions
The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.755	Shapiro Wilk Test Statistic	0.856
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	2.682	95% H-UCL	2.762
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	3.212
95% Adjusted-CLT UCL (Chen-1995)	2.839	97.5% Chebyshev (MVUE) UCL	3.698
95% Modified-t UCL (Johnson-1978)	2.717	99% Chebyshev (MVUE) UCL	4.651

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	5.157	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.408		
MLE of Mean	2.107		
MLE of Standard Deviation	0.928		
nu star	92.83		
Approximate Chi Square Value (.05)	71.61	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	2.616
Adjusted Chi Square Value	67.69	95% Jackknife UCL	2.682
		95% Standard Bootstrap UCL	2.587
Anderson-Darling Test Statistic	0.647	95% Bootstrap-t UCL	3.171
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL	4.579
Kolmogorov-Smirnov Test Statistic	0.217	95% Percentile Bootstrap UCL	2.61
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL	2.84
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	3.456
		97.5% Chebyshev(Mean, Sd) UCL	4.04
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5.187
95% Approximate Gamma UCL (Use when n >= 40)	2.731		
95% Adjusted Gamma UCL (Use when n < 40)	2.889		
Potential UCL to Use		Use 95% Approximate Gamma UCL	2.731

Attachment E-1
ProUCL Output for 0-0.7 feet bgs
YPG-178a Landfill

LEAD

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	2.36	Minimum of Log Data	0.859
Maximum	5.13	Maximum of Log Data	1.635
Mean	3.237	Mean of log Data	1.151
Geometric Mean	3.163	SD of log Data	0.22
Median	3.11		
SD	0.799		
Std. Error of Mean	0.266		
Coefficient of Variation	0.247		
Skewness	1.847		

Warning: There are only 9 Values in this data
Note: It should be noted that even though bootstrap methods may be performed on this data set,
the resulting calculations may not be reliable enough to draw conclusions
The literature suggests to use bootstrap methods on data sets having more than 10-15 observations.

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.825	Shapiro Wilk Test Statistic	0.908
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
95% Student's-t UCL	3.732	95% H-UCL	3.765
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	4.268
95% Adjusted-CLT UCL (Chen-1995)	3.85	97.5% Chebyshev (MVUE) UCL	4.717
95% Modified-t UCL (Johnson-1978)	3.759	99% Chebyshev (MVUE) UCL	5.598

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	14.6	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.222		
MLE of Mean	3.237		
MLE of Standard Deviation	0.847		
nu star	262.7		
Approximate Chi Square Value (.05)	226.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	3.675
Adjusted Chi Square Value	219	95% Jackknife UCL	3.732
		95% Standard Bootstrap UCL	3.649
Anderson-Darling Test Statistic	0.48	95% Bootstrap-t UCL	4.046
Anderson-Darling 5% Critical Value	0.721	95% Hall's Bootstrap UCL	5.736
Kolmogorov-Smirnov Test Statistic	0.214	95% Percentile Bootstrap UCL	3.682
Kolmogorov-Smirnov 5% Critical Value	0.279	95% BCA Bootstrap UCL	3.828
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	4.397
		97.5% Chebyshev(Mean, Sd) UCL	4.899
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	5.886
95% Approximate Gamma UCL (Use when n >= 40)	3.759		
95% Adjusted Gamma UCL (Use when n < 40)	3.882		
Potential UCL to Use		Use 95% Approximate Gamma UCL	3.759

Attachment E-1
ProUCL Output for 0-0.7 feet bgs
YPG-178a Landfill

MERCURY

General Statistics

Number of Valid Data	9	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	7
		Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0063	Minimum Detected	-5.067
Maximum Detected	0.0087	Maximum Detected	-4.744
Mean of Detected	0.0075	Mean of Detected	-4.906
SD of Detected	0.0017	SD of Detected	0.228
Minimum Non-Detect	0.0029	Minimum Non-Detect	-5.843
Maximum Non-Detect	0.0036	Maximum Non-Detect	-5.627

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	2
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	77.78%

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	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.003	Mean	-6.045
SD	0.00262	SD	0.654
95% DL/2 (t) UCL	0.00463	95% H-Stat (DL/2) UCL	0.00528
Maximum Likelihood Estimate(MLE) Method	N/A	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	0.00657
5% K-S Critical Value	N/A	SD	0.00075425

Attachment E-1
ProUCL Output for 0-0.7 feet bgs
YPG-178a Landfill

MERCURY (Continued)			
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00035556
		95% KM (t) UCL	0.00723
Assuming Gamma Distribution		95% KM (z) UCL	0.00715
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.00827
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	0.0087
Median	N/A	95% KM (Chebyshev) UCL	0.00812
SD	N/A	97.5% KM (Chebyshev) UCL	0.00879
k star	N/A	99% KM (Chebyshev) UCL	0.0101
Theta star	N/A		
Nu star	N/A	Potential UCLs to Use	
AppChi2	N/A	95% KM (t) UCL	0.00723
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (% Bootstrap) UCL	0.0087
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Attachment E-1
ProUCL Output for 0-0.7 feet bgs
YPG-178a Landfill

ZINC

General Statistics

Number of Valid Observations	9	Number of Distinct Observations	9

Raw Statistics		Log-transformed Statistics	
Minimum	7.83	Minimum of Log Data	2.058
Maximum	23.5	Maximum of Log Data	3.157
Mean	12.03	Mean of log Data	2.406
Geometric Mean	11.09	SD of log Data	0.407
Median	8.85		
SD	5.686		
Std. Error of Mean	1.895		
Coefficient of Variation	0.473		
Skewness	1.456		

Warning: There are only 9 Values in this data

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

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

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.763	Shapiro Wilk Test Statistic	0.819
Shapiro Wilk Critical Value	0.829	Shapiro Wilk Critical Value	0.829
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	15.55	95% H-UCL	16.39
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	19.05
95% Adjusted-CLT UCL (Chen-1995)	16.13	97.5% Chebyshev (MVUE) UCL	22.13
95% Modified-t UCL (Johnson-1978)	15.71	99% Chebyshev (MVUE) UCL	28.19
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	4.269	Data do not follow a Discernable Distribution (0.05)	
Theta Star	2.818		
MLE of Mean	12.03		
MLE of Standard Deviation	5.822		
nu star	76.84		
Approximate Chi Square Value (.05)	57.65	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0231	95% CLT UCL	15.15
Adjusted Chi Square Value	54.16	95% Jackknife UCL	15.55
		95% Standard Bootstrap UCL	14.93
Anderson-Darling Test Statistic	0.86	95% Bootstrap-t UCL	21
Anderson-Darling 5% Critical Value	0.722	95% Hall's Bootstrap UCL	29.35
Kolmogorov-Smirnov Test Statistic	0.28	95% Percentile Bootstrap UCL	15.18
Kolmogorov-Smirnov 5% Critical Value	0.28	95% BCA Bootstrap UCL	15.8
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	20.29
		97.5% Chebyshev(Mean, Sd) UCL	23.87
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	30.89
95% Approximate Gamma UCL (Use when n >= 40)	16.03		
95% Adjusted Gamma UCL (Use when n < 40)	17.07		
Potential UCL to Use		Use 95% Student's-t UCL	15.55
		or 95% Modified-t UCL	15.71

Attachment E-2
ProUCL Output for 0-5.5 feet bgs
YPG-178a Landfill

ANTIMONY

General Statistics

Number of Valid Data	13	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	11
		Percent Non-Detects	84.62%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	1.87	Maximum Detected	0.626
Mean of Detected	1.035	Mean of Detected	-0.492
SD of Detected	1.181	SD of Detected	1.581
Minimum Non-Detect	0.12	Minimum Non-Detect	-2.12
Maximum Non-Detect	0.12	Maximum Non-Detect	-2.12

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	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.21	Mean	-2.456
SD	0.5	SD	0.984
95% DL/2 (t) UCL	0.457	95% H-Stat (DL/2) UCL	0.31
Maximum Likelihood Estimate(MLE) Method	N/A	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	0.328
5% K-S Critical Value	N/A	SD	0.445
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.175

Attachment E-2
ProUCL Output for 0-5.5 feet bgs
YPG-178a Landfill

ANTIMONY (Continued)

		95% KM (t) UCL	0.64
Assuming Gamma Distribution		95% KM (z) UCL	0.616
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	N/A
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	1.089
SD	N/A	97.5% KM (Chebyshev) UCL	1.418
k star	N/A	99% KM (Chebyshev) UCL	2.065
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	97.5% KM (Chebyshev) UCL	1.418
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Attachment E-2
ProUCL Output for 0-5.5 feet bgs
YPG-178a Landfill

COPPER

General Statistics

Number of Valid Observations	13	Number of Distinct Observations	13

Raw Statistics		**Log-transformed Statistics**	
Minimum	1.39	Minimum of Log Data	0.329
Maximum	52.9	Maximum of Log Data	3.968
Mean	9.777	Mean of log Data	1.166
Geometric Mean	3.209	SD of log Data	1.275
Median	1.82		
SD	18.89		
Std. Error of Mean	5.239		
Coefficient of Variation	1.932		
Skewness	2.172		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.478	Shapiro Wilk Test Statistic	0.634
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	19.11	95% H-UCL	24.79
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	17.68
95% Adjusted-CLT UCL (Chen-1995)	21.77	97.5% Chebyshev (MVUE) UCL	22.49
95% Modified-t UCL (Johnson-1978)	19.64	99% Chebyshev (MVUE) UCL	31.95
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.482	Data do not follow a Discernable Distribution (0.05)	
Theta Star	20.27		
MLE of Mean	9.777		
MLE of Standard Deviation	14.08		
nu star	12.54		
Approximate Chi Square Value (.05)	5.585	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0301	95% CLT UCL	18.39
Adjusted Chi Square Value	4.939	95% Jackknife UCL	19.11
		95% Standard Bootstrap UCL	18.03
Anderson-Darling Test Statistic	2.812	95% Bootstrap-t UCL	200.6
Anderson-Darling 5% Critical Value	0.785	95% Hall's Bootstrap UCL	201.5
Kolmogorov-Smirnov Test Statistic	0.413	95% Percentile Bootstrap UCL	17.71
Kolmogorov-Smirnov 5% Critical Value	0.249	95% BCA Bootstrap UCL	21.56
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	32.61
		97.5% Chebyshev(Mean, Sd) UCL	42.49
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	61.9
95% Approximate Gamma UCL (Use when n >= 40)	21.95		
95% Adjusted Gamma UCL (Use when n < 40)	24.82		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	32.61

Attachment E-2
ProUCL Output for 0-5.5 feet bgs
YPG-178a Landfill

LEAD

General Statistics

Number of Valid Observations	13	Number of Distinct Observations	13

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.36	Minimum of Log Data	0.859
Maximum	271	Maximum of Log Data	5.602
Mean	36.12	Mean of log Data	1.801
Geometric Mean	6.056	SD of log Data	1.588
Median	3.23		
SD	83.25		
Std. Error of Mean	23.09		
Coefficient of Variation	2.305		
Skewness	2.494		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.471	Shapiro Wilk Test Statistic	0.555
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	77.28	95% H-UCL	130.3
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	56.08
95% Adjusted-CLT UCL (Chen-1995)	91.17	97.5% Chebyshev (MVUE) UCL	72.62
95% Modified-t UCL (Johnson-1978)	79.94	99% Chebyshev (MVUE) UCL	105.1

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.338	Data do not follow a Discernable Distribution (0.05)	
Theta Star	106.9		
MLE of Mean	36.12		
MLE of Standard Deviation	62.14		
nu star	8.787		
Approximate Chi Square Value (.05)	3.199	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0301	95% CLT UCL	74.1
Adjusted Chi Square Value	2.737	95% Jackknife UCL	77.28
		95% Standard Bootstrap UCL	72.11
Anderson-Darling Test Statistic	3.295	95% Bootstrap-t UCL	4185
Anderson-Darling 5% Critical Value	0.815	95% Hall's Bootstrap UCL	3237
Kolmogorov-Smirnov Test Statistic	0.475	95% Percentile Bootstrap UCL	77.35
Kolmogorov-Smirnov 5% Critical Value	0.254	95% BCA Bootstrap UCL	89.49
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	136.8
		97.5% Chebyshev(Mean, Sd) UCL	180.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	265.9
95% Approximate Gamma UCL (Use when n >= 40)	99.23		
95% Adjusted Gamma UCL (Use when n < 40)	116		

Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	265.9

Attachment E-2
ProUCL Output for 0-5.5 feet bgs
YPG-178a Landfill

MERCURY

General Statistics

Number of Valid Data	13	Number of Detected Data	6
Number of Distinct Detected Data	6	Number of Non-Detect Data	7
		Percent Non-Detects	53.85%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0044	Minimum Detected	-5.426
Maximum Detected	0.068	Maximum Detected	-2.688
Mean of Detected	0.0171	Mean of Detected	-4.618
SD of Detected	0.025	SD of Detected	0.976
Minimum Non-Detect	0.0029	Minimum Non-Detect	-5.843
Maximum Non-Detect	0.0036	Maximum Non-Detect	-5.627

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	7
Number treated as Detected	6
Single DL Non-Detect Percentage	53.85%

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	0.557	Shapiro Wilk Test Statistic	0.733
5% Shapiro Wilk Critical Value	0.788	5% Shapiro Wilk Critical Value	0.788
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00881	Mean	-5.562
SD	0.018	SD	1.108
95% DL/2 (t) UCL	0.0177	95% H-Stat (DL/2) UCL	0.0187
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-6.097
		SD in Log Scale	1.643
		Mean in Original Scale	0.0083
		SD in Original Scale	0.0182
		95% t UCL	0.0173
		95% Percentile Bootstrap UCL	0.018
		95% BCA Bootstrap UCL	0.0238
		95% H-UCL	0.0589

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.635	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0269		
nu star	7.615		
A-D Test Statistic	1.141	Nonparametric Statistics	
5% A-D Critical Value	0.714	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.714	Mean	0.0103
5% K-S Critical Value	0.341	SD	0.0167

Attachment E-2
ProUCL Output for 0-5.5 feet bgs
YPG-178a Landfill

MERCURY (Continued)

Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00509
		95% KM (t) UCL	0.0193
Assuming Gamma Distribution		95% KM (z) UCL	0.0186
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0182
Minimum	0.000001	95% KM (bootstrap t) UCL	0.0884
Maximum	0.068	95% KM (BCA) UCL	0.0221
Mean	0.00789	95% KM (Percentile Bootstrap) UCL	0.02
Median	0.000001	95% KM (Chebyshev) UCL	0.0324
SD	0.0184	97.5% KM (Chebyshev) UCL	0.042
k star	0.175	99% KM (Chebyshev) UCL	0.0609
Theta star	0.045		
Nu star	4.551	**Potential UCLs to Use**	
AppChi2	0.951	95% KM (t) UCL	0.0193
95% Gamma Approximate UCL (Use when n >= 40)	0.0377	95% KM (% Bootstrap) UCL	0.02
95% Adjusted Gamma UCL (Use when n < 40)	0.0483		

Attachment E-2
ProUCL Output for 0-5.5 feet bgs
YPG-178a Landfill

ZINC

General Statistics

Number of Valid Observations	13	Number of Distinct Observations	12

Raw Statistics		**Log-transformed Statistics**	
Minimum	7.83	Minimum of Log Data	2.058
Maximum	279	Maximum of Log Data	5.631
Mean	44.25	Mean of log Data	2.873
Geometric Mean	17.69	SD of log Data	1.16
Median	12		
SD	82.22		
Std. Error of Mean	22.8		
Coefficient of Variation	1.858		
Skewness	2.527		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.509	Shapiro Wilk Test Statistic	0.697
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	84.9	95% H-UCL	99.09
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	81.36
95% Adjusted-CLT UCL (Chen-1995)	98.84	97.5% Chebyshev (MVUE) UCL	102.7
95% Modified-t UCL (Johnson-1978)	87.56	99% Chebyshev (MVUE) UCL	144.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.562	Data do not follow a Discernable Distribution (0.05)	
Theta Star	78.71		
MLE of Mean	44.25		
MLE of Standard Deviation	59.02		
nu star	14.62		
Approximate Chi Square Value (.05)	6.997	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0301	95% CLT UCL	81.76
Adjusted Chi Square Value	6.259	95% Jackknife UCL	84.9
		95% Standard Bootstrap UCL	80.32
Anderson-Darling Test Statistic	2.381	95% Bootstrap-t UCL	618.9
Anderson-Darling 5% Critical Value	0.777	95% Hall's Bootstrap UCL	448.6
Kolmogorov-Smirnov Test Statistic	0.362	95% Percentile Bootstrap UCL	85.41
Kolmogorov-Smirnov 5% Critical Value	0.247	95% BCA Bootstrap UCL	97.01
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	143.7
		97.5% Chebyshev(Mean, Sd) UCL	186.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	271.2
95% Approximate Gamma UCL (Use when n >= 40)	92.45		
95% Adjusted Gamma UCL (Use when n < 40)	103.3		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	143.7

Attachment E-3
ProUCL Output for 0-8.0 feet bgs
YPG-178a Landfill

ANTIMONY

General Statistics

Number of Valid Data	14	Number of Detected Data	2
Number of Distinct Detected Data	2	Number of Non-Detect Data	12
		Percent Non-Detects	85.71%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.2	Minimum Detected	-1.609
Maximum Detected	1.87	Maximum Detected	0.626
Mean of Detected	1.035	Mean of Detected	-0.492
SD of Detected	1.181	SD of Detected	1.581
Minimum Non-Detect	0.12	Minimum Non-Detect	-2.12
Maximum Non-Detect	0.12	Maximum Non-Detect	-2.12

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	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.199	Mean	-2.482
SD	0.482	SD	0.95
95% DL/2 (t) UCL	0.428	95% H-Stat (DL/2) UCL	0.268
Maximum Likelihood Estimate(MLE) Method	N/A	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	0.319
5% K-S Critical Value	N/A	SD	0.43

Attachment E-3
ProUCL Output for 0-8.0 feet bgs
YPG-178a Landfill

ANTIMONY (Continued)

Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.163
		95% KM (t) UCL	0.607
Assuming Gamma Distribution		95% KM (z) UCL	0.587
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	N/A
Minimum	N/A	95% KM (bootstrap t) UCL	N/A
Maximum	N/A	95% KM (BCA) UCL	N/A
Mean	N/A	95% KM (Percentile Bootstrap) UCL	N/A
Median	N/A	95% KM (Chebyshev) UCL	1.028
SD	N/A	97.5% KM (Chebyshev) UCL	1.334
k star	N/A	99% KM (Chebyshev) UCL	1.937
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	97.5% KM (Chebyshev) UCL	1.334
95% Gamma Approximate UCL (Use when n >= 40)	N/A		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Attachment E-3
ProUCL Output for 0-8.0 feet bgs
YPG-178a Landfill

COPPER

General Statistics

Number of Valid Observations	14	Number of Distinct Observations	14

Raw Statistics		**Log-transformed Statistics**	
Minimum	1.39	Minimum of Log Data	0.329
Maximum	52.9	Maximum of Log Data	3.968
Mean	9.234	Mean of log Data	1.138
Geometric Mean	3.122	SD of log Data	1.229
Median	2		
SD	18.26		
Std. Error of Mean	4.881		
Coefficient of Variation	1.978		
Skewness	2.288		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.461	Shapiro Wilk Test Statistic	0.623
Shapiro Wilk Critical Value	0.874	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**	
95% Student's-t UCL	17.88	95% H-UCL	19.71
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	15.82
95% Adjusted-CLT UCL (Chen-1995)	20.45	97.5% Chebyshev (MVUE) UCL	20.02
95% Modified-t UCL (Johnson-1978)	18.37	99% Chebyshev (MVUE) UCL	28.27
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.498	Data do not follow a Discernable Distribution (0.05)	
Theta Star	18.53		
MLE of Mean	9.234		
MLE of Standard Deviation	13.08		
nu star	13.95		
Approximate Chi Square Value (.05)	6.538	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0312	95% CLT UCL	17.26
Adjusted Chi Square Value	5.877	95% Jackknife UCL	17.88
		95% Standard Bootstrap UCL	16.98
Anderson-Darling Test Statistic	3.12	95% Bootstrap-t UCL	186.2
Anderson-Darling 5% Critical Value	0.787	95% Hall's Bootstrap UCL	149.9
Kolmogorov-Smirnov Test Statistic	0.425	95% Percentile Bootstrap UCL	16.74
Kolmogorov-Smirnov 5% Critical Value	0.24	95% BCA Bootstrap UCL	20.23
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	30.51
		97.5% Chebyshev(Mean, Sd) UCL	39.71
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	57.8
95% Approximate Gamma UCL (Use when n >= 40)	19.7		
95% Adjusted Gamma UCL (Use when n < 40)	21.92		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	30.51

Attachment E-3
ProUCL Output for 0-8.0 feet bgs
YPG-178a Landfill

LEAD

General Statistics

Number of Valid Observations	14	Number of Distinct Observations	14

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.36	Minimum of Log Data	0.859
Maximum	271	Maximum of Log Data	5.602
Mean	33.79	Mean of log Data	1.76
Geometric Mean	5.813	SD of log Data	1.533
Median	3.245		
SD	80.46		
Std. Error of Mean	21.5		
Coefficient of Variation	2.381		
Skewness	2.612		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.452	Shapiro Wilk Test Statistic	0.538
Shapiro Wilk Critical Value	0.874	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**	
95% Student's-t UCL	71.87	95% H-UCL	92.93
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	48.77
95% Adjusted-CLT UCL (Chen-1995)	85.2	97.5% Chebyshev (MVUE) UCL	62.88
95% Modified-t UCL (Johnson-1978)	74.37	99% Chebyshev (MVUE) UCL	90.59
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.344	Data do not follow a Discernable Distribution (0.05)	
Theta Star	98.18		
MLE of Mean	33.79		
MLE of Standard Deviation	57.6		
nu star	9.637		
Approximate Chi Square Value (.05)	3.716	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0312	95% CLT UCL	69.16
Adjusted Chi Square Value	3.243	95% Jackknife UCL	71.87
		95% Standard Bootstrap UCL	68.53
Anderson-Darling Test Statistic	3.676	95% Bootstrap-t UCL	4051
Anderson-Darling 5% Critical Value	0.817	95% Hall's Bootstrap UCL	3150
Kolmogorov-Smirnov Test Statistic	0.481	95% Percentile Bootstrap UCL	72.04
Kolmogorov-Smirnov 5% Critical Value	0.245	95% BCA Bootstrap UCL	83.49
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	127.5
		97.5% Chebyshev(Mean, Sd) UCL	168.1
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	247.7
95% Approximate Gamma UCL (Use when n >= 40)	87.62		
95% Adjusted Gamma UCL (Use when n < 40)	100.4		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	247.7

Attachment E-3
ProUCL Output for 0-8.0 feet bgs
YPG-178a Landfill

MECURY

General Statistics

Number of Valid Data	14	Number of Detected Data	7
Number of Distinct Detected Data	7	Number of Non-Detect Data	7
		Percent Non-Detects	50.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.0044	Minimum Detected	-5.426
Maximum Detected	0.068	Maximum Detected	-2.688
Mean of Detected	0.0154	Mean of Detected	-4.699
SD of Detected	0.0232	SD of Detected	0.916
Minimum Non-Detect	0.0029	Minimum Non-Detect	-5.843
Maximum Non-Detect	0.0036	Maximum Non-Detect	-5.627

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	7
Number treated as Detected	7
Single DL Non-Detect Percentage	50.00%

Warning: There are only 7 Detected Values in this data
Note: It should be noted that even though bootstrap may be performed on this data set
the resulting calculations may not be reliable enough to draw conclusions
It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.

UCL Statistics

Normal Distribution Test with Detected Values Only		Lognormal Distribution Test with Detected Values Only	
Shapiro Wilk Test Statistic	0.516	Shapiro Wilk Test Statistic	0.7
5% Shapiro Wilk Critical Value	0.803	5% Shapiro Wilk Critical Value	0.803
Data not Normal at 5% Significance Level		Data not Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.00858	Mean	-5.535
SD	0.0173	SD	1.069
95% DL/2 (t) UCL	0.0168	95% H-Stat (DL/2) UCL	0.0165
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-5.897
		SD in Log Scale	1.452
		Mean in Original Scale	0.0082
		SD in Original Scale	0.0175
		95% t UCL	0.0165
		95% Percentile Bootstrap UCL	0.0173
		95% BCA Bootstrap UCL	0.0225
		95% H-UCL	0.0336

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.714	Data do not follow a Discernable Distribution (0.05)	
Theta Star	0.0216		
nu star	9.993		
A-D Test Statistic	1.386	Nonparametric Statistics	
5% A-D Critical Value	0.726	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.726	Mean	0.00992
5% K-S Critical Value	0.319	SD	0.0162

Attachment E-3
ProUCL Output for 0-8.0 feet bgs
YPG-178a Landfill

MECURY (Continued)

Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.00467
		95% KM (t) UCL	0.0182
Assuming Gamma Distribution		95% KM (z) UCL	0.0176
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0174
Minimum	0.000001	95% KM (bootstrap t) UCL	0.0818
Maximum	0.068	95% KM (BCA) UCL	0.0233
Mean	0.00772	95% KM (Percentile Bootstrap) UCL	0.0189
Median	0.0022	95% KM (Chebyshev) UCL	0.0303
SD	0.0177	97.5% KM (Chebyshev) UCL	0.0391
k star	0.182	99% KM (Chebyshev) UCL	0.0564
Theta star	0.0423		
Nu star	5.106	**Potential UCLs to Use**	
AppChi2	1.202	95% KM (t) UCL	0.0182
95% Gamma Approximate UCL (Use when n >= 40)	0.0328	95% KM (% Bootstrap) UCL	0.0189
95% Adjusted Gamma UCL (Use when n < 40)	0.0406		

Attachment E-3
ProUCL Output for 0-8.0 feet bgs
YPG-178a Landfill

ZINC

General Statistics

Number of Valid Observations	14	Number of Distinct Observations	13

Raw Statistics		Log-transformed Statistics	
Minimum	7.83	Minimum of Log Data	2.058
Maximum	279	Maximum of Log Data	5.631
Mean	42.07	Mean of log Data	2.855
Geometric Mean	17.37	SD of log Data	1.117
Median	12		
SD	79.42		
Std. Error of Mean	21.23		
Coefficient of Variation	1.888		
Skewness	2.646		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.491	Shapiro Wilk Test Statistic	0.691
Shapiro Wilk Critical Value	0.874	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**	
95% Student's-t UCL	79.66	95% H-UCL	81.85
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	73.79
95% Adjusted-CLT UCL (Chen-1995)	93.02	97.5% Chebyshev (MVUE) UCL	92.57
95% Modified-t UCL (Johnson-1978)	82.16	99% Chebyshev (MVUE) UCL	129.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.586	Data do not follow a Discernable Distribution (0.05)	
Theta Star	71.77		
MLE of Mean	42.07		
MLE of Standard Deviation	54.95		
nu star	16.41		
Approximate Chi Square Value (.05)	8.254	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0312	95% CLT UCL	76.98
Adjusted Chi Square Value	7.498	95% Jackknife UCL	79.66
		95% Standard Bootstrap UCL	76.1
Anderson-Darling Test Statistic	2.621	95% Bootstrap-t UCL	567.4
Anderson-Darling 5% Critical Value	0.776	95% Hall's Bootstrap UCL	394.1
Kolmogorov-Smirnov Test Statistic	0.365	95% Percentile Bootstrap UCL	79.7
Kolmogorov-Smirnov 5% Critical Value	0.239	95% BCA Bootstrap UCL	92.46
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	134.6
		97.5% Chebyshev(Mean, Sd) UCL	174.6
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	253.3
95% Approximate Gamma UCL (Use when n >= 40)	83.65		
95% Adjusted Gamma UCL (Use when n < 40)	92.09		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	134.6

Attachment E-4
ProUCL Output for 0-0.7 feet bgs
YPG-178b Landfill

ANTIMONY

General Statistics

Number of Valid Data	10	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	9
		Percent Non-Detects	90.00%

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

The data set for variable Antimony was not processed!

Attachment E-4
ProUCL Output for 0-0.7 feet bgs
YPG-178b Landfill

LEAD

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10

Raw Statistics		Log-transformed Statistics	
Minimum	2.73	Minimum of Log Data	1.004
Maximum	5.73	Maximum of Log Data	1.746
Mean	4.045	Mean of log Data	1.364
Geometric Mean	3.91	SD of log Data	0.272
Median	3.67		
SD	1.135		
Std. Error of Mean	0.359		
Coefficient of Variation	0.281		
Skewness	0.635		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.865	Shapiro Wilk Test Statistic	0.902
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
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	4.703	95% H-UCL	4.84
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	5.565
95% Adjusted-CLT UCL (Chen-1995)	4.712	97.5% Chebyshev (MVUE) UCL	6.224
95% Modified-t UCL (Johnson-1978)	4.715	99% Chebyshev (MVUE) UCL	7.518

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	10.49	Data appear Normal at 5% Significance Level	
Theta Star	0.386		
MLE of Mean	4.045		
MLE of Standard Deviation	1.249		
nu star	209.8		
Approximate Chi Square Value (.05)	177.2	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	4.635
Adjusted Chi Square Value	172	95% Jackknife UCL	4.703
		95% Standard Bootstrap UCL	4.607
Anderson-Darling Test Statistic	0.53	95% Bootstrap-t UCL	4.838
Anderson-Darling 5% Critical Value	0.725	95% Hall's Bootstrap UCL	4.538
Kolmogorov-Smirnov Test Statistic	0.2	95% Percentile Bootstrap UCL	4.614
Kolmogorov-Smirnov 5% Critical Value	0.266	95% BCA Bootstrap UCL	4.699
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	5.61
		97.5% Chebyshev(Mean, Sd) UCL	6.287
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	7.617
95% Approximate Gamma UCL (Use when n >= 40)	4.787		
95% Adjusted Gamma UCL (Use when n < 40)	4.932		

Potential UCL to Use		Use 95% Student's-t UCL	4.703

Attachment E-4
ProUCL Output for 0-0.7 feet bgs
YPG-178b Landfill

MERCURY

General Statistics

Number of Valid Data	10	Number of Detected Data	1
Number of Distinct Detected Data	1	Number of Non-Detect Data	9
		Percent Non-Detects	90.00%

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

Attachment E-4
ProUCL Output for 0-0.7 feet bgs
YPG-178b Landfill

ZINC

General Statistics

Number of Valid Observations	10	Number of Distinct Observations	10

Raw Statistics		Log-transformed Statistics	
Minimum	11.5	Minimum of Log Data	2.442
Maximum	22.8	Maximum of Log Data	3.127
Mean	15.44	Mean of log Data	2.711
Geometric Mean	15.05	SD of log Data	0.234
Median	14.05		
SD	3.873		
Std. Error of Mean	1.225		
Coefficient of Variation	0.251		
Skewness	1.072		

Relevant UCL Statistics

Normal Distribution Test		Lognormal Distribution Test	
Shapiro Wilk Test Statistic	0.862	Shapiro Wilk Test Statistic	0.9
Shapiro Wilk Critical Value	0.842	Shapiro Wilk Critical Value	0.842
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	17.69	95% H-UCL	17.95
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	20.41
95% Adjusted-CLT UCL (Chen-1995)	17.9	97.5% Chebyshev (MVUE) UCL	22.57
95% Modified-t UCL (Johnson-1978)	17.75	99% Chebyshev (MVUE) UCL	26.82

Gamma Distribution Test		Data Distribution	
k star (bias corrected)	13.76	Data appear Normal at 5% Significance Level	
Theta Star	1.122		
MLE of Mean	15.44		
MLE of Standard Deviation	4.162		
nu star	275.2		
Approximate Chi Square Value (.05)	237.8	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0267	95% CLT UCL	17.45
Adjusted Chi Square Value	231.8	95% Jackknife UCL	17.69
		95% Standard Bootstrap UCL	17.39
Anderson-Darling Test Statistic	0.545	95% Bootstrap-t UCL	18.72
Anderson-Darling 5% Critical Value	0.725	95% Hall's Bootstrap UCL	18.12
Kolmogorov-Smirnov Test Statistic	0.202	95% Percentile Bootstrap UCL	17.5
Kolmogorov-Smirnov 5% Critical Value	0.266	95% BCA Bootstrap UCL	17.83
Data appear Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	20.78
		97.5% Chebyshev(Mean, Sd) UCL	23.09
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	27.63
95% Approximate Gamma UCL (Use when n >= 40)	17.87		
95% Adjusted Gamma UCL (Use when n < 40)	18.34		
Potential UCL to Use		Use 95% Student's-t UCL	17.69

Attachment E-5
ProUCL Output for 0-5.5 feet bgs
YPG-178b Landfill

ANTIMONY

General Statistics

Number of Valid Data	15	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	12
		Percent Non-Detects	80.00%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.16	Minimum Detected	-1.833
Maximum Detected	4.34	Maximum Detected	1.468
Mean of Detected	2.063	Mean of Detected	0.0533
SD of Detected	2.115	SD of Detected	1.7
Minimum Non-Detect	0.12	Minimum Non-Detect	-2.12
Maximum Non-Detect	0.12	Maximum Non-Detect	-2.12

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	0.977	Shapiro Wilk Test Statistic	0.942
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.461	Mean	-2.24
SD	1.152	SD	1.35
95% DL/2 (t) UCL	0.985	95% H-Stat (DL/2) UCL	0.883
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-6.767
		SD in Log Scale	4.734
		Mean in Original Scale	0.416
		SD in Original Scale	1.169
		95% t UCL	0.948
		95% Percentile Bootstrap UCL	0.934
		95% BCA Bootstrap UCL	1.271
		95% H-UCL	32153610

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	0.541
5% K-S Critical Value	N/A	SD	1.084
Data not Gamma Distributed at 5% Significance Level		SE of Mean	0.343
		95% KM (t) UCL	1.145
Assuming Gamma Distribution		95% KM (z) UCL	1.105
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.578
Minimum	N/A	95% KM (bootstrap t) UCL	1.381

Attachment E-5
ProUCL Output for 0-5.5 feet bgs
YPG-178b Landfill

ANTIMONY (Continued)			
Maximum	N/A	95% KM (BCA) UCL	4.34
Mean	N/A	95% KM (Percentile Bootstrap) UCL	4.34
Median	N/A	95% KM (Chebyshev) UCL	2.035
SD	N/A	97.5% KM (Chebyshev) UCL	2.682
k star	N/A	99% KM (Chebyshev) UCL	3.953
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	1.145
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	4.34
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Attachment E-5
ProUCL Output for 0-5.5 feet bgs
YPG-178b Landfill

LEAD

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	15

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.73	Minimum of Log Data	1.004
Maximum	203	Maximum of Log Data	5.313
Mean	44.99	Mean of log Data	2.333
Geometric Mean	10.31	SD of log Data	1.704
Median	4.1		
SD	72.97		
Std. Error of Mean	18.84		
Coefficient of Variation	1.622		
Skewness	1.42		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.625	Shapiro Wilk Test Statistic	0.69
Shapiro Wilk Critical Value	0.881	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**	
95% Student's-t UCL	78.18	95% H-UCL	271.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	116.5
95% Adjusted-CLT UCL (Chen-1995)	83.36	97.5% Chebyshev (MVUE) UCL	151.1
95% Modified-t UCL (Johnson-1978)	79.33	99% Chebyshev (MVUE) UCL	219.2
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.396	Data do not follow a Discernable Distribution (0.05)	
Theta Star	113.5		
MLE of Mean	44.99		
MLE of Standard Deviation	71.46		
nu star	11.89		
Approximate Chi Square Value (.05)	5.155	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	75.98
Adjusted Chi Square Value	4.62	95% Jackknife UCL	78.18
		95% Standard Bootstrap UCL	74.42
Anderson-Darling Test Statistic	2.54	95% Bootstrap-t UCL	93.69
Anderson-Darling 5% Critical Value	0.806	95% Hall's Bootstrap UCL	71.37
Kolmogorov-Smirnov Test Statistic	0.421	95% Percentile Bootstrap UCL	76.57
Kolmogorov-Smirnov 5% Critical Value	0.236	95% BCA Bootstrap UCL	80.01
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	127.1
		97.5% Chebyshev(Mean, Sd) UCL	162.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	232.5
95% Approximate Gamma UCL (Use when n >= 40)	103.8		
95% Adjusted Gamma UCL (Use when n < 40)	115.8		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	232.5

Attachment E-5
ProUCL Output for 0-5.5 feet bgs
YPG-178b Landfill

MERCURY

General Statistics

Number of Valid Data	15	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	11
		Percent Non-Detects	73.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	0.093	Maximum Detected	-2.375
Mean of Detected	0.0345	Mean of Detected	-3.77
SD of Detected	0.0392	SD of Detected	0.968
Minimum Non-Detect	0.0029	Minimum Non-Detect	-5.843
Maximum Non-Detect	0.0035	Maximum Non-Detect	-5.655

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	11
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	4
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	73.33%

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	0.719	Shapiro Wilk Test Statistic	0.866
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	
Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.0104	Mean	-5.683
SD	0.0235	SD	1.276
95% DL/2 (t) UCL	0.0212	95% H-Stat (DL/2) UCL	0.023
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-6.75
		SD in Log Scale	2.218
		Mean in Original Scale	0.00976
		SD in Original Scale	0.0238
		95% t UCL	0.0206
		95% Percentile Bootstrap UCL	0.0209
		95% BCA Bootstrap UCL	0.0295
		95% H-UCL	0.265

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only	
k star (bias corrected)	0.513	Data appear Gamma Distributed at 5% Significance Level	
Theta Star	0.0673		
nu star	4.101		
A-D Test Statistic	0.561	**Nonparametric Statistics**	
5% A-D Critical Value	0.663	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.663	Mean	0.0165
5% K-S Critical Value	0.4	SD	0.0206
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.00614
		95% KM (t) UCL	0.0274
Assuming Gamma Distribution		95% KM (z) UCL	0.0266
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.025
Minimum	0.000001	95% KM (bootstrap t) UCL	0.0602
Maximum	0.093	95% KM (BCA) UCL	0.0338

Attachment E-5
ProUCL Output for 0-5.5 feet bgs
YPG-178b Landfill

MERCURY (Continued)			
Mean	0.0092	95% KM (Percentile Bootstrap) UCL	0.0338
Median	0.000001	95% KM (Chebyshev) UCL	0.0433
SD	0.024	97.5% KM (Chebyshev) UCL	0.0549
k star	0.143	99% KM (Chebyshev) UCL	0.0776
Theta star	0.0645		
Nu star	4.276	**Potential UCLs to Use**	
AppChi2	0.834	95% KM (t) UCL	0.0274
95% Gamma Approximate UCL (Use when n >= 40)	0.0472		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Attachment E-5
ProUCL Output for 0-5.5 feet bgs
YPG-178b Landfill

ZINC

General Statistics

Number of Valid Observations	15	Number of Distinct Observations	15

Raw Statistics		**Log-transformed Statistics**	
Minimum	10.6	Minimum of Log Data	2.361
Maximum	1060	Maximum of Log Data	6.966
Mean	149.1	Mean of log Data	3.565
Geometric Mean	35.33	SD of log Data	1.583
Median	15.3		
SD	295.6		
Std. Error of Mean	76.34		
Coefficient of Variation	1.982		
Skewness	2.567		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.553	Shapiro Wilk Test Statistic	0.724
Shapiro Wilk Critical Value	0.881	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**	
95% Student's-t UCL	283.6	95% H-UCL	608.7
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	321.6
95% Adjusted-CLT UCL (Chen-1995)	328.8	97.5% Chebyshev (MVUE) UCL	415
95% Modified-t UCL (Johnson-1978)	292	99% Chebyshev (MVUE) UCL	598.5
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.403	Data do not follow a Discernable Distribution (0.05)	
Theta Star	369.7		
MLE of Mean	149.1		
MLE of Standard Deviation	234.8		
nu star	12.1		
Approximate Chi Square Value (.05)	5.293	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0324	95% CLT UCL	274.7
Adjusted Chi Square Value	4.75	95% Jackknife UCL	283.6
		95% Standard Bootstrap UCL	271.9
Anderson-Darling Test Statistic	2.34	95% Bootstrap-t UCL	613.2
Anderson-Darling 5% Critical Value	0.804	95% Hall's Bootstrap UCL	739.3
Kolmogorov-Smirnov Test Statistic	0.401	95% Percentile Bootstrap UCL	282.8
Kolmogorov-Smirnov 5% Critical Value	0.235	95% BCA Bootstrap UCL	334.8
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	481.9
		97.5% Chebyshev(Mean, Sd) UCL	625.8
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	908.7
95% Approximate Gamma UCL (Use when n >= 40)	340.9		
95% Adjusted Gamma UCL (Use when n < 40)	379.9		
Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	908.7

Attachment E-6
ProUCL Output for 0-8.0 feet bgs
YPG-178b Landfill

ANTIMONY

General Statistics

Number of Valid Data	18	Number of Detected Data	3
Number of Distinct Detected Data	3	Number of Non-Detect Data	15
		Percent Non-Detects	83.33%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.16	Minimum Detected	-1.833
Maximum Detected	4.34	Maximum Detected	1.468
Mean of Detected	2.063	Mean of Detected	0.0533
SD of Detected	2.115	SD of Detected	1.7
Minimum Non-Detect	0.12	Minimum Non-Detect	-2.12
Maximum Non-Detect	0.12	Maximum Non-Detect	-2.12

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	0.977	Shapiro Wilk Test Statistic	0.942
5% Shapiro Wilk Critical Value	0.767	5% Shapiro Wilk Critical Value	0.767
Data appear Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.394	Mean	-2.336
SD	1.057	SD	1.244
95% DL/2 (t) UCL	0.827	95% H-Stat (DL/2) UCL	0.521
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-7.627
		SD in Log Scale	4.993
		Mean in Original Scale	0.347
		SD in Original Scale	1.072
		95% t UCL	0.787
		95% Percentile Bootstrap UCL	0.818
		95% BCA Bootstrap UCL	1.072
		95% H-UCL	23793566

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 0.477
5% K-S Critical Value	N/A	SD 1
Data not Gamma Distributed at 5% Significance Level		SE of Mean 0.289
		95% KM (t) UCL 0.979

Attachment E-6
ProUCL Output for 0-8.0 feet bgs
YPG-178b Landfill

ANTIMONY (Continued)			
Assuming Gamma Distribution		95% KM (z) UCL	0.952
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.492
Minimum	N/A	95% KM (bootstrap t) UCL	0.813
Maximum	N/A	95% KM (BCA) UCL	4.34
Mean	N/A	95% KM (Percentile Bootstrap) UCL	4.34
Median	N/A	95% KM (Chebyshev) UCL	1.736
SD	N/A	97.5% KM (Chebyshev) UCL	2.28
k star	N/A	99% KM (Chebyshev) UCL	3.35
Theta star	N/A		
Nu star	N/A	**Potential UCLs to Use**	
AppChi2	N/A	95% KM (t) UCL	0.979
95% Gamma Approximate UCL (Use when n >= 40)	N/A	95% KM (Percentile Bootstrap) UCL	4.34
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Attachment E-6
ProUCL Output for 0-8.0 feet bgs
YPG-178b Landfill

LEAD

General Statistics

Number of Valid Observations	18	Number of Distinct Observations	18

Raw Statistics		**Log-transformed Statistics**	
Minimum	2.73	Minimum of Log Data	1.004
Maximum	203	Maximum of Log Data	5.313
Mean	38.08	Mean of log Data	2.152
Geometric Mean	8.598	SD of log Data	1.604
Median	3.925		
SD	68.1		
Std. Error of Mean	16.05		
Coefficient of Variation	1.788		
Skewness	1.701		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.572	Shapiro Wilk Test Statistic	0.654
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
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	66.01	95% H-UCL	126.9
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	80.01
95% Adjusted-CLT UCL (Chen-1995)	71.36	97.5% Chebyshev (MVUE) UCL	102.9
95% Modified-t UCL (Johnson-1978)	67.08	99% Chebyshev (MVUE) UCL	147.9

Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.4	Data do not follow a Discernable Distribution (0.05)	
Theta Star	95.1		
MLE of Mean	38.08		
MLE of Standard Deviation	60.18		
nu star	14.42		
Approximate Chi Square Value (.05)	6.857	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	64.48
Adjusted Chi Square Value	6.362	95% Jackknife UCL	66.01
		95% Standard Bootstrap UCL	63.23
Anderson-Darling Test Statistic	3.461	95% Bootstrap-t UCL	79.37
Anderson-Darling 5% Critical Value	0.814	95% Hall's Bootstrap UCL	61.2
Kolmogorov-Smirnov Test Statistic	0.44	95% Percentile Bootstrap UCL	64.19
Kolmogorov-Smirnov 5% Critical Value	0.217	95% BCA Bootstrap UCL	72.59
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	108
		97.5% Chebyshev(Mean, Sd) UCL	138.3
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	197.8
95% Approximate Gamma UCL (Use when n >= 40)	80.06		
95% Adjusted Gamma UCL (Use when n < 40)	86.3		

Potential UCL to Use		Use 99% Chebyshev (Mean, Sd) UCL	197.8

Attachment E-6
ProUCL Output for 0-8.0 feet bgs
YPG-178b Landfill

MERCURY

General Statistics

Number of Valid Data	18	Number of Detected Data	4
Number of Distinct Detected Data	4	Number of Non-Detect Data	14
		Percent Non-Detects	77.78%

Raw Statistics		Log-transformed Statistics	
Minimum Detected	0.01	Minimum Detected	-4.605
Maximum Detected	0.093	Maximum Detected	-2.375
Mean of Detected	0.0345	Mean of Detected	-3.77
SD of Detected	0.0392	SD of Detected	0.968
Minimum Non-Detect	0.0029	Minimum Non-Detect	-5.843
Maximum Non-Detect	0.0035	Maximum Non-Detect	-5.655

Note: Data have multiple DLs - Use of KM Method is recommended	Number treated as Non-Detect	14
For all methods (except KM, DL/2, and ROS Methods),	Number treated as Detected	4
Observations < Largest ND are treated as NDs	Single DL Non-Detect Percentage	77.78%

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	0.719	Shapiro Wilk Test Statistic	0.866
5% Shapiro Wilk Critical Value	0.748	5% Shapiro Wilk Critical Value	0.748
Data not Normal at 5% Significance Level		Data appear Lognormal at 5% Significance Level	

Assuming Normal Distribution		Assuming Lognormal Distribution	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.009	Mean	-5.794
SD	0.0216	SD	1.186
95% DL/2 (t) UCL	0.0179	95% H-Stat (DL/2) UCL	0.0143
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE yields a negative mean		Mean in Log Scale	-7.218
		SD in Log Scale	2.373
		Mean in Original Scale	0.00818
		SD in Original Scale	0.0219
		95% t UCL	0.0172
		95% Percentile Bootstrap UCL	0.018
		95% BCA Bootstrap UCL	0.0233
		95% H-UCL	0.218

Gamma Distribution Test with Detected Values Only		Data Distribution Test with Detected Values Only
k star (bias corrected)	0.513	Data appear Gamma Distributed at 5% Significance Level
Theta Star	0.0673	
nu star	4.101	
A-D Test Statistic	0.561	**Nonparametric Statistics**
5% A-D Critical Value	0.663	Kaplan-Meier (KM) Method
K-S Test Statistic	0.663	Mean 0.0154
5% K-S Critical Value	0.4	SD 0.019
Data appear Gamma Distributed at 5% Significance Level		SE of Mean 0.00516
		95% KM (t) UCL 0.0244
Assuming Gamma Distribution		95% KM (z) UCL 0.0239

Attachment E-6
ProUCL Output for 0-8.0 feet bgs
YPG-178b Landfill

MERCURY (Continued)			
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.0226
Minimum	0.000001	95% KM (bootstrap t) UCL	0.0517
Maximum	0.093	95% KM (BCA) UCL	0.093
Mean	0.00767	95% KM (Percentile Bootstrap) UCL	0.0299
Median	0.000001	95% KM (Chebyshev) UCL	0.0379
SD	0.0221	97.5% KM (Chebyshev) UCL	0.0477
k star	0.136	99% KM (Chebyshev) UCL	0.0668
Theta star	0.0565		
Nu star	4.884	**Potential UCLs to Use**	
AppChi2	1.099	95% KM (t) UCL	0.0244
95% Gamma Approximate UCL (Use when n >= 40)	0.0341		
95% Adjusted Gamma UCL (Use when n < 40)	N/A		

Attachment E-6
ProUCL Output for 0-8.0 feet bgs
YPG-178b Landfill

ZINC

General Statistics

Number of Valid Observations	18	Number of Distinct Observations	17

Raw Statistics		**Log-transformed Statistics**	
Minimum	10.6	Minimum of Log Data	2.361
Maximum	1060	Maximum of Log Data	6.966
Mean	126.3	Mean of log Data	3.384
Geometric Mean	29.48	SD of log Data	1.496
Median	14.05		
SD	273.4		
Std. Error of Mean	64.44		
Coefficient of Variation	2.165		
Skewness	2.864		

Relevant UCL Statistics

Normal Distribution Test		**Lognormal Distribution Test**	
Shapiro Wilk Test Statistic	0.5	Shapiro Wilk Test Statistic	0.673
Shapiro Wilk Critical Value	0.897	Shapiro Wilk Critical Value	0.897
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	238.4	95% H-UCL	313
95% UCLs (Adjusted for Skewness)		95% Chebyshev (MVUE) UCL	226
95% Adjusted-CLT UCL (Chen-1995)	278.7	97.5% Chebyshev (MVUE) UCL	289
95% Modified-t UCL (Johnson-1978)	245.6	99% Chebyshev (MVUE) UCL	412.7
Gamma Distribution Test		**Data Distribution**	
k star (bias corrected)	0.408	Data do not follow a Discernable Distribution (0.05)	
Theta Star	309.7		
MLE of Mean	126.3		
MLE of Standard Deviation	197.8		
nu star	14.68		
Approximate Chi Square Value (.05)	7.037	**Nonparametric Statistics**	
Adjusted Level of Significance	0.0357	95% CLT UCL	232.3
Adjusted Chi Square Value	6.534	95% Jackknife UCL	238.4
		95% Standard Bootstrap UCL	226.9
Anderson-Darling Test Statistic	3.314	95% Bootstrap-t UCL	520.4
Anderson-Darling 5% Critical Value	0.812	95% Hall's Bootstrap UCL	586.1
Kolmogorov-Smirnov Test Statistic	0.419	95% Percentile Bootstrap UCL	240.8
Kolmogorov-Smirnov 5% Critical Value	0.217	95% BCA Bootstrap UCL	281.1
Data not Gamma Distributed at 5% Significance Level		95% Chebyshev(Mean, Sd) UCL	407.2
		97.5% Chebyshev(Mean, Sd) UCL	528.7
Assuming Gamma Distribution		99% Chebyshev(Mean, Sd) UCL	767.5
95% Approximate Gamma UCL (Use when n >= 40)	263.3		
95% Adjusted Gamma UCL (Use when n < 40)	283.6		
Potential UCL to Use		Use 95% Chebyshev (Mean, Sd) UCL	407.2

APPENDIX F

REMOVAL ACTION PHOTOGRAPHS

APPENDIX F – REMOVAL ACTION PHOTOGRAPHS

Photograph F-1
YPG-178a – Ash/Debris Area #1 – Debris on Surface Prior to Removal

Photograph F-2
YPG-178a – Ash/Debris Area #1 – Debris Extending into Hillside

APPENDIX F – REMOVAL ACTION PHOTOGRAPHS

Photograph F-3
YPG-178a – Ash/Debris Area #2 – Removal of Ash and Debris

Photograph F-4
YPG-178a – Ash/Debris Area #2 – Ash/Debris Extending into Hillside

APPENDIX F – REMOVAL ACTION PHOTOGRAPHS

Photograph F-5
YPG 178a – Ash/Debris Area #3 – Ash and Debris on Surface Prior to Removal

Photograph F-6
YPG-178a – Ash/Debris Area #3 – Area Cleared and Staked for Soil Sampling

APPENDIX F – REMOVAL ACTION PHOTOGRAPHS

Photograph F-7
YPG 178a – Ash/Debris Area #4 – Ash and Debris on Surface Prior to Removal

Photograph F-8
YPG-178a – Ash/Debris Area #4 – Area Cleared and Staked for Soil Sampling

APPENDIX F – REMOVAL ACTION PHOTOGRAPHS

Photograph F-9
YPG-178b – Ash/Debris Area #5 – Mound of Ash/Debris Prior to Removal

Photograph F-10
YPG-178b – Ash/Debris Area #5 – Removal of Ash and Debris

APPENDIX F – REMOVAL ACTION PHOTOGRAPHS

Photograph F-11
YPG-178b – Ash/Debris Area #6 – Ash and Debris (not removed)

Photograph F-12
YPG-178b – Ash/Debris Area #6 – Beneath 55-Gallon Drum (ash/debris not removed)

APPENDIX F – REMOVAL ACTION PHOTOGRAPHS

Photograph F-13
YPG-178b – Ash/Debris Area #7 – Ash and Debris on Surface Prior to Removal

Photograph F-14
YPG-178b – Ash/Debris Area #7 – Area Cleared of Ash and Debris