



**DEPARTMENT OF ENERGY**  
Environmental Management Los Alamos Field Office (EM-LA)  
Los Alamos, New Mexico 87544

EMLA-2020-1186-04-001



FEB 19 2020

Mr. Kevin Pierard  
Bureau Chief  
Hazardous Waste Bureau  
New Mexico Environment Department  
2905 Rodeo Park Drive East, Building 1  
Santa Fe, NM 87505-6313

Subject: Request for Certificate of Completion for One Solid Waste Management Unit in the Twomile Canyon Aggregate Area

Dear Mr. Pierard:

In accordance with Section XXI of the 2016 Compliance Order on Consent (Consent Order), the U.S. Department of Energy (DOE) is requesting a certificate of completion without controls for Solid Waste Management Unit (SWMU) 06-003(c) within the Twomile Canyon Aggregate Area.

A Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) was performed at SWMU 06-003(c) and the results were documented in the "RFI Report for Potential Release Sites at TAs-6, -8, -22, and -40" (Los Alamos National Laboratory [LANL] document LA-UR-97-3316). The RFI was conducted to assess whether contaminants were present at the site, to evaluate the potential for release and redistribution into the surrounding soils, and to determine if any contamination posed an unacceptable risk to human health. The RFI employed a biased, worst case sampling strategy. The biased sampling design was weighted toward sampling media from the most potentially contaminated area of the site and field sampling was further biased by the use of metal detectors and other field screening techniques to focus sample collection in areas of potential contamination. The report concluded the site appears not to have been impacted by previous activities with no widespread distribution of contaminants at levels that would result in human health risk, and no additional sampling was recommended. The RFI report included a human health risk screening assessment that concluded there was no unacceptable risk to human health under the residential scenario. At the time the report was issued, LANL was developing an approach for ecological risk assessment. Therefore, an ecological risk screening assessment was not presented. The report indicated ecological risk assessment at SWMU 06-003(c) would be deferred until the ecological risk screening methodology had been developed.

Following development of an ecological risk assessment methodology, ecological risk was evaluated in the "RFI Report for Potential Release Sites in the Eastern and Western Aggregates at Technical Area 6," (hereafter the Technical Area 06 [TA-06] RFI report) (LANL document LA-UR-98-3710). Because SWMU 06-003(c) is located in close proximity to SWMU 06-002 and Areas of Concern (AOCs) C-06-005, C-06-006, C-06-016, and C-06-020, these six sites were collectively evaluated as the Eastern Aggregate in the TA-06 RFI report, and the remaining SWMUs and AOCs at TA-06 were evaluated as the Western Aggregate. The RFI data for SWMU 06-003(c) were included with the data

used to evaluate the Eastern Aggregate, along with additional data characterizing the other five sites. The TA-06 RFI report concluded the Eastern Aggregate sites did not pose an unacceptable risk to ecological receptors. The TA-06 RFI report recommended no further action for the two SWMUs and four AOCs comprising the Eastern Aggregate. Following review of the TA-06 RFI report, the New Mexico Environment Department (NMED) requested supplemental information and this information was submitted to NMED on January 18, 2000.

Following submittal of the supplemental information requested by NMED, the TA-06 RFI report was approved in NMED's letter "Approval of the RFI Report for Technical Area (TA) 6," dated March 14, 2000. In the approval letter, NMED concurred no further action was required at SWMU 06-003(c) and AOCs C-06-006, C-06-016, and C-06-020, but indicated additional sampling to characterize the extent of releases was needed for SWMU 06-002 and AOC C-06-005. Under the Consent Order, SWMU 06-002 and AOC C-06-005 will now be investigated as part of the Twomile Canyon Aggregate Area investigation and evaluated separately for potential human health and ecological risk. AOCs C-06-006, C-06-016, and C-16-020 are listed in Attachment K, Table K-3, to LANL's Hazardous Waste Facility Permit and require no further action.

SWMU 06-003(c) does not require further investigation, but does require a site-specific ecological risk assessment. To support evaluation of corrective action complete status for SWMU 06-003(c), an ecological risk screening assessment was performed using the RFI data for this site and the current screening-level ecological risk assessment methodology. The results of the ecological risk screening assessment for SWMU 06-003(c) are presented in Enclosure 1. These results show SWMU 06-003(c) does not pose an unacceptable risk to ecological receptors.

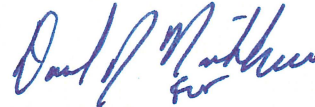
For the chemicals of potential concern identified for SWMU 06-003(c) in the RFI report, the soil screening levels (SSLs) and screening action levels (SALs) for the residential scenario are all less than the SSLs and SALs for the construction worker scenario. Therefore, the residential scenario is protective of construction workers and no controls related to future construction activities at the site are needed.

SWMU 06-003(c) is a former firing site and potential contaminants at the site include metals, explosive compounds, and uranium isotopes. Volatile organic compounds (VOCs) were not used at the site and RFI samples were not analyzed for VOCs. Because VOCs are not potential contaminants, the vapor intrusion pathway for SWMU 06-003(c) is incomplete and further evaluation of the vapor intrusion pathway is not warranted.

Based on the results of the approved TA-06 RFI report and the ecological risk screening evaluation in Enclosure 1, nature and extent of contamination are defined or no further sampling is warranted at SWMU 06-003(c) and the site poses no unacceptable human health risk or dose under the residential and construction worker scenarios and no unacceptable risk to ecological receptors. Therefore, SWMU 06-003(c) is appropriate for a certificate of completion without controls.

If you have any questions, please contact Kent Rich at (505) 551-2962 (kent.rich@em-la.doe.gov) or Cheryl Rodriguez at (505) 257-7941 (cheryl.rodriguez@em.doe.gov).

Sincerely,



Arturo Q. Duran  
Compliance and Permitting Manager  
Environmental Management  
Los Alamos Field Office

Enclosures:

1. Two hard copies with electronic files – Ecological Risk Screening Assessment for Solid Waste Management Unit 06-003(c) (EM2020-0011)

CC (letter and enclosure emailed):

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## ENCLOSURE 1

### Ecological Risk Screening Assessment for Solid Waste Management Unit 06-003(c)

A total of 12 samples were collected from 6 locations at Solid Waste Management Unit (SWMU) 06-003(c) during the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) (LANL 1997, 056664). Three locations were within the footprint of the former SWMU 06-003(c) firing pad and three locations were around the perimeter of the pad. Samples were collected at depth intervals of 0.0 ft to 0.5 ft and 2.0 ft to 3.0 ft below ground surface (bgs) at all locations. All samples were analyzed for target analyte list (TAL) metals, cyanide, high explosives, isotopic uranium, cesium-137, and strontium-90. Table 1 presents the samples collected and analytes requested, Table 2 presents inorganic chemicals above background values (BVs), Table 3 presents detected organic chemicals, and Table 4 presents radionuclides detected or detected above BVs.

All inorganic chemicals detected above BVs or not detected with detection limits (DLs) above BVs were evaluated to determine whether they were chemicals of potential concern (COPCs) for the ecological risk screening assessment. Antimony was not detected above the soil BV (0.83 mg/kg) but had DLs (4.2 mg/kg to 5.0 mg/kg) above BV in 12 samples. Antimony is retained as a COPC. Arsenic was detected above the soil BV (8.17 mg/kg) in 1 sample at a concentration of 13.6 mg/kg and is retained as a COPC. Cadmium was not detected above the soil BV (0.4 mg/kg) but had DLs (0.46 mg/kg to 0.58 mg/kg) above the BV in 3 samples. The DLs were only 0.06 mg/kg to 0.18 mg/kg above the BV and below the 3 highest concentrations in the soil background data set (2.6 mg/kg, 1.4 mg/kg, and 0.6 mg/kg) and below the 3 highest DLs in the soil background data set (all 2.0 mg/kg). Cadmium is not a COPC. Cobalt was detected above the soil BV (8.64 mg/kg) in 2 samples with a maximum concentration of 16.4 mg/kg and was not detected but had DLs (9.0 mg/kg and 10.6 mg/kg) above the soil BV in 2 samples. Cobalt is retained as a COPC. Lead was detected above the soil BV (22.3 mg/kg) in 5 samples with a maximum concentration of 63.4 mg/kg and is retained as a COPC. Manganese was detected above the soil BV (671 mg/kg) in 1 sample at a concentration of 686 mg/kg. The maximum concentration was only 15 mg/kg above the BV and below the 5 highest concentrations in the background data set (1100 mg/kg, 1000 mg/kg, 950 mg/kg, 860 mg/kg, and 810 mg/kg). Manganese is not a COPC. Thallium was not detected above the soil BV (0.73 mg/kg) but had DLs (0.82 mg/kg to 2.2 mg/kg) above the BV in 4 samples. Thallium is retained as a COPC. Zinc was detected above the soil BV (48.8 mg/kg) in 1 sample at a concentration of 51.5 mg/kg. The maximum concentration was only 2.7 mg/kg above the BV and below the 6 highest soil background concentrations (75.5 mg/kg, 60 mg/kg, 57 mg/kg, 57 mg/kg, 55 mg/kg, and 53 mg/kg). Zinc is not a COPC.

All detected organic chemicals and all radionuclides detected without BVs or detected above BVs were retained as COPCs for the ecological risk screening assessment.

Ecological risk was evaluated in accordance with the Los Alamos National Laboratory (LANL or the Laboratory) document "Screening-Level Ecological Risk Assessment Methods, Revision 5," (LANL 2017, 602649). Exposure point concentrations (EPCs) were determined using data from samples collected in the depth range 0.0 ft to 5.0 ft bgs. For COPCs having 8 or more samples with 5 or more detections, the 95% upper confidence limit (UCL) was used as the EPC. ProUCL was used to determine UCLs and ProUCL input and output files are provided in Attachment 1. If there were too few samples or detections to calculate UCLs, the maximum detected concentration (or maximum detection limit for nondetected COPCs) was used as the EPC. EPCs for ecological receptors at SWMU 06-003(c) are presented in Table 5. The EPCs were compared to the minimum of the receptor-specific ecological screening levels (ESLs) for each chemical to identify chemicals of potential ecological concern (COPECs). ESLs for terrestrial receptors are shown in Table 6 and the results of the minimum ESL comparison are shown in Table 7. Antimony, arsenic, cobalt, lead, thallium, and 1,3-dinitrobenzene are retained as COPECs

because the hazard quotients (HQs) were greater than 0.3. The HQs and hazard indexes (HIs) for each COPEC and receptor combination are presented in Table 8. The HI analysis indicates that the robin (all feeding guilds), cottontail, shrew, deer mouse, and plant have HIs greater than 1. The HI for the earthworm was equivalent to 1 and the HIs for the gray fox and kestrel (all feeding guilds) were less than 1.

The HQs and HIs for each receptor having an HI greater than 1 were adjusted using population area use factors (PAUFs). The area of SWMU 06-003(c) is approximately 0.12 ha. The PAUF was estimated by dividing the site area by the population area of each receptor population (Table 9). The HQs and HIs were recalculated using the PAUFs. The HIs for the plant and earthworm are not adjusted by PAUFs because these receptors do not have home ranges. The adjusted HIs for SWMU 06-003(c) are less than 1 for all receptors (Table 10). The plant had an unadjusted HI of 46 due primarily to thallium with contributions from antimony, arsenic, cobalt, and lead, and the earthworm had an unadjusted HI equivalent to 1. To address the HI greater than 1 and reduce the associated uncertainty, analyses were conducted using ESLs derived from lowest observed adverse effect levels (LOAELs) rather than no observed adverse effects levels. The LOAEL-based ESLs were calculated based on toxicity information in the ECORISK Database, Release 4.1 (LANL 2017, 602538) and are presented in Table 11. The HI analysis using LOAEL-based ESLs resulted in an HI of 5 for the plant (Table 12), due almost exclusively to thallium.

Thallium was not detected in any samples. The DLs for the 12 samples ranged from 0.4 mg/kg to 2.2 mg/kg. Four of the DLs (0.82 mg/kg, 0.98 mg/kg, 1.7 mg/kg, and 2.2 mg/kg) were above the soil BV (0.73 mg/kg) and 2 of these DLs were also above the highest soil background concentration (1.0 mg/kg). Because there were fewer than 5 detections, it was not possible to calculate a 95% UCL to use as the EPC. Instead, the maximum DL was used as the EPC. Because thallium was not detected in any samples and 10 of 12 DLs were within the range of background concentrations, thallium is likely present at background levels at the site. Thallium was analyzed in the RFI samples using atomic absorption spectroscopy whereas thallium was analyzed in the background data set using inductively coupled plasma mass spectrometry, which generally had lower DLs. Most background data set DLs were 0.2 mg/kg with a maximum of 1 mg/kg while the RFI DLs ranged from 0.4 mg/kg to 2.2 mg/kg. Therefore, the RFI DLs may be biased high compared with the background data, and the maximum RFI DL, which is outside the range of background concentrations, does not appear to represent average exposure concentrations and overestimates risk to plants.

The New Mexico Environment Department's (NMED's) approval with modifications for the Upper Sandia Canyon Aggregate Area supplemental investigation report (NMED 2017, 602127) indicated that when there are too few detections to calculate UCLs, other measures such as the median may be a representative estimate of population central tendency. The median DL for the RFI data is 0.44 mg/kg and should be more representative of average conditions across the site. The LOAEL-based HI using the median DL for thallium as the EPC is 0.9.

Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations, LOAEL analyses, and the relationship of detection limits to background concentrations, no potential ecological risks to the earthworm, plant, robin, kestrel, deer mouse, montane shrew, desert cottontail, and gray fox exist at SWMU 06-003(c).

## References

*The following reference list includes documents cited in this enclosure. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. This information is also included in text citations. ERIDs were assigned by the Laboratory's Associate Directorate for Environmental Management (IDs through 599999); ESHIDs were assigned by the Laboratory's Associate Directorate for Environment, Safety, and Health (IDs 600000 through 699999); and EMIDs are assigned by N3B (Newport News Nuclear BWXT-Los Alamos) (IDs 700000 and above). IDs are used to locate documents in N3B's Records Management System and in the Master Reference Set. The NMED Hazardous Waste Bureau and N3B maintain copies of the Master Reference Set. The set ensures that NMED has the references to review documents. The set is updated when new references are cited in documents.*

EPA (U.S. Environmental Protection Agency), December 1993. "Wildlife Exposure Factors Handbook," Vol. I of II, EPA/600/R-93/187a, Office of Research and Development, Washington, D.C. (EPA 1993, 059384)

LANL (Los Alamos National Laboratory), September 1997. "RFI Report for Potential Release Sites at TAs -6, -8, -22, and -40 (located in former Operable Units 1157 and 1111)," Los Alamos National Laboratory document LA-UR-97-3316, Los Alamos, New Mexico. (LANL 1997, 056664)

LANL (Los Alamos National Laboratory), September 22, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 059730)

LANL (Los Alamos National Laboratory), September 2015. "Derivation and Use of Radionuclide Screening Action Levels, Revision 4," Los Alamos National Laboratory document LA-UR-15-24859, Los Alamos, New Mexico. (LANL 2015, 600929)

LANL (Los Alamos National Laboratory), September 2017. "Screening-Level Ecological Risk Assessment Methods, Revision 5," Los Alamos National Laboratory document LA-UR-17-28553, Los Alamos, New Mexico. (LANL 2017, 602649)

LANL (Los Alamos National Laboratory), October 2017. "ECORISK Database (Release 4.1)," on CD, LA-UR-17-26376, Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 2017, 602538)

NMED (New Mexico Environment Department), January 24, 2017. "Approval with Modifications [sic], Supplemental Investigation Report for Upper Sandia Canyon Aggregate Area, Revision 1," New Mexico Environment Department letter to D. Hintze (DOE-EM) and M. Brandt (LANL) from J.E. Kielling (NMED-HWB), Santa Fe, New Mexico. (NMED 2017, 602127)

NMED (New Mexico Environment Department), March 7, 2019. "Risk Assessment Guidance for Site Investigations and Remediation, Volume 1, Soil Screening Guidance for Human Health Risk Assessments," February 2019 (Revision 1, 3/7/19), Hazardous Waste Bureau and Ground Water Quality Bureau, Santa Fe, New Mexico. (NMED 2019, 700500)

Ryti, R.T., J. Markwiese, R. Mirenda, and L. Soholt, April 2004. "Preliminary Remediation Goals for Terrestrial Wildlife," *Human and Ecological Risk Assessment*, Vol. 10, No. 2, pp. 437–450. (Ryti et al. 2004, 600901)





**Table 1**  
**Samples Collected and Analyses Requested for SWMU 06-003(c)**

Sample ID	Location ID	Media	Depth (ft)	High Explosives	TAL Metals	Total Cyanide	Isotopic Uranium	Cesium-137	Strontium-90
<b>Within Firing Pad Footprint</b>									
AAB7849	06-04007	Soil	0–0.5	18504*	18523	18523	18979	18979	18979
AAB7850	06-04007	Soil	2–3	18504	18523	18523	18979	18979	18979
AAB7851	06-04008	Soil	0–0.5	18504	18523	18523	18979	18979	18979
AAB7852	06-04008	Soil	2–3	18504	18523	18523	18979	18979	18979
AAB7853	06-04009	Soil	0–0.5	18504	18523	18523	18979	18979	18979
AAB7854	06-04009	Soil	2–3	18504	18523	18523	18979	18979	18979
<b>Firing Pad Perimeter</b>									
AAB7855	06-04010	Soil	0–0.5	18504	18523	18523	18979	18979	18979
AAB7856	06-04010	Soil	2–3	18504	18523	18523	18979	18979	18979
AAB7857	06-04011	Soil	0–0.5	18504	18523	18523	18979	18979	18979
AAB7858	06-04011	Soil	2–3	18504	18523	18523	18979	18979	18979
AAB7859	06-04012	Soil	0–0.5	18504	18523	18523	18979	18979	18979
AAB7860	06-04012	Soil	2–3	18504	18523	18523	18979	18979	18979

\*Analytical request number.



**Table 2**  
**Inorganic Chemicals Above BVs at SWMU 06-003(c)**

Sample ID	Location ID	Media	Depth (ft)	Antimony	Arsenic	Cadmium	Cobalt	Lead	Manganese	Thallium	Zinc
<b>Soil BV<sup>a</sup></b>				<b>0.83</b>	<b>8.17</b>	<b>0.4</b>	<b>8.64</b>	<b>22.3</b>	<b>671</b>	<b>0.73</b>	<b>48.8</b>
<b>Residential SSL<sup>b</sup></b>				<b>31.3</b>	<b>7.07</b>	<b>70.5</b>	<b>23.4</b>	<b>400</b>	<b>10,500</b>	<b>0.782</b>	<b>23,500</b>
<b>Construction Worker SSL<sup>b</sup></b>				<b>142</b>	<b>41.2</b>	<b>72.1</b>	<b>36.7</b>	<b>800</b>	<b>464</b>	<b>3.54</b>	<b>106,000</b>
<b>Industrial SSL<sup>b</sup></b>				<b>519</b>	<b>35.9</b>	<b>1110</b>	<b>388</b>	<b>800</b>	<b>160,000</b>	<b>13</b>	<b>389,000</b>
AAB7849	06-04007	Soil	0–0.5	4.2 (U) <sup>c</sup>	— <sup>d</sup>	—	—	—	—	—	—
AAB7850	06-04007	Soil	2–3	4.8 (U)	—	—	—	22.6 (J) <sup>e</sup>	—	2.2 (U)	—
AAB7851	06-04008	Soil	0–0.5	4.2 (U)	—	—	16.4	—	—	—	51.5
AAB7852	06-04008	Soil	2–3	4.6 (U)	—	—	10.6 (U)	28.9 (J)	—	—	—
AAB7853	06-04009	Soil	0–0.5	4.3 (U)	—	0.5 (U)	—	—	—	—	—
AAB7854	06-04009	Soil	2–3	5 (U)	—	—	—	52.7 (J)	—	0.98 (U)	—
AAB7855	06-04010	Soil	0–0.5	4.9 (U)	—	0.46 (U)	15	—	686 (J)	—	—
AAB7856	06-04010	Soil	2–3	4.5 (U)	—	—	—	—	—	—	—
AAB7857	06-04011	Soil	0–0.5	4.4 (U)	—	—	—	—	—	—	—
AAB7858	06-04011	Soil	2–3	4.8 (U)	13.6	0.58 (U)	—	63.4 (J)	—	1.7 (U)	—
AAB7859	06-04012	Soil	0–0.5	4.3 (U)	—	—	—	—	—	—	—
AAB7860	06-04012	Soil	2–3	4.8 (U)	—	—	9 (U)	42.8 (J)	—	0.82 (U)	—

Notes: Results are in mg/kg.

<sup>a</sup> BVs are from LANL (1998, 059730).

<sup>b</sup> Soil screening levels (SSLs) are from NMED (2019, 700500). If chemical has both carcinogenic and noncarcinogenic SSLs, the lower of the two is presented.

<sup>c</sup> U = The analyte was analyzed for but not detected.

<sup>d</sup> — = Not detected or not detected above BV.

<sup>e</sup> J = The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.

**Table 3**  
**Organic Chemicals Detected at SWMU 06-003(c)**

Sample ID	Location ID	Media	Depth (ft)	Dinitrobenzene[1,3-]
<b>Residential SSL<sup>a</sup></b>				<b>6.3</b>
<b>Construction Worker SSL<sup>b</sup></b>				<b>128</b>
<b>Industrial SSL<sup>a</sup></b>				<b>82</b>
AAB7859	06-04012	Soil	0–0.5	0.54 (J) <sup>c</sup>

Notes: Results are in mg/kg.

<sup>a</sup> Soil screening levels (SSLs) are from U.S. Environmental Protection Agency (EPA) regional screening tables (<https://www.epa.gov/regional-screening-levels-rsls-generic-tables>).

<sup>b</sup> Construction worker SSL calculated using toxicity value from EPA regional screening tables (<https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables>) and equation and parameters from NMED (2019, 700500).

<sup>c</sup> J = The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.

**Table 4**  
**Radionuclides Detected Above BVs at SWMU 06-003(c)**

Sample ID	Location ID	Media	Depth (ft)	Uranium-234	Uranium-235/236	Uranium-238
<b>Soil BV<sup>a</sup></b>				<b>2.59</b>	<b>0.2</b>	<b>2.29</b>
<b>Residential SAL<sup>b</sup></b>				<b>290</b>	<b>42</b>	<b>150</b>
<b>Construction Worker SAL<sup>b</sup></b>				<b>1000</b>	<b>130</b>	<b>470</b>
<b>Industrial SAL<sup>b</sup></b>				<b>3100</b>	<b>160</b>	<b>710</b>
AAB7851	06-04008	Soil	0–0.5	12.2	0.475	11.8

Notes: Results are in pCi/g.

<sup>a</sup> BVs are from LANL (1998, 059730).

<sup>b</sup> Screening action levels (SALs) are from LANL (2015, 600929).

**Table 5**  
**EPCs at SWMU 06-003(c) for Ecological Receptors**

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
<b>Inorganic Chemicals (mg/kg)</b>							
Antimony	12	0	4.2 (U) <sup>a</sup>	5 (U)	n/a <sup>b</sup>	5 (U)	Maximum detection limit
Arsenic	12	10	0.4	13.6	Gamma	7.38	95% KM Adjusted Gamma
Cobalt	12	2	1.7 (U)	16.4	n/a	16.4	Maximum detected concentration
Lead	12	12	1	63.4	Normal	33.6	95% Student's-t
Thallium	12	0	0.4 (U)	2.2 (U)	n/a	2.2 (U)	Maximum detection limit
<b>Organic Chemicals (mg/kg)</b>							
Dinitrobenzene[1,3-]	12	1	0.13 (U)	0.54	n/a	0.54	Maximum detected concentration
<b>Radionuclides (pCi/g)</b>							
Uranium-234	12	12	0.502	12.2	Nonparametric	5.96	95% Chebyshev(Mean, Sd)
Uranium-235/236	12	12	0.025	0.475	Nonparametric	0.24	95% Chebyshev(Mean, Sd)
Uranium-238	12	12	0.577	11.8	Nonparametric	5.84	95% Chebyshev(Mean, Sd)

<sup>a</sup> U = The analyte was analyzed for but not detected.

<sup>b</sup> n/a = Not applicable.

**Table 6**  
**Ecological Screening Levels for Terrestrial Receptors**

COPEC	Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Cottontail (mammalian herbivore)	Deer Mouse (mammalian omnivore)	Montane Shrew (mammalian insectivore)	Earthworm (soil dwelling invertebrate)	Generic Plant (terrestrial autotroph-producer)
<b>Inorganic Chemicals (mg/kg)</b>											
Antimony	46	na*	na	na	na	na	2.7	2.3	7.9	78	11
Arsenic	820	740	100	34	21	15	110	32	19	6.8	18
Cobalt	5400	2300	620	130	97	76	1000	400	240	na	13
Lead	3700	540	83	18	14	11	310	120	93	1700	120
Thallium	5	100	48	6.9	5.5	4.5	1.2	0.72	0.42	na	0.05
<b>Organic Chemicals (mg/kg)</b>											
Dinitrobenzene[1,3-]	82	120	9.3	0.079	0.15	1.6	0.091	0.072	0.95	na	na
<b>Radionuclides (pCi/g)</b>											
Uranium-234	110,000	260,000	260,000	14,000	27,000	69,000	36,000	120,000	140,000	2200	440
Uranium-235/236	5200	10,000	10,000	6300	7900	9500	4700	5200	5200	1600	440
Uranium-238	2100	4200	4200	3300	3700	4000	2000	2100	2100	1100	400

Notes: Ecological screening levels are from LANL (2017, 602538).

\*na = Not available.

**Table 7**  
**Minimum ESL Comparison for SWMU 06-003(c)**

COPC	EPC (mg/kg)	ESL (mg/kg)	Receptor	HQ
<b>Inorganic Chemicals (mg/kg)</b>				
Antimony	5 (U)*	2.3	Deer Mouse	<b>2.17</b>
Arsenic	7.38	6.8	Earthworm	<b>1.09</b>
Cobalt	16.4	13	Plant	<b>1.26</b>
Lead	33.6	11	Robin (insectivore)	<b>3.05</b>
Thallium	2.2 (U)	0.05	Plant	<b>44</b>
<b>Organic Chemicals (mg/kg)</b>				
Dinitrobenzene[1,3-]	0.54	0.072	Deer Mouse	<b>7.5</b>
<b>Radionuclides (pCi/g)</b>				
Uranium-234	5.96	440	Plant	0.014
Uranium-235/236	0.24	440	Plant	0.00054
Uranium-238	5.84	400	Plant	0.015

Notes: Bolded values indicate HQs greater than 0.3.

\*U = The analyte was analyzed for but not detected.

**Table 8**  
**HI Analysis for SWMU 06-003(c)**

COPEC	EPC (mg/kg)	Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Cottontail (mammalian herbivore)	Montane Shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Antimony	5 (U) <sup>a</sup>	0.11	na <sup>b</sup>	na	na	na	na	<b>1.85</b>	<b>0.63</b>	<b>2.17</b>	0.064	<b>0.45</b>
Arsenic	7.38	0.009	0.01	0.074	0.22	<b>0.35</b>	<b>0.49</b>	0.067	<b>0.39</b>	0.23	<b>1.09</b>	<b>0.41</b>
Cobalt	16.4	0.003	0.0071	0.026	0.13	0.17	0.22	0.016	0.068	0.041	na	<b>1.26</b>
Lead	33.6	0.0091	0.062	<b>0.4</b>	<b>1.87</b>	<b>2.4</b>	<b>3.05</b>	0.11	<b>0.36</b>	0.28	0.02	0.28
Thallium	2.2 (U)	<b>0.44</b>	0.022	0.046	<b>0.32</b>	<b>0.40</b>	<b>0.49</b>	<b>1.83</b>	<b>5.24</b>	<b>3.06</b>	na	<b>44.0</b>
Dinitrobenzene[1,3-]	0.54	0.0066	0.0045	0.058	<b>6.84</b>	<b>3.6</b>	<b>0.34</b>	<b>5.93</b>	<b>0.57</b>	<b>7.5</b>	na	na
<b>HI</b>		0.6	0.1	0.6	<b>9</b>	<b>7</b>	<b>5</b>	<b>10</b>	<b>7</b>	<b>13</b>	1	<b>46</b>

Note: Bolded values indicate HQs greater than 0.3 or HI greater than 1.

<sup>a</sup> U = The analyte was analyzed for but not detected.

<sup>b</sup> na = Not available.

**Table 9**  
**PAUFs for Ecological Receptors for SWMU 06-003(c)**

Receptor	HR (ha) <sup>a</sup>	Population Area (ha) <sup>b</sup>	PAUF <sup>c</sup>
American Kestrel	106	4240	2.83E-05
American Robin	0.42	16.8	7.14E-03
Deer Mouse	0.077	3	4.00E-02
Cottontail	3.1	124	9.68E-04
Montane Shrew	0.39	15.6	7.69E-03
Fox	1038	41,520	2.89E-06

<sup>a</sup> Values from EPA (1993, 059384).

<sup>b</sup> Population area is equal to the home range (HR) times 40 (Ryti et al. 2004, 600901).

<sup>c</sup> PAUF is calculated as the area of the site (0.12 ha) divided by the population area.



**Table 10**  
**Adjusted HIs for SWMU 06-003(c)**

COPEC	EPC (mg/kg)	Fox (mammalian top carnivore)	American Kestrel (avian top carnivore)	American Kestrel (avian intermediate carnivore)	American Robin (avian herbivore)	American Robin (avian omnivore)	American Robin (avian insectivore)	Cottontail (mammalian herbivore)	Montane Shrew (mammalian insectivore)	Deer Mouse (mammalian omnivore)	Earthworm (soil dwelling invertebrate)	Plant (terrestrial autotroph-producer)
Antimony	5 (U) <sup>a</sup>	3.14E-07	na <sup>b</sup>	na	na	na	na	1.79E-03	4.87E-03	0.087	0.064	<b>0.45</b>
Arsenic	7.38	2.60E-08	2.82E-07	2.09E-06	1.55E-03	2.51E-03	3.51E-03	6.49E-05	2.99E-03	9.23E-03	<b>1.09</b>	<b>0.41</b>
Cobalt	16.4	8.78E-09	2.02E-07	7.49E-07	9.01E-04	1.21E-03	1.54E-03	1.59E-05	5.26E-04	1.64E-03	na	<b>1.26</b>
Lead	33.6	2.62E-08	1.76E-06	1.15E-05	0.0133	0.0171	0.0218	1.05E-04	2.78E-03	0.011	0.02	<b>0.28</b>
Thallium	2.2 (U)	1.27E-06	6.23E-07	1.30E-06	0.00228	0.00286	0.00349	1.77E-03	0.0403	<b>0.12</b>	na	<b>44</b>
Dinitrobenzene[1,3-]	0.54	1.90E-08	1.27E-07	1.64E-06	0.0488	0.0257	2.41E-03	5.74E-03	4.37E-03	<b>0.3</b>	na	na
<b>Adjusted HI</b>		2E-06	3E-06	2E-05	0.07	0.05	0.03	9E-03	0.06	0.5	1	<b>46</b>

Note: Bolded values indicate HQs greater than 0.1 or HI greater than 1.

<sup>a</sup> U = The analyte was analyzed for but not detected.

<sup>b</sup> na = Not available.

**Table 11**  
**Summary of LOAEL-Based ESLs for Terrestrial Receptors**

COPEC	Receptor	LOAEL-Based ESL* (mg/kg)
Antimony	Plant	58
Arsenic	Plant	91
Cobalt	Plant	130
Lead	Plant	570
Thallium	Plant	0.5

\*LOAEL-based ESLs from ECORISK Database, Release 4.1 (LANL 2017, 602538).

**Table 12**  
**HI Analysis Using LOAEL-Based ESLs for SWMU 06-003(c)**

COPEC	EPC (mg/kg)	Plant
Antimony	5 (U)	0.086
Arsenic	7.38	0.081
Cobalt	16.4	<b>0.13</b>
Lead	33.6	0.059
Thallium	2.2 (U)	<b>4.4</b>
<b>HI</b>		<b>5</b>

Notes: Bolded values indicate HQ greater than 0.1 or HI greater than 1.

# **Attachment 1**

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*ProUCL Files*  
*(on CD included with this document)*

