



TA16



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Mr. James Bearzi
Hazardous Waste Bureau
2905 Rodeo Park Dr. E/Bldg 1
Santa Fe, NM 87505

RE: Evaluation of the Ecological Risk Screening Assessment for Dioxins/Furans for the Open Burning Treatment Units (TA-16-388 and TA-16-399), June 2009

Dear Mr. Bearzi:

This letter addresses Los Alamos National Laboratory's (LANL) ecological risk screening assessment for dioxin and furan congeners detected in soil samples associated with the Open Burning Treatment Units at Technical Area 16 (TA-16-388 and TA-16-399). LANL collected six soil samples and analyzed the samples for dioxin and furan congeners. An additional sample was collected to represent background concentrations (sample 09RCRA462). LANL did not include a screening assessment against the results from the background soil location nor did LANL provide any comparison to the background data. The results of the screening assessment conducted by LANL indicated that there were elevated hazard quotients (HQs) for the shrew and deer mouse, based on both the maximum TCDD toxicity equivalent concentration (TEC) and the mean TCDD TEC.

As part of this review, it was assumed that all the data collected to support this evaluation have been reviewed, validated, and deemed acceptable for use in a risk assessment. Our review of the LANL assessment included four primary steps:

1. Screening assessment using the background sample data,
2. Comparison of site samples and HQs to background,
3. Evaluation of avian receptors, and
4. Refined screening assessment.

Step 1 - Screening assessment using the background sample data

The screening calculations provided by LANL were verified. Following the same methodology, a screening assessment using both the maximum TCDD TEC and average TCDD TEC was conducted for background. The results indicated that for all receptors, the HQs were below the target level of one. In addition, the background concentrations and TCDD TECs were lower than the samples identified as being potentially impacted by the open burning treatment units. Therefore, it is reasonable to assume that sample 09RCRA462 is not as impacted by the open burning treatment units as the other samples. In order to assess whether this sample is truly representative of background, a review of wind rose data (to ensure the location is upwind of the treatment unit) and a statistical comparison to other background samples would be required. Table 1 provides a summary of the calculate TEC for background and resulting HQs for each receptor.

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Comments should not be evaluated as a final work product.*

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Table 1. Evaluation of “Background” Sample 09RCRA462

TCDD TEC (mg/kg)	Kestral	Robin	Red Fox	Cotton- tail	Shrew	Deer Mouse	Earth- worm	Plant
2.86E-08	1.02E-02	1.02E-02	2.39E-02	5.96E-04	9.87E-02	4.93E-02	5.72E-09	NA

NA – phytotoxicity data not available.

Step 2 – Comparison of site samples and HQs to background

Assuming the data from sample 09RCRA462 is representative of background, an analysis was conducted to determine what contributions to the HQ were reflective of potential emissions from the open burning treatment units. For this evaluation, the background HQs were subtracted from the site HQs. The results are presented in Table 2. As shown in the table, subtracting background resulted in no significant change in the results. Those receptors for which the HQs were above a target level of one prior to excluding background contributions were still elevated after removing background (data above the target level of one are in bold).

Table 2. Comparison of Hazard Indices with Background and Excluding Background

TCDD TECs	Kestral	Robin	Red Fox	Cotton- tail	Shrew	Deer Mouse	Earth- worm	Plant
Max	3.75E+00	3.75E+00	8.74E+00	2.18E-01	3.62E+01	1.81E+01	2.10E-06	NA
Max - Bk	3.74E+00	3.74E+00	8.72E+00	2.18E-01	3.61E+01	1.80E+01	2.09E-06	NA
Avg	8.59E-01	8.59E-01	2.00E+00	5.01E-02	8.29E+00	4.15E+00	4.81E-07	NA
Avg - Bk	8.49E-01	8.49E-01	1.98E+00	4.95E-02	8.19E+00	4.10E+00	4.75E-07	NA

Max: Maximum TEQ

Max – Bk: Maximum TEQ minus Background TEQ

Avg: Average TEQ

Avg – Bk: Average TEQ minus Background TEQ

NA: phytotoxicity data not available

Step 3 – Evaluation of avian receptors

A primary concern with the evaluation is that neither the kestrel nor robin (avian receptors) was included in the evaluation, as LANL does not have toxicity reference values (TRVs) for dioxin/furans in their EcoRisk database (October 2008). A notice of deficiency (NOD) comment would typically be drafted concerning this issue. In order to expedite evaluation of this site, a review of literature resulted in TRVs for both of these receptors (Sample *et al* 1996:

<http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf>). As part of this review, these TRVs from Sample *et al* were applied to determine screening level HQs for the kestrel and robin. The HQs were determined following the LANL methodology and input parameters in the “Screening-Level Ecological Risk Assessment Methods, Revision 2”. The resulting HQs for avian receptors are shown in Table 3. For both the kestrel and robin using the maximum TCDD TEC, the resulting HI is above the target level of one. However, the HI is below the target level for both receptors when using the average TCDD TEC. (HQs excluding background are presented in Table 2.)

Table 3. Avian Receptors		
TCDD TEC	Kestral	Robin
Maximum	3.75E+00	3.75E+00
Average	8.59E-01	8.59E-01

(Using a TRV of 2.8E-06 from Sample *et al* 1996)

Step 4 – Refined screening assessment

LANL conducted a limited refinement of the HQs by applying the population area use factor (AUF). The refinement evaluates each receptor’s population territory size in relation to the size of the open burning treatment facility (2.6 hectares). The results of this refinement reduce all HQs to less than the target level of one for all receptors except the shrew and deer mouse, regardless of whether background is included (see Table 4).

Table 4. Refined Hazard Quotient Analysis using Population AUFs								
TCDD TECs	Kestral	Robin	Red Fox	Cotton-tail	Shrew	Deer Mouse	Earth-worm	Plant
Max	2.30E-03	5.80E-01	5.47E-04	4.58E-03	6.03E+00	1.53E+01	2.10E-06	NA
Avg.	5.27E-04	1.33E-01	1.25E-04	1.05E-03	1.38E+00	3.50E+00	4.81E-07	NA
Bkgnd	6.27E-06	1.58E-03	1.49E-06	1.25E-05	1.64E-02	4.17E-02	5.72E-09	NA
Max- Bk	2.29E-03	5.78E-01	5.46E-04	4.57E-03	6.01E+00	1.52E+01	2.09E-06	NA
Avg - Bk	5.20E-04	1.31E-01	1.24E-04	1.04E-03	1.37E+00	3.46E+00	4.75E-07	NA

Based upon this refined assessment, LANL concluded that there are no unacceptable ecological risks, even though the deer mouse shows significantly elevated HQ when using the maximum TCDD TEQ. According to LANL’s guidance for ecological risk assessments, a more refined assessment for the shrew and deer mouse should have been conducted. Typically a notice of deficiency comment would be drafted requesting additional refinement and assessment for the shrew and deer mouse. However, in order to expedite the regulatory process for this site, additional review was conducted.

The additional assessment included refining the estimate of exposure by calculating ingestion of soil and ingestion of food products using Equation 4.2-3 and input data from Table 4.2-5 from the LANL guidance. Ingestion of water was not evaluated as no site data were provided. The approach applied the AUF for an individual receptor and then the population AUF. The results are shown in Table 5. Note that subtracting background levels from the HQs did not change the conclusions. As the HQs for the deer mouse based upon the individual AUF resulted in HQs below the target level of one, additional refinement was not needed.

Table 5. Refined HQs for Shrew and Deer Mouse		
Using Individual AUF	Shrew	Deer Mouse
Max TCDD TEQ	3.07E+00	2.84E-01
Avg TCDD TEQ	7.04E-01	6.51E-02
Bkgd TCDD TEQ	8.38E-03	7.75E-04
Using Population AUF		
Max TCDD TEQ	1.31E+00	
Avg TCDD TEQ	3.01E-01	
Bkgd TCDD TEQ	3.58E-03	

Based upon the above review and additional analyses of the data provided in LANL's ecological risk screening assessment for the open burning treatment units at TA-16, excess ecological risk is most likely not a concern. However, this conclusion is based upon limited data (five site-related samples). Due to the limited number of data, a statistical evaluation could not be conducted. Typically an average concentration is not applied but rather an upper confidence level (UCL) of the mean is determined and used if the maximum detected result results in excess risk.

While the report focused solely on ecological risks, a preliminary assessment of the TCDD TECs to human health screening levels was conducted (NMED's Soil Screening Guidance July 2009). Using the maximum TCDD TEC, the residential screening level is slightly exceeded, resulting in an excess cancer risk of 2.53E-05. The residential screening level using the average TEC resulted in acceptable risk. The industrial screening levels were below the target risk level of 1E-05 using both the maximum and average TCDD TECs.

The attached spreadsheet provides the supporting calculations discussed in this letter.

If you or any of your staff have questions, please contact me at (801) 451-2864 or via email at paigewalton@msn.com.

Thank you,



Paige Walton
AQS Senior Scientist and Project Lead

Enclosure (Excel file – for internal review only)

cc: John Kieling NMED (electronic)
Joel Workman, AQS (electronic)

LANL TA-16 Open Burning Units Ecological Screening Assessment Check Calculations

Congener	Sample 09RCRA460 (mg/kg)	Sample 09RCRA461 (mg/kg)	Sample 09RCRA463 (mg/kg)	Sample 09RCRA464 (mg/kg)	Sample 09RCRA465 (mg/kg)	Sample 09RCRA432 (mg/kg)
2,3,7,8-TCDD	ND	ND	ND	ND	ND	ND
1,2,3,7,8-PeCDD	ND	ND	ND	ND	1.92E-06	ND
1,2,3,4,7,8-HxCDD	4.19E-07	ND	ND	ND	5.38E-06	ND
1,2,3,6,7,8-HxCDD	7.15E-07	ND	ND	ND	1.06E-05	ND
1,2,3,7,8,9-HxCDD	7.26E-07	ND	ND	ND	1.14E-05	ND
1,2,3,4,6,7,8,-HpCDD	2.08E-05	4.22E-06	4.41E-06	1.08E-05	2.92E-04	1.83E-06
OCDD	1.41E-04	2.07E-05	2.70E-05	3.22E-05	1.55E-03	1.22E-05
2,3,7,8-TCDF	1.83E-07	ND	ND	ND	2.01E-07	ND
1,2,3,7,8-PeCDF	ND	ND	ND	ND	ND	ND
2,3,4,7,8-PeCDF	ND	ND	ND	6.33E-07	7.15E-07	ND
1,2,3,4,7,8-HxCDF	4.95E-07	ND	ND	7.30E-07	3.21E-06	ND
1,2,3,6,7,8-HxCDF	5.39E-07	ND	ND	1.02E-06	3.96E-06	ND
2,3,4,6,7,8-HxCDF	7.23E-07	ND	ND	1.09E-06	5.33E-06	ND
1,2,3,7,8,9-HxCDF	ND	ND	ND	ND	ND	ND
1,2,3,4,6,7,8,-HpCDF	1.04E-05	1.63E-06	1.20E-06	5.09E-06	8.44E-05	6.31E-07
1,2,3,4,7,8,9-HpCDF	5.35E-07	ND	ND	1.38E-06	5.95E-06	ND
OCDF	1.77E-05	2.54E-06	2.83E-06	1.07E-05	1.87E-04	1.17E-06

TRVS

	KESTRAL	ROBIN	RED FOX	COTTONTAIL	SHREW	MOUSE	WORM	PLANT
TCDD - LANL	N/A	N/A	1.20E-06	4.80E-05	2.90E-07	5.80E-07		5 N/A
TCDD - OTHER*	2.80E-06	2.80E-06						

*Kestral and Robin TRVs based on Sample, et al, 1996. <http://www.esd.ornl.gov/programs/ecorisk/documents/tm86r3.pdf>
 Test dose of 1.4E-05 NOAEL, applied intertaxon uncertainty factor of 5

TEF	Sample 09RCRA460 (mg/kg)	Sample 09RCRA461 (mg/kg)	Sample 09RCRA463 (mg/kg)	Sample 09RCRA464 (mg/kg)	Sample 09RCRA465 (mg/kg)	Sample 09RCRA43 2 (mg/kg)
1.00E+00						
1.00E+00					1.92E-06	
1.00E-01	4.19E-08				5.38E-07	
1.00E-01	7.15E-08				1.06E-06	
1.00E-01	7.26E-08				1.14E-06	
1.00E-02	2.08E-07	4.22E-08	4.41E-08	1.08E-07	2.92E-06	1.83E-08
3.00E-04	4.23E-08	6.21E-09	8.10E-09	9.66E-09	4.65E-07	3.66E-09
1.00E-01	1.83E-08				2.01E-08	
3.00E-02						
3.00E-01				1.90E-07	2.15E-07	
1.00E-01	4.95E-08			7.30E-08	3.21E-07	
1.00E-01	5.39E-08			1.02E-07	3.96E-07	
1.00E-01	7.23E-08			1.09E-07	5.33E-07	
1.00E-01						
1.00E-02	1.04E-07	1.63E-08	1.20E-08	5.09E-08	8.44E-07	6.31E-09
1.00E-02	5.35E-09			1.38E-08	5.95E-08	
3.00E-04	5.31E-09	7.62E-10	8.49E-10	3.21E-09	5.61E-08	3.51E-10
TEC:	7.45E-07	6.55E-08	6.50E-08	6.59E-07	1.05E-05	2.86E-08
TEC MAX:	1.05E-05					
TEC AVG:	2.40E-06					
8KND:	2.86E-08					