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Date: NOV 2 5 2009
Refer To: EP2009-0621

Mr. Lawrence E. Starfield, Acting Regional Administrator
Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Subject: Report on the Risk-based Polychlorinated Biphenyl Cleanup of the Septic Tank Area at Solid Waste Management Unit 21-024(c)

Dear Mr. Starfield:

Enclosed for your review is the Los Alamos National Laboratory's (the Laboratory's) report on the risk-based polychlorinated biphenyl cleanup of the septic tank area at Solid Waste Management Unit 21-024(c).

If you have any questions, please contact Mark Thacker at (505) 699-1963 (mthacker@lanl.gov) or Woody Woodworth at (505) 665-5820 (lwoodworth@doeal.gov).

Sincerely,

Michael J. Graham, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

David R. Gregory, Project Director
Environmental Operations
Los Alamos Site Office

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Enclosures: Two hard copies with electronic files – Report on the risk-based polychlorinated biphenyl cleanup of the septic tank area at Solid Waste Management Unit 21-024(c) (LA-UR-09-7545)

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LA-UR-09-7545
November 2009
EP2009-0621

Risk-Based Polychlorinated Biphenyl Cleanup of the Septic Tank Area at Solid Waste Management Unit 21-024(c)

Prepared by the Environmental Programs Directorate

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1.0 INTRODUCTION

This report presents the polychlorinated biphenyl- (PCB) contaminated soil investigation results and risk-based cleanup activities at Solid Waste Management Unit (SWMU) 21-024(c), which is a septic system consisting of a septic tank, inlet and outlet drainlines, and an outfall area, located within Technical Area 21 (TA-21) at Los Alamos National Laboratory (LANL or Laboratory) (Figure 1).

2.0 FIELD ACTIVITIES

The PCB-contaminated former septic tank area was described in the risk-based application dated March 2009 (LANL 2009, 105184) and had been previously excavated to 4 ft below ground surface (bgs) during site investigations in 2006 (LANL 2008, 102760). Following U.S. Environmental Protection Agency (EPA) approval of the risk-based application, the Laboratory removed approximately 25 yd^3 of soil from under and around the former septic tank area in August 2009. As planned in the EPA-approved, risk-based application, the excavation was continued to 10 ft bgs under the former septic tank. The PCB-contaminated soil was placed into appropriate containers for shipping and disposal at the Energy Solutions disposal facility in Clive, Utah.

As outlined in the approved EPA application and resulting conditions for approval, samples were collected from the bottom and sidewall of the excavation area and analyzed for PCBs using EPA Method 8082 from LANL's analytical statement of work (LANL 2000, 071233). Samples were collected from one depth at the bottom of the excavation area (locations 21-605617, 21-605618, and 21-605619) (Figure 2). A sample was collected from one depth at the sidewall of the excavation area along the south side (location 21-605620). No staining was observed; therefore, no additional samples were collected.

Total PCBs are derived by adding the different detected Aroclor congener concentrations by depth at each location. In 2007, total PCBs were detected at 4.14 mg/kg under the center of the septic tank excavation area (location 21-25748) (Table 1 and Figure 2). Consequently, in 2009, two additional samples were collected from under the center of the septic tank at depths of 19 to 20 ft and 26 to 27 ft bgs (location 21-25748) and analyzed for PCBs to define the vertical extent of contamination (Figure 2).

The 2009 sample results from these five locations were either non-detect or less than 1 mg/kg total PCBs. Sampling from the bottom of the excavation area (10 ft bgs) resulted in total PCB concentrations of 0.255 mg/kg, 0.47 mg/kg, and 0.59 mg/kg (locations 21-605617, 21-605618, and 21-605619, respectively) (Table 1 and Figure 2). The sidewall sample resulted in 0.216 mg/kg total PCBs. After PCB results determined concentrations at the bottom of the excavation to be less than 1 mg/kg, the excavation area was backfilled with clean fill from a known source that had been sampled and determined to be clean by the Laboratory. Deeper sampling from under the septic tank (location 21-25748) did not detect PCBs (Table 1 and Figure 2). Therefore, the extent of PCBs is defined under the former septic tank.

3.0 RISK-BASED CLEANUP RESULTS

As presented in the risk-based application, a total PCB concentration greater than 1 mg/kg is still present at 14 to 15 ft bgs (4.14 mg/kg total PCBs comprised of Aroclor-1254 and Aroclor-1260) under the center of the septic tank excavation area (location 21-25748) (Table 1 and Figure 2). However, the extent of the total PCB concentration is limited as the deeper sample from 19 to 20 ft bgs did not detect any Aroclors. The area is sloped towards Los Alamos Canyon and is currently fenced to prohibit trespassing. In addition, the area is within 35 ft of the mesa edge and not suitable for sub-slab construction. The

proposed future land use for this area is industrial. Therefore, there is no complete pathway for exposure to PCBs at 14 ft bgs.

For risk estimation purposes, ProUCL Version 4.00.04 (EPA 2009, 106601) was used to determine the exposure concentrations (the 95% upper confidence level [UCL] of the mean) at the septic tank area. Table 2 is the statistical analysis output and UCL determination generated by ProUCL. All detected Aroclors at the former septic tank area were considered in the risk screening presented below regardless of the depth detected. The potential risk to human health from exposure to the Aroclors still present within the former septic tank area is calculated below.

Using the EPA regional screening level (RSL), the potential risk to human health from exposure to the Aroclors still present within the former septic tank area using the industrial scenario is estimated as follows:

- Industrial EPA RSL (http://www.epa.gov/region6/6pd/rcra_c/pd-n/screen.htm) = 0.74 mg/kg for Aroclor-1254 and Aroclor-1260 based on a 10^{-6} cancer risk is:
    - Industrial risk from Aroclor-1254 = 3.2×10^{-6}:
      [2.39 mg/kg UCL (Table 2) ÷ 0.74 mg/kg x 10^{-6} = 3.2×10^{-6}]
    - Industrial worker risk from Aroclor-1260 = 1.3×10^{-6}:
      [0.98 mg/kg UCL (Table 2) ÷ 0.74 mg/kg x 10^{-6} = 1.3×10^{-6}]
    - Estimated total risk using EPA industrial RSL = **4.5×10^{-6}**

For comparison purposes, the New Mexico Environment Department (NMED) industrial scenario is estimated as follows:

- Industrial NMED soil screening level (SSL) = 8.26 mg/kg (NMED 2009, 106420) for Aroclor-1254 and Aroclor-1260 based on a 10^{-5} cancer risk is:
    - Industrial risk from Aroclor-1254 = 2.9×10^{-6}
      [2.39 mg/kg UCL (Table 2) ÷ 8.26 mg/kg x 10^{-5} = 2.9×10^{-6}]
    - Industrial worker risk from Aroclor-1260 = 1.2×10^{-6}
      [0.98 mg/kg UCL (Table 2) ÷ 8.26 mg/kg x 10^{-5} = 1.2×10^{-6}]
    - Estimated total risk using NMED industrial SSL = **4.1×10^{-6}**

Potential risks estimated using the EPA RSL or NMED SSL are within the upper end of the EPA target risk range of 10^{-4} to 10^{-6} and below the NMED target risk level of 1×10^{-5} (NMED 2009, 106420), respectively. It is also highly unlikely for an industrial worker to be exposed to concentrations at 14 to 15 ft bgs only within former septic tank area for either 225 d per yr for 25 yr per NMED exposure assumptions (NMED 2009, 106420) or 250 d per yr for 25 yr per EPA exposure assumptions (http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm). The potential risk calculated above is, therefore, overestimated for a worker.

A risk screening assessment of the entire SWMU will be performed and included in the DP Site Aggregate Area Phase II Investigation Report to be submitted in April 2010. This risk screening assessment will utilize all available PCB data from the entire SWMU, which incorporates a 30-times larger area (0.003 ac for the septic tank excavation area compared to 0.09 ac for the SWMU as a whole). This will provide a more comprehensive estimate of risk from exposure to PCBs still present at the site.

4.0 CONCLUSIONS

The Laboratory performed the work outlined in the application submitted in March 2009 (LANL 2009, 105184) and approved by the EPA on April 22, 2009 (EPA 2009, 107326). A risk-based evaluation to justify leaving a total PCB concentration of 4.14 mg/kg at 14 to 15 ft bgs was performed. The results indicate the estimated risk is less than the NMED target risk level and within the upper end of EPA's target risk range. The Laboratory recommends the septic tank area at SWMU 21-024(c) for no further action.

5.0 REFERENCES

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

EPA (U.S. Environmental Protection Agency), February 2009. "ProUCL Version 4.00.04 User Guide (Draft)," EPA/600/R-07/038, Office of Research and Development, Washington, D.C. (EPA 2009, 106601)

EPA (U.S. Environmental Protection Agency), April 22, 2009. "Approval with Conditions for the PCB Risk-Based Disposal (40 CFR 761.61(c)) for the Septic Tank Area at Solid Waste Management Unit 21-024(c) at Los Alamos National Laboratory (LANL)," U.S. Environmental Protection Agency letter to D.R. Gregory (DOE-LASO) and M.J. Graham (LANL) from C.E. Edlund (EPA Region 6), Dallas, Texas. (EPA 2009, 107326)

LANL (Los Alamos National Laboratory), December 2000. "University of California, Los Alamos National Laboratory (LANL), I8980SOW0-8S, Statement of Work for Analytical Laboratories," Rev. 1, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2000, 071233)

LANL (Los Alamos National Laboratory), March 2008. "Delta Prime Site Aggregate Area Investigation Report, Revision 1," Los Alamos National Laboratory document LA-UR-08-1834, Los Alamos, New Mexico. (LANL 2008, 102760)

LANL (Los Alamos National Laboratory), March 2009. "Application for Risk-Based Disposal Approval for the Septic Tank Area at Solid Waste Management Unit 21-024(c)," Los Alamos National Laboratory document LA-UR-09-1668, Los Alamos, New Mexico. (LANL 2009, 105184)

NMED (New Mexico Environment Department), August 2009. "Technical Background Document for Development of Soil Screening Levels, Revision 5.0," New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 106420)

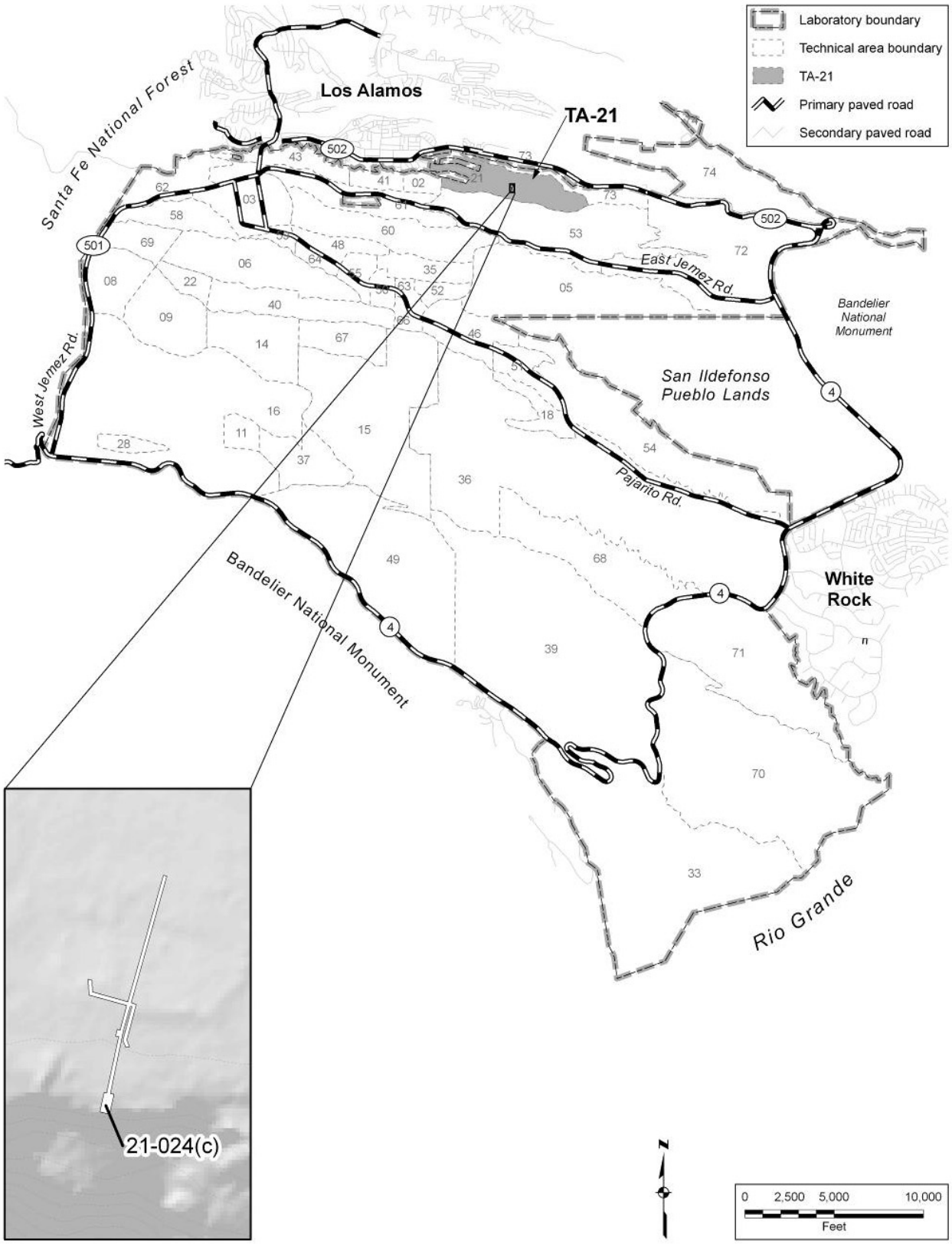

Figure 1 Location of SWMU 21-24(c) within TA-21 at LANL

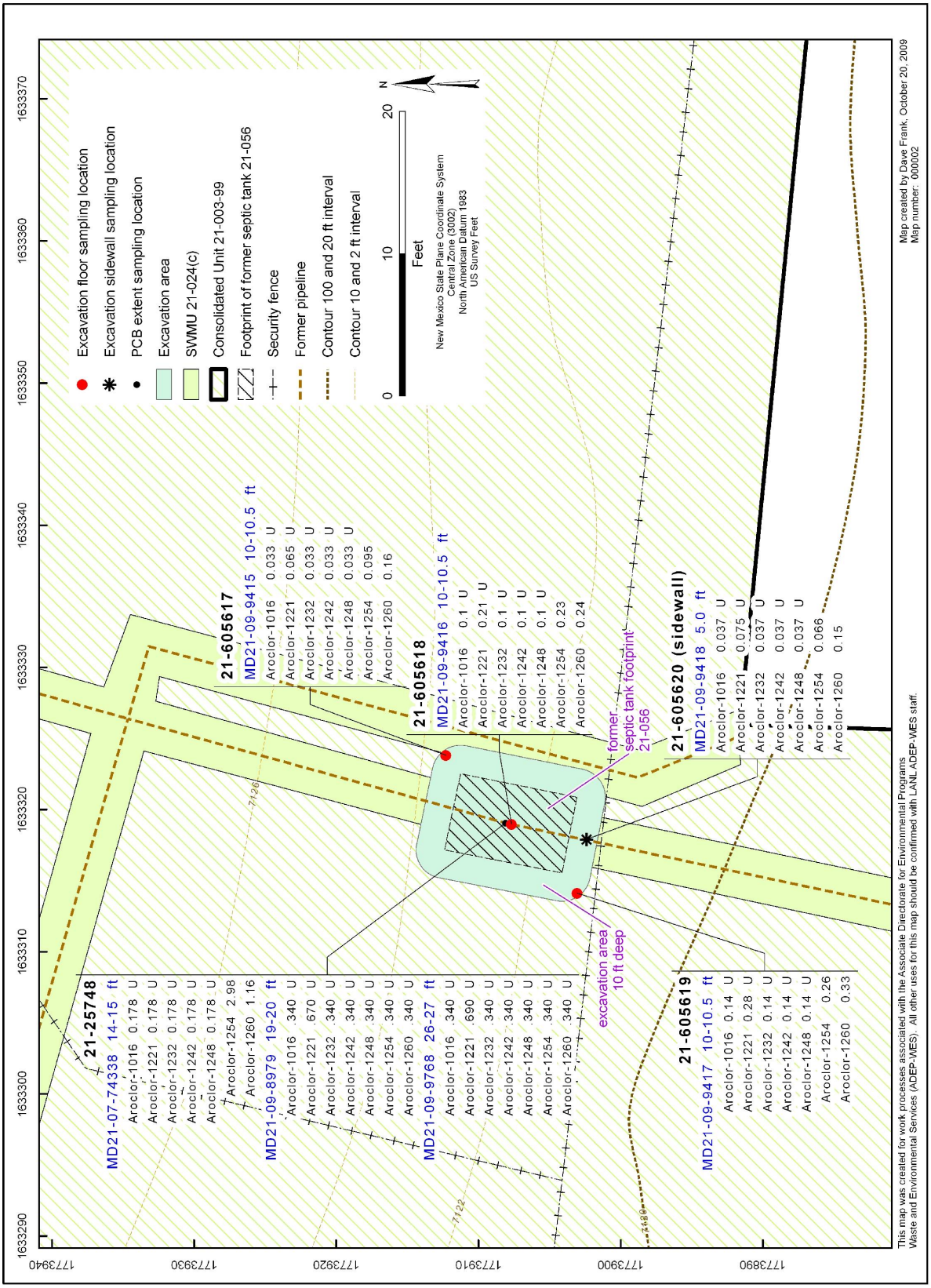

Figure 2 PCB concentrations at SWMU 21-024(c) former septic tank area

Table 1
PCB Concentrations Remaining at SWMU 21-024(c) Former Septic Tank Area

Location	Sample ID	Aroclor	Result (mg/kg)	Qualifier	Top Depth (ft bgs)	Date Collected
21-25748	MD21-07-74338	Aroclor-1016	0.178	U[a]	14–15	04/12/2007
21-25748	MD21-07-74338	Aroclor-1221	0.178	U	14–15	04/12/2007
21-25748	MD21-07-74338	Aroclor-1232	0.178	U	14–15	04/12/2007
21-25748	MD21-07-74338	Aroclor-1242	0.178	U	14–15	04/12/2007
21-25748	MD21-07-74338	Aroclor-1248	0.178	U	14–15	04/12/2007
21-25748	MD21-07-74338	Aroclor-1254	**2.98**[b]	—[c]	14–15	04/12/2007
21-25748	MD21-07-74338	Aroclor-1260	**1.16**	—	14–15	04/12/2007
21-25748	MD21-09-8979	Aroclor-1016	0.340	U	19–20	06/28/2009
21-25748	MD21-09-8979	Aroclor-1221	0.670	U	19–20	06/28/2009
21-25748	MD21-09-8979	Aroclor-1232	0.340	U	19–20	06/28/2009
21-25748	MD21-09-8979	Aroclor-1242	0.340	U	19–20	06/28/2009
21-25748	MD21-09-8979	Aroclor-1248	0.340	U	19–20	06/28/2009
21-25748	MD21-09-8979	Aroclor-1254	0.340	U	19–20	06/28/2009
21-25748	MD21-09-8979	Aroclor-1260	0.340	U	19–20	06/28/2009
21-25748	MD21-09-9768	Aroclor-1016	0.340	U	26–27	06/28/2009
21-25748	MD21-09-9768	Aroclor-1221	0.690	U	26–27	06/28/2009
21-25748	MD21-09-9768	Aroclor-1232	0.340	U	26–27	06/28/2009
21-25748	MD21-09-9768	Aroclor-1242	0.340	U	26–27	06/28/2009
21-25748	MD21-09-9768	Aroclor-1248	0.340	U	26–27	06/28/2009
21-25748	MD21-09-9768	Aroclor-1254	0.340	U	26–27	06/28/2009
21-25748	MD21-09-9768	Aroclor-1260	0.340	U	26–27	06/28/2009
21-605617	MD21-09-9415	Aroclor-1016	0.033	U	10–10.5	08/17/2009
21-605617	MD21-09-9415	Aroclor-1221	0.065	U	10–10.5	08/17/2009
21-605617	MD21-09-9415	Aroclor-1232	0.033	U	10–10.5	08/17/2009
21-605617	MD21-09-9415	Aroclor-1242	0.033	U	10–10.5	08/17/2009
21-605617	MD21-09-9415	Aroclor-1248	0.033	U	10–10.5	08/17/2009
21-605617	MD21-09-9415	Aroclor-1254	0.095	—	10–10.5	08/17/2009
21-605617	MD21-09-9415	Aroclor-1260	0.16	—	10–10.5	08/17/2009
21-605618	MD21-09-9416	Aroclor-1016	0.1	U	10–10.5	08/17/2009
21-605618	MD21-09-9416	Aroclor-1221	0.21	U	10–10.5	08/17/2009
21-605618	MD21-09-9416	Aroclor-1232	0.1	U	10–10.5	08/17/2009
21-605618	MD21-09-9416	Aroclor-1242	0.1	U	10–10.5	08/17/2009
21-605618	MD21-09-9416	Aroclor-1248	0.1	U	10–10.5	08/17/2009
21-605618	MD21-09-9416	Aroclor-1254	0.23	—	10–10.5	08/17/2009
21-605618	MD21-09-9416	Aroclor-1260	0.24	—	10–10.5	08/17/2009
21-605619	MD21-09-9417	Aroclor-1016	0.14	U	10–10.5	08/17/2009
21-605619	MD21-09-9417	Aroclor-1221	0.28	U	10–10.5	08/17/2009

Table 1 (continued)

Location	Sample ID	Aroclor	Result (mg/kg)	Qualifier	Top Depth (ft bgs)	Date Collected
21-605619	MD21-09-9417	Aroclor-1232	0.14	U	10–10.5	08/17/2009
21-605619	MD21-09-9417	Aroclor-1242	0.14	U	10–10.5	08/17/2009
21-605619	MD21-09-9417	Aroclor-1248	0.14	U	10–10.5	08/17/2009
21-605619	MD21-09-9417	Aroclor-1254	0.26	—	10–10.5	08/17/2009
21-605619	MD21-09-9417	Aroclor-1260	0.33	—	10–10.5	08/17/2009
21-605620[d]	MD21-09-9418	Aroclor-1016	0.037	U	5	08/17/2009
21-605620	MD21-09-9418	Aroclor-1221	0.075	U	5	08/17/2009
21-605620	MD21-09-9418	Aroclor-1232	0.037	U	5	08/17/2009
21-605620	MD21-09-9418	Aroclor-1242	0.037	U	5	08/17/2009
21-605620	MD21-09-9418	Aroclor-1248	0.037	U	5	08/17/2009
21-605620	MD21-09-9418	Aroclor-1254	0.066	—	5	08/17/2009
21-605620	MD21-09-9418	Aroclor-1260	0.15	—	5	08/17/2009

[a] U = Nondetect.

[b] Bolded concentrations are >1 mg/kg total PCBs.

[c] — = Detected. No qualifier assigned.

[d] Sidewall collected from approximately 5 ft bgs.

Table 2
ProUCL Output

	General UCL Statistics for Data Sets with Nondetects		
User Selected Options			
From File	Z:\gis_projects\dp_site_aggregate_area_phase_2\xls\ucl_pro\ucl_pro_21-056_septic_tank_aroclor-1254,1260_all_depths.wst		
Full Precision	OFF		
Confidence Coefficient	95%		
Number of Bootstrap Operations	2000		
Aroclor-1254			
General Statistics			
Number of Valid Data	7	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Nondetect Data	2
		Percent Nondetects	28.57%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.066	Minimum Detected	-2.718
Maximum Detected	2.98	Maximum Detected	1.092
Mean of Detected	0.726	Mean of Detected	-1.359
SD of Detected	1.263	SD of Detected	1.488
Minimum Nondetect	0.34	Minimum Nondetect	-1.079
Maximum Nondetect	0.34	Maximum Nondetect	-1.079
Warning: There are only 5 Detected Values in this data			
Note: It should be noted that even though bootstrap may be performed on this data set			
the resulting calculations may not be reliable enough to draw conclusions			
It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.613	Shapiro Wilk Test Statistic	0.87
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
Data not Normal at 5% Significance Level		**Data appear Lognormal at 5% Significance Level**	

Table 2 (continued)

Assuming Normal Distribution		**Assuming Lognormal Distribution**	
DL/2 Substitution Method		DL/2 Substitution Method	
Mean	0.567	Mean	-1.477
SD	1.066	SD	1.231
95% DL/2 (t) UCL	1.35	95% H-Stat (DL/2) UCL	1.751
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.503
		SD in Log Scale	1.285
		Mean in Original Scale	0.571
		SD in Original Scale	1.066
		95% Percentile Bootstrap UCL	1.355
		95% BCA Bootstrap UCL	1.762
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.371	**Data Follow Appr. Gamma Distribution at 5% Significance Level**	
Theta Star	1.955		
nu star	3.714		
A-D Test Statistic	0.685	**Nonparametric Statistics**	
5% A-D Critical Value	0.706	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.706	Mean	0.565
5% K-S Critical Value	0.37	SD	0.989
Data follow Appr. Gamma Distribution at 5% Significance Level		SE of Mean	0.419
		95% KM (t) UCL	1.378
Assuming Gamma Distribution		95% KM (z) UCL	1.254
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	1.352
Minimum	0.066	95% KM (bootstrap t) UCL	6.26
Maximum	2.98	95% KM (BCA) UCL	1.398
Mean	0.724	95% KM (Percentile Bootstrap) UCL	1.357
Median	0.26	95% KM (Chebyshev) UCL	2.389
SD	1.04	97.5% KM (Chebyshev) UCL	3.179
k star	0.543	99% KM (Chebyshev) UCL	4.729
Theta star	1.334		
Nu star	7.605	**Potential UCLs to Use**	
AppChi2	2.508	95% KM (Chebyshev) UCL	2.389

Table 2 (continued)

95% Gamma Approximate UCL	2.196		
95% Adjusted Gamma UCL	3.21		
Note: DL/2 is not a recommended method.			
Aroclor-1260			
General Statistics			
Number of Valid Data	7	Number of Detected Data	5
Number of Distinct Detected Data	5	Number of Nondetect Data	2
		Percent Non-Detects	28.57%
Raw Statistics		**Log-transformed Statistics**	
Minimum Detected	0.15	Minimum Detected	-1.897
Maximum Detected	1.16	Maximum Detected	0.148
Mean of Detected	0.408	Mean of Detected	-1.223
SD of Detected	0.427	SD of Detected	0.831
Minimum Nondetect	0.34	Minimum Nondetect	-1.079
Maximum Nondetect	0.34	Maximum Nondetect	-1.079
Warning: There are only 5 Detected Values in this data			
Note: It should be noted that even though bootstrap may be performed on this data set			
the resulting calculations may not be reliable enough to draw conclusions			
It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.			
UCL Statistics			
Normal Distribution Test with Detected Values Only		**Lognormal Distribution Test with Detected Values Only**	
Shapiro Wilk Test Statistic	0.697	Shapiro Wilk Test Statistic	0.852
5% Shapiro Wilk Critical Value	0.762	5% Shapiro Wilk Critical Value	0.762
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	

Table 2 (continued)

Mean	0.34	Mean	-1.38
SD	0.367	SD	0.729
95% DL/2 (t) UCL	0.61	95% H-Stat (DL/2) UCL	0.47
Maximum Likelihood Estimate(MLE) Method	N/A	Log ROS Method	
MLE method failed to converge properly		Mean in Log Scale	-1.303
		SD in Log Scale	0.717
		Mean in Original Scale	0.358
		SD in Original Scale	0.361
		95% Percentile Bootstrap UCL	0.61
		95% BCA Bootstrap UCL	0.657
Gamma Distribution Test with Detected Values Only		**Data Distribution Test with Detected Values Only**	
k star (bias corrected)	0.804	**Data appear Gamma Distributed at 5% Significance Level**	
Theta Star	0.507		
nu star	8.04		
A-D Test Statistic	0.592	**Nonparametric Statistics**	
5% A-D Critical Value	0.686	Kaplan-Meier (KM) Method	
K-S Test Statistic	0.686	Mean	0.354
5% K-S Critical Value	0.361	SD	0.336
Data appear Gamma Distributed at 5% Significance Level		SE of Mean	0.143
		95% KM (t) UCL	0.633
Assuming Gamma Distribution		95% KM (z) UCL	0.59
Gamma ROS Statistics using Extrapolated Data		95% KM (jackknife) UCL	0.625
Minimum	0.15	95% KM (bootstrap t) UCL	1.503
Maximum	1.16	95% KM (BCA) UCL	0.599
Mean	0.406	95% KM (Percentile Bootstrap) UCL	0.586
Median	0.33	95% KM (Chebyshev) UCL	0.979
SD	0.35	97.5% KM (Chebyshev) UCL	1.249
k star	1.394	99% KM (Chebyshev) UCL	1.78
Theta star	0.291		
Nu star	19.51	**Potential UCLs to Use**	
AppChi2	10.49	95% KM (Chebyshev) UCL	0.979
95% Gamma Approximate UCL	0.754		
95% Adjusted Gamma UCL	0.924		
Note: DL/2 is not a recommended method.			